Joint Defra / Environment Agency Flood and Coastal Erosion Risk Management R&D Programme

Improving response, recovery and Resilience

Improving Institutional and Social Responses to Flooding

Science Report: SC060019 - Work Package 2

Environment Agency

defra
Department for Environment Food and Rural Affairs

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It's our job to make sure that air, land and water are looked after by everyone in today's society, so that tomorrow's generations inherit a cleaner, healthier world.

Our work includes tackling flooding and pollution incidents, reducing industry's impacts on the environment, cleaning up rivers, coastal waters and contaminated land, and improving wildlife habitats.

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Steve Killeen

Head of Science

Executive summary

This report summarises Work Package 2 of the project Improving Institutional and Social Responses to Flooding. The aim of Work Package 2 was 'to understand how the Environment Agency can improve people's responses to flood warnings for people in different flood risk situations. This is before, during and after a flood so that the Environment Agency and partners can help to improve institutional and community resilience.'

The following tasks were carried out as part of this work package:

1) Review of literature on social impacts of, responses to and recovery from flooding.

2) Case example of Stockbridge around institutional responses to a flood event.

3) Case study of recovery and resilience following the January 2005 flood in Carlisle, including review of resilience theory. Focus groups with flood victims and interviews with key informants were used in this case study.

4) Case study from the FLOODsite research project. The case study is taken from research conducted under the European Commission-funded FLOODsite project, Task 11: Risk perception, community behaviour and social resilience. The Task carried out investigations in Germany with flood victims from the 2002 flood.

Key findings from this work package are outlined below.

Impacts of flooding and response to warnings

The research confirmed that the social impacts of flooding are widespread, interconnected and may be long-lasting. Negative social impacts may be affected by characteristics of the flood (such as depth and velocity), individual (for example, low income), and/or community. Often, the long-lasting effects of a flood may be caused or exacerbated by the stress of dealing with the aftermath of a flood or recovery period. There are often ongoing sources of stress and negative impacts during this phase which make it worse than the actual flood. The main sources of stress include cleaning up and dealing with builders and insurers.

In terms of response before and during a flood, our research found that people often prioritise actions designed to alleviate psychological discomfort and don't just focus on moving material property. These actions include moving people and pets to safety and helping vulnerable neighbours. The key factors that affect response are similar to those that affect the social impacts. A further issue affecting response is people's construction of what a flood is like, often underestimating the speed and depth of the flood waters. The consequences of a flood and the devastation it can cause are often unknown to and unanticipated by people.

Receiving a timely, informative and credible flood warning aids response to flooding and recovery. However, taking action does not necessarily follow the receipt of a warning. A number of factors affect this response including the provision of locally relevant, consistent and repeated information together with the characteristics of the recipient and social context.

Adaptation and resilience to flooding

With regard to adaptation to flooding following an event, this research challenges the assumption of a linear relationship between flood experience, adaptation and preparedness. Research shows that only a very small proportion of flood victims are prepared for a future event. The causes of this low preparedness range from an

understandable wish to move on and reduce anxiety, to feeling that one cannot do anything about flooding.

The research into resilience showed that whilst it is important to protect people and property from flooding by building and maintaining flood defences and providing effective flood warnings, flood risk management should include a shift to another type of resilience that includes learning from past events and adapting to future risk. This is particularly important in the context of climate change and changes in population.

In terms of positive examples our research found that a quick, effective and coordinated response from the authorities can do much to alleviate the negative impacts of a flood, particularly those of the immediate aftermath, and consequently aid recovery. Having strong informal local networks (which include the voluntary sector) is a factor that was shown consistently to improve response and recovery.

We also found a clear gap between the public's perception of their own responsibility and that of authorities in terms of reducing flood risk. This has serious implications for the Environment Agency and other authorities. If the public do not perceive that reducing flood risk is their responsibility, they will not act on and adapt to future risk.

Recommendations

This report provides recommendations to improve response, aid recovery and build community resilience. The Environment Agency is not the lead organisation in this phase of an event and an overall recommendation is that the findings and recommendations of this work package should be shared with professional partners and other organisations. Key recommendations include:

- The Environment Agency should put effort into improving flood warnings to provide consistent, frequent, specific and locally relevant information via a number of methods including face-to-face.
- The concept of appropriate action should be examined for different flood situations including flash flooding, to develop specific action lists that can be disseminated during emergency planning and enacted during a flood.
- The Environment Agency should work to increase the public's awareness of the peculiarities and variability of flooding. More emphasis should be placed on the potential for rapid onset events and flooding which can arise from groundwater, drains, and sewers as well as rivers and streams. Public awareness of the potential length and seriousness of the recovery process should also be increased.
- Work with community groups, including flood groups, should be carried out around developing knowledge of what to do in a flood but also how to prepare for the recovery period, including evacuation, dealing with insurance, loss adjustors.
- The Environment Agency should lobby for changes in insurance policy in order to minimise the stress often experienced by flood victims when dealing with claims.
- The orientation of flood risk management should be reconsidered with a reduced focus on resistance and 'getting back to normal' and increased adaptation to the risk.
- Institutions and local authorities should be able to work more flexibly during an emergency and be able to react more quickly. For the Environment Agency, this could mean developing 'latent capacity' which can be invoked at short notice.
- The Environment Agency should work to facilitate bridging social capital which in turn could increase institutional resilience to flooding. This could be done, for example, by being more active in the Local Resilience Forum (LRF) or proactively participating in local authority recovery plans.
- The Environment Agency should consider commissioning new research in various related areas including: community impacts of flooding, people's perception of flooding and its consequences and human response to and adaptation to flooding.

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1 Introduction

This report summarises Work Package 2 of the project *Improving Institutional and Social Responses to Flooding*. The project started in January 2007 and finished in March 2008. Work Package 2 focuses on understanding and improving responses, recovery and resilience to flooding.

The overall aim of Work Package 2 was: '*to understand how the Environment Agency can improve people's responses to flood warnings for people in different flood risk situations. This is before, during and after a flood so that the Environment Agency and partners can help to improve institutional and community resilience*.'

This work package was expected to have the following outcomes:

- Understand what types of response the Environment Agency is looking for, linking to corporate targets. Are the actions and responses defined the right ones? Are different types of actions appropriate for different types of people in different flood risk situations?
- Understand how effective (in terms of creating a response that reduces the risk to life and property) different responses are for people in different flood risk situations.
- Understand what affects this response, creating, changing or improving a response. And how this varies for people in different flood risk situations.
- Understand the role and effects on the actions of the way partners[1] work with people in different flood risk situations before, during and after a flood. And what this means to those people who are flooded.
- Collect evidence to back-up proposed changes.
- Develop recommendations to achieve a better response to flood warnings

1.1 Contents and structure of this report

This report aims to bring together the different research outputs produced as part of this research. The following outputs have been produced as part of this work package:

1) Review of research and literature relevant to social impacts of flooding, responses to and recovery from flooding. The review aimed to summarise existing knowledge on response and recovery. It also provided the basis for the design of the focus groups and interviews undertaken in Carlisle (Output 3).
2) Case example of Stockbridge around institutional responses to a flood event.
3) Case study of recovery and resilience following the January 2005 flood in Carlisle, including review of resilience theory.
4) Case study from the FLOODsite research project. The case study is taken from recent research conducted under the European Commission-funded FLOODsite project, Task 11: Risk perception, community behaviour and social

[1] Using the Civil Contingencies Act definition.

resilience. The task conducted empirical investigations in Germany (Steinführer and Kuhlicke, 2007) the final report of which, *Social vulnerability and the 2002*

5) *flood* (Report number T11-07-08), can be accessed from the FLOODsite website at: www.floodsite.net.

Section 2 of this report summarises the key findings from the different outputs of this research as listed above. Section 3 provides recommendations for the Environment Agency to improve response and recovery and increase resilience. The review of response, recovery and adaptation is included in Section 4, the example of Stockbridge in Section 5. The two case studies, Carlisle and FLOODsite, are included in Sections 6 and 7 respectively.

2 Key issues from this research

This section summarises some key findings from all the different outputs of this work package. These findings are discussed in more detail in Sections 4 (literature review), 5 (Stockbridge case example), 6 (Carlisle case study) and 7 (FLOODsite- European case study).

Social impacts of flooding

It is clear from our review and others (such as Walker *et al*., 2006) that flooding has direct negative social impacts (such as loss of possessions, risk of injury) but that there are also negative impacts associated with response (such as stress from evacuation) and the recovery (like the time and stress of dealing with insurance). Often, the long-lasting effects of a flood may be caused or exacerbated by the stress of dealing with the aftermath of a flood: cleaning up, dealing with insurers and builders and reinstating the home. People are vulnerable in different ways at different times of the flood incident cycle. Negative social impacts may be exacerbated by characteristics of the flood (such as depth and velocity), individual (disability for example), and/or community (such as deprived communities). The case study undertaken in Carlisle confirms these findings from the literature related to the effects of flooding and the causes of social impacts.

There are gaps in the research, for instance, the long-lasting effects of a flood on a community have not been researched in the UK. Identifying the key factors that influence the impacts of flooding should help the targeting of efforts to improve community resilience to flooding.

Response

The literature reviewed showed that the most common actions undertaken during and before a flood can be grouped in a series of categories:

- Moving people and pets to safety - which is often the first response.
- Moving valued possessions and cars
- Trying to stop water entering the property
- Trying to confirm the warning (often the first response), seek advice and help others

The review also found that people often prioritise actions designed to alleviate psychological discomfort and not just focussed on moving material property. These actions include the first point above, moving people and pets to safety and also help vulnerable neighbours. In terms of saving possessions people tend to focus more on items of sentimental value. However, participants in the Carlisle focus groups (section 6) reported they wished they had saved things of sentimental value although at the time they tended to try to save things that had economic value.

In terms of the key factors that affect response to flooding these include: flood characteristics, individual and household characteristics- demographics, prior experience, family composition, characteristics of a property, receiving help during a flood from neighbours or relatives. These factors are similar to those affecting the social impacts of flooding.

A further issue impacting response is the perception of a ‘typical’ flood. Research in Carlisle showed that many participants had a predetermined idea that a flood would be a slow-onset event signalled by rising surface water. In Carlisle, the flood had neither of these characteristics. The speed of onset and the fact that flood waters rose up through the floors of most buildings meant that residents and business operators in

general did not react quickly and avoidable damage to property occurred as a consequence. Understanding people's constructions and expectations of flooding and specifically its consequences is a gap in the current knowledge.

The findings also illustrate that different types of preparedness actions or responses may be appropriate for different types of people and flood risk situations, for example between owners-occupiers and renters, rural and urban areas.

In terms of institutional responses, the Stockbridge example included in Section 5 is a positive example of a quick and effective response and provides a series of key factors that facilitated that response by the local authority and led to an increase in the trust in the organisations involved:

- Personal leadership.
- Setting up a small full-time core team to work with those who had been flooded and also with those involved with the response.
- Support from 'above' in the council and MPs which crucially made resources available on the ground.
- Including everyone: from flood victims to organisations in daily meetings. This facilitated relationships between those affected by the flood and those responding to the event.
- Empathy: accepting people's emotions, even though they were angry and hostile in the early days.
- Building connections and social capital through all the above which enabled the response and recovery to take place much more smoothly.

Flood warnings

Receiving a timely, informative and credible flood warning is a key factor that aids response to flooding and recovery. However, receiving a warning does not necessarily lead to action. Fielding *et al.* (2007, p13-15) summarise the variables shown to affect response to a warning:

- Characteristics of the warning message - providing specific and locally relevant information and the consistency and frequency of the information received are key factors that lead to a response. The source of the message is also an important factor and face-to-face communication seems to increase public response. Environmental factors such as heavy rainfall can themselves provide a warning and increase the likelihood of response.
- Individual factors - including factors such as age and ethnicity and other predictors of 'vulnerability'. However, people's perceptions of risk and their own vulnerability have on the other hand a clear effect on response; a belief that one's home is at risk or a feeling of vulnerability has been reported to heighten response.
- Social factors - warning response is a complex social process that often occurs in groups. Factors that increase response included having strong social networks, being responsible for children or having an illness and being in the same place as the rest of the family.

In addition to the above factors, the German case study (Section 7) illustrates that different warning methods may be appropriate for different segments of the population, for instance during the event, no one over 59 had consulted the internet to receive information about the flood. There is also evidence in the UK of elderly people using

the internet less (ONS, 2006), yet there is a growing emphasis on electronic warning methods. This issue is discussed in more detail in Twigger-Ross *et al.* (2008).

Recovery

The recovery process following a flood lasts for months or even years. There are often a series of on-going sources of stress and negative impacts during this phase of an event. The literature and the case studies undertaken for this work package highlight that often the recovery period and all it entails including cleaning up and dealing with builders and insurers is often worse than the actual flood. Research with flood victims finds time and again that the most severe impacts occur sometime after the flood. These findings were confirmed in the Carlisle study.

In terms of what organisations can do to improve recovery, the Stockbridge case example included in Section 5 provides two important positive insights:

- The response and recovery effort was led and organised in a way that not only responded to the individual and community physical and building repair/infrastructure needs, but also to their socio-emotional needs as well.
- Speedy and effective institutional response is likely to lead to better recovery and cement better partnership working. In turn this social capital is available then to work at the strategic, catchment levels.

Adaptation

The percentage of flood victims that undertake any measures to prepare themselves for a future event, by creating a flood plan or adapting their home, is consistently low across the literature and the case studies presented in this report. There is no linear relationship between flood experience and adaptation. This contradicts the myth that 'if we could flood everyone once….' people would then be prepared. A series of factors have been found to act potentially as barriers to undertaking adaptation measures, including:

- Psychological factors which include the need to 'move on' after a flood and reduce anxiety.
- The idea that a flood 'won't happen again' - this may be reinforced by the language used by flood practitioners, such as one in 100 years flood.
- Feeling that one cannot do anything to prevent flooding or reduce the consequences.

The findings of this research challenge the assumption that there is a strong correlation between awareness and preparedness and undertaking appropriate action during a flood. The participants in the two case studies in Carlisle and Germany reveal that although they have been through a serious flood, they have done little in the way of adapting their property or indeed their behaviour. Since the flood events only a very small number of participants had a flood plan for a possible future event. This has implications for awareness raising by the Environment Agency.

Resilience

Understanding the concept of resilience was central to this report. A review for the Carlisle case study explored the concept of resilience and its different interpretations in policy and academic literature. Some of the implications of these different interpretations for responses to flooding were considered, in order to provide a preliminary framework for analysing the Carlisle case study results. In summary, the resilience review found that at the conceptual level and within specific applications, researchers have interpreted and applied resilience in three very distinct ways:

- ‘Type 1’ resilience is the capacity of a system to resist exogenous shocks and disturbances by virtue of its robustness and absorptive capacity. In relation to flooding, this type of resilience is best exemplified by the building of defences and improvement of flood warnings.
- ‘Type 2’ resilience is the capacity of a system to return to its previous state by restoring damaged structures, processes and procedures. This type of resilience is currently the focus of the recovery phase: reconstruction, insurance payments, ‘getting back to normal’.
- ‘Type 3’ resilience refers to the capacity of a system to re-configure itself and adapt to changes in its operating environment on the basis of experience and learning so that it is able to function. This type of resilience is achieved by learning from an event and adapting as a consequence. Learning and adapting can happen at the institutional level (by improving planning and working together) or household/ community/individual level (by adapting the home, making flood plans, being part of a flood action group and so on).

Whilst it is important to protect people and property from flooding through flood defences and warnings, flood risk management should shift to type 3 resilience: learning and adapting. This is particularly important in the context of climate change and changes in population. We cannot ‘go back to normal’ because the baseline is constantly changing. However, the Carlisle case study showed that the focus was on type 1 and 2 resilience (building new defences and going back to normal), although we did find some examples of adaptive resilience including an increase in social networks and community cohesion in the local authority and voluntary sectors.

Social networks play a key role before, during and after a flood. For instance, these networks facilitate contacts with formal networks and fill gaps in the response capacity of the official networks. In Carlisle, the community and voluntary sector provided the first response to the event, days before the local authority’s response. In Germany informal networks were also the most important resources for coping with the flood event and recovery, with membership of local associations being particularly important.

Perception of personal and organisational responsibility

There is a clear gap between the public’s perception of their own responsibility and that of authorities in terms of reducing flood risk. This was a consistent finding in the two case studies in England and Germany. This also has implications in terms of resilience: if the public do not perceive that reducing flood risk is their responsibility they will not do anything about it and will not adapt to the future risk. Whilst the scientific community and institutions have moved from a focus on flood defence to flood risk management, this paradigm shift has not been picked up by the general public, highlighting the knowledge gap between the scientific community and local populations. This has a series of implications: people do not take responsibility for protecting themselves against flood risk, do not understand the concept of residual risk from flood defences, do not understand the distinction between structural and non-structural measures. The public’s stance in terms of flooding is mainly that it is the authorities’ job to protect them.

The perception of responsibility is also related to tenure: in some locations both in the Carlisle and German case studies differences in terms of preparedness and response between home owners and renters were identified. In the case of rented properties, much of the responsibility rests with the landlord which has been shown to reduce the likelihood of residents undertaking preparedness measures.

3 Recommendations for increasing resilience to flooding

This section draws together the main recommendations from the research undertaken for this work package. Because of the nature of flooding and the impacts on people and communities and the fact that the Environment Agency does not have a leading role in this aspect of flood risk management, one overall recommendation from the research is that the findings and recommendations of Work Package 2 are shared with other professional partners and voluntary organisations with a role in response, recovery and resilience.

Understanding social impacts

1. The Environment Agency has researched the social impacts of flooding which should be shared with collaborators through seminars and joint working on research projects and the implementation of findings. Work is being shared with the Health Protection Agency (HPA) and we suggest that information is shared with other organisations such as local authorities. Knowing how important empathy is within the flood situation from this and other research there needs to be wider recognition among policy makers and flood incident managers of the diversity of impacts and experiences among flood victims and different communities. Recognition of the long time-scales that can be involved and the way that social impacts can evolve for some victims and communities is also important.

2. We recommend that given the stress experienced by flood victims from dealing with insurance that the Environment Agency lobbies for changes in insurance policy that benefit the flood victim and ensure consistency in approach across insurance companies. Research independent of the insurance industry should be commissioned that specifically seeks to evaluate the experience of flood victims through the process of making claims, with the aim of identifying good and bad practice.

Improving response

3. Improving the social elements of the Flood Warning system. Broadly, receiving a warning does not necessarily mean that people will take effective action but receiving a warning is more likely to lead to action. Given this the warning messages need to be as good as they can be recognising that the risk communication context is as important as the message itself. Therefore, the Environment Agency should put effort into improving flood warnings as far as possible focussing on providing consistent, frequent, specific and locally relevant information given out using a variety of methods including face-to-face.

4. Improving appropriate actions. We recommend that the Environment Agency examine different flood situations and establish what is effective action for each of those situations (such as rapid response catchments, slow rising catchments) and develop specific action lists that can be disseminated during emergency planning and enacted during a flood. People need to be more aware of, and prepared for, the peculiarities and variability of flooding. More emphasis should be placed on the potential for rapid on-set events and the fact that flooding can arise from groundwater, storm water drains, and sewers as well as rivers and streams. Public awareness of the potential length of the recovery process, and the residual risk of flooding even where defences are in place, also needs to be increased.

5. We recommend that the Environment Agency work with other Category 1 responders (local authorities, HPA) and with community flood action groups as appropriate to develop knowledge around what actions to take to prepare for a flood but also how to prepare not just for the inundation of water but for the recovery period: what to do if you are evacuated, what to do with pets, what to expect from insurance companies, loss adjusters and so on. Discussions with community flood action groups, parish councils, residents associations and so on would enable staff to understand what people are concerned about and to suggest what actions might be effective.

Adaptation and resilience

6. We recommend that the Environment Agency develop an institutional understanding of resilience, using the three types identified in the Carlisle case study: resistance, restoration and re-configuration. Understanding that different communities will express different types of resilience and this will affect their willingness to engage with measures designed to improve resilience.

7. It is likely that different parts of the Environment Agency will also have different understandings of resilience which affect action. We recommend that the Environment Agency initiate a discussion with key collaborators on what is understood by resilience and how actions can be developed to support it.

8. Overall we recommend that the orientation of flood prevention and flood incident management needs to be reconsidered. At present, the focus is largely on enhancing resistance via improved flood defences and warning systems, along with emergency planning aimed at providing basic services and restoring infrastructures as quickly as possible. However, restoration is not the same as recovery. Some of the research participants in Carlisle are equally, if not more, vulnerable to the effects of flooding now compared to 2005. In the context of local flood action plans, more emphasis should be placed on vulnerability-reducing adaptation (type 3 resilience), recognizing that such innovations will have to be developed in the medium and longer term alongside more traditional strategies designed to resist flooding and provide emergency relief. Such changes are unlikely to occur unless communities are more effectively engaged in decision- making for flood risk management.

Addressing the factors that reduce individual resilience

9. The research shows that there are a number of characteristics that are likely to reduce or increase effective responses to flood warnings and response in flooding, recovery and resilience. We recommend that the Environment Agency works in partnership to consider how best to enable people with those characteristics to develop effective responses. This is likely to take place best at a local area level where there would first need to be an understanding of what characteristics might be important in that area followed by community engagement with different groups as appropriate (recognising that people with vulnerability characteristics might also be those who are not easy to reach because they are not connected to services) to work with them to develop understanding and capacity in terms of effective action. Experiences in Carlisle and Germany indicate that ‘bottom-up’ flood incident strategies are needed which are designed around detailed understanding of the socio-economic and institutional characteristics of each area. Furthermore, there is a strong case for providing more emotional support for flood victims, including the establishment of self-help groups. The Environment Agency should also share this conclusion with local authorities, the HPA and voluntary organisations who may be able to facilitate delivery of such emotional support.

Developing institutional resilience

10. The Environment Agency can be in a position to facilitate bridging social capital by focussing on the above issues. That bridging social capital may well improve the rate of recovery for flooded communities.

    - The Environment Agency should develop and maintain personal contacts with key personnel via the LRF.
    - The Environment Agency should ensure it is part of or closely connected to a core team who are responsible for recovery in their area. Give staff time to participate in that team. If no team exists then the Environment Agency should engage with key partners to set one up.
    - Develop a culture of inclusion and blurring of institutional boundaries so that community groups, voluntary groups can be connected to the core team and given roles for recovery.
    - Ask local authorities if they have recovery plans and find out what expectations they have of the Environment Agency. Proactively engage with those plans.

11. Institutions and local authorities should be able to work more flexibly during an emergency and be able to react more quickly. For example, emergency plans should also refer to organizational structures and procedures as well as the actual types of emergency services to be offered. We recommend that organizations such as the Environment Agency and local authorities develop 'latent capacity' which can be invoked at short notice. In practice this would involve the designation of secondary/alternative roles, the provision of training so that people can be re-deployed and carry out other functions when required, and the strategic distribution of resources so that they are not all concentrated in one location which might be disabled by a flood. For the Environment Agency, this could include having procedures in place so that staff from Areas not affected by flooding could be redeployed to flooded Areas during an emergency. Regarding insurance, the organizations need to have pre-arranged insurance policies in place that can be quickly authorized by the insurers and invoked at the start of an emergency. This would allow council workers to go in to buildings and carry out functions outside their normal jobs/roles.

Developing responsibilities for flood incident management

12. We recommend that the Environment Agency works internally, with partners and with members of the public and communities to develop a shared understanding of the different phases and roles within flood incident management. The aim is to develop a dialogue about how the risk and consequences of flooding can be tackled in collaboration.

Further research

13. The Environment Agency should consider supporting further research in Carlisle and in other parts of England and Wales on human response, adjustment and adaptation to flooding. With some adjustments and refinements to research design and methodology, it would be possible to generate a more substantial body of evidence upon which the future policies and practices of the Environment Agency and other relevant organizations could be based. In supporting future research, particular attention should be paid to ensuring that balanced and representative groups of research participants are recruited from the study areas.

14. We need more research to understand people's perception of the consequences of flooding, not just probability, in order to produce more targeted awareness campaigns and to promote more effective response. We also need to understand more about people's perception of their responsibilities in relation to flooding. If the public perceive that flood risk management is the responsibility of the authorities they will not have any incentive to protect themselves.

15. Another gap identified by this research is the community level impacts of flooding. Most of the studies on impacts of flooding in the UK have been undertaken on individuals and households but not on communities.

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4 Review of response, recovery and adaptation

Amalia Fernández-Bilbao and Clare Twigger-Ross[2]

We have approached this review by firstly considering the social impacts of flooding, that is, what happens to people and social systems during and after flooding as this research aims to provide evidence to help reduce negative impacts and to foster resilience. Following the section on social impacts are three sections that review existing research in the following areas:

- responses during flooding by different types of social group, community and catchment/flood type[3];
- recovery and adaptation by different types of community and for different social impacts of floods;
- public perceptions of effectiveness of institutional responses to flooding..

We reviewed Environment Agency-commissioned research, research by the Flood Hazard Research Centre and other published academic papers. We have also aimed to highlight key gaps in the literature and research. The focus is on the UK but we have also included other European and US research.

4.1 The Social impacts of flooding

This section provides an introduction to social impacts and in particular to the social impacts of flooding and draws on a recent comprehensive review of the social impacts of flooding undertaken by Walker *et al.* (2006). In order to examine response, recovery and adaptation to flooding it is important to explore the nature of the social since it is avoidance and reduction of negative impacts that this research is focussed on. A particular focus of this section is the potential long-term effects identified in the research such as on psychological health and potential effects on communities. It is hypothesised that long-lasting effects will have the greater impact on longer term community resilience. Lastly this section examines some key factors that UK research shows that may affect the severity of the social impacts of flooding.

Sections 4.1.1 to 4.1.4 focus respectively on:

- the definition of a social impact;
- main social impacts of flooding;
- long-term impacts, particularly health and community impacts;
- factors that influence the magnitude of these social impacts including flood and social characteristics and other factors such as prior experience of flooding, evacuation, having insurance or type of community.

[2] Collingwood Environmental Planning
[3] This task focuses on response, but it is hard to consider response without discussing flood warnings so the distinction is somewhat arbitrary.

4.1.1 Definition of social impact

Of the many available definitions of 'social impacts' Walker *et al.* (2006, p20) cite two:

> '*All impacts on humans and on all the ways in which people and communities interact with their socio-cultural, economic and biophysical surroundings.*'
>
> '*The consequences to human populations of any public or private actions that alter the ways in which people live, work, play, relate to one another, organise to meet their needs and generally cope as members of society. The term also includes cultural impacts involving changes to the norms, values and beliefs that guide and rationalise their cognition of themselves and their society.*'

These two definitions are particularly relevant to floods as they highlight the impacts on the social world of people affected. In this research we use 'social impact' in a broad sense to cover social and economic impacts and their relationships.

4.1.2 Social impacts of flooding

Flooding can seriously alter the daily life of people and communities and cause widespread impacts which include: disruption of people's lives and the knock-on effect on communities, physical and psychological health effects, loss of security and fear of future flooding, loss of property and irreplaceable items (Tapsell *et al*., 2002).

People affected by flooding can become '*displaced and homeless*' (Carroll *et al.*, 2007, p39). In extreme cases floods can cause direct loss of life, for example by drowning. There is anecdotal evidence that floods may 'hasten' some deaths, such as the very elderly or infirm (Bennet, 1970; Ketteridge and Fordham, 1997; Tapsell *et al.*, 1999; Carroll *et al.*, 2007).

The social impacts of flooding have been classified into:

- *Economic impacts*, including damages to the property and its contents. It also includes expenses incurred after a flood associated with living in temporary accommodation and/or repairing the home and replacing contents. Some of these losses may be covered by insurance. Effects on house prices and not being able to sell a property that has been affected by flooding are potential economic impacts that may affect home owners in the short term. Businesses are affected economically if their premises are flooded (loss of stock, damage to property and furnishings, lost days trading). Employees may lose days at work, either because their workplace has been flooded or because their home has been flooded (Walker *et al.*, 2006).
- *Non-economic losses*, including the loss of personal or sentimental items. The most important losses for victims are often personal possessions such as photographs (Green *et al.*, 1994; Tapsell and Tunstall, 2001; Carroll *et al.*, 2007).
- *Impacts on physical health and psychological health*. These impacts are described in more detail in the following section.
- *Impacts associated with evacuation and temporary accommodation*. The seriousness of these impacts often depends on factors such as the level of preparedness, for example, having time to gather possessions and personal effects prior to the evacuation (Walker *et al.*, 2006).
- *Household disruption,* which may include: the stress and inconvenience of living away from the home if evacuation is necessary, cleaning and repairing the

property, moving and replacing property, living in damp and dirty conditions, dealing with builders and insurers (Walker *et al.*, 2006).

- *Community and neighbourhood changes.* Walker *et al.* (2006) consider it likely that areas affected by flooding experience population change. The changes may be short-term if residents are temporarily evacuated from their homes. Lasting population changes may result from those who are able to move doing so leaving behind those who are unable to do so, including '*older or poorer residents and local authority or housing association tenants'* (Walker *et al.*, 2006, p41). Tapsell and Tunstall (2001) cite residents perceiving their local community to have changed due to the influx of renters into the area following the flooding with little commitment to the area. These renters were living in properties that flood victims had been unable to sell and no longer wanted to live in themselves.

Flood victims often regard non-economic impacts such as those on health, disruption caused by flooding and loss of irreplaceable items as the most important (Green *et al.*, 1994). However, impacts of flooding are likely to be '*interconnected and cumulative. For example, the experience of the loss of valued possessions and disruption to the household may have effects on psychological health. Health impacts in turn may have economic consequences if they render an individual unable to work*' (Walker *et al.*, 2006, p30). Moreover, some impacts are aggravated by interactions with others:

> '*There are important interactions between the psychological and physical health impacts of floods, with stress being blamed for a range of physical symptoms. It is reasonable to expect that those who suffer the greatest losses and inconvenience (often those on lower incomes and without insurance) may be most susceptible to psychological health effects and, by extension, physical health effects'* (Walker *et al.* 2006, p44).

4.1.3 Long-term impacts of flooding

This section focuses on the health impacts of flooding, particularly on the psychological health effects. The research shows that these impacts are potentially long-lasting. The second part of the section focuses on the impacts on communities. Research in the UK focuses on impacts on individuals and not longer term impact on communities, which is a clear gap in the knowledge of the effects of flooding. However, we hypothesise here that those impacts are also likely to be long term.

Health impacts of flooding

The documented physical and psychological health effects of natural hazards and disaster are numerous; however, detailed studies into the health effects of flooding and particularly into the long-term effects in the UK are few, including few epidemiological studies (see Ahern *et al.*, 2005; Hajat *et al.*, 2005).

The physical health effects of flooding are varied and often caused by being in contact with water that is cold or contaminated with sewage and also by accident, presence of debris and so on. These effects may include: drowning, injury, exposure, acute asthma, skin rashes and outbreaks of gastroenteritis and respiratory infection (Reacher *et al.*, 2004; Ahern *et al.*, 2005). For instance, physical health effects were reported by over half of the participants in a large-scale survey of flood victims in England and Wales. The most common effects reported included shock experienced by a third of the respondents, followed by colds, coughs, sore throats and flu and headaches (RPA/FHRC *et al.*, 2004). In addition, there are particular health effects associated with the rescue and clean-up phase of a flood such as risk of electrocution, carbon monoxide poisoning or injury from unstable buildings (Ahern *et al.*, 2005; DH/HPA,

2007). The physical health effects of flooding are in general experienced in the short or medium term (Reacher *et al.*, 2004).

In contrast, psychological effects *'are likely to be long-lasting'* (Tapsell *et al.*, 2003, p84) and often present themselves sometime after the flood event. Over two-thirds of the respondents to the RPA/FHRC survey (2004) reported psychological effects, the most common being anxiety triggered by rainfall which 55% of flood victims experienced, followed by increased stress levels and sleeping problems. A small minority of thirteen individuals (out of a sample of over 900 respondents) reported having had thoughts of suicide following the flood. Similar health effects have been reported elsewhere (Tapsell and Tunstall, 2001; Tapsell *et al.*, 1999; Reacher *et al.*, 2004).

The stress of a flood event is one impact often highlighted in the literature and linked to other impacts (Tapsell and Tunstall, 2001; Tapsell *et al.*, 2002). The stress experienced during the flood event and worries about future flooding have been linked to whether a household reports suffering health effects after a flood (Green *et al.*, 1994). Stress has been measured in different ways: in some cases (such as Tapsell and Tunstall, 2001; RPA/FHRC *et al.*, 2004) stress is self-reported and self-defined by the participants; other researchers use a specific '*event stress scale*' (Green *et al.*, 1994) or post-traumatic stress disorder (PTSD)[4] (RPA/FHRC *et al.*, 2004).

Self-reported stress has been found to be more prevalent, more serious and longer lasting than physical effects from the flood (Carroll *et al.*, 2007). Some participants in the study by Carroll *et al.* reported symptoms of acute stress and PTSD. Some participants reported that they did not receive the help they required due to lack of support facilities and resources to combat psychological stress. All participants in this study reported feeling some degree of anxiety or stress not only short term but also medium and long term. Common symptoms experienced were: panic attacks, flashbacks, loss of motivation, feeling unsettled, obsessive behaviour and living in fear of future floods.

Other factors related to the event but happening in the aftermath '*prolonged anxieties and stress when they could have been reduced or even avoided in some cases*'. These factors included '*exploitation by bed and breakfast owners, landlords and builders, dealing with loss adjusters and insurance companies, the threatening behaviour of young people and actions of neighbours*' (Carroll *et al.*, 2007, p48).

Disruption to daily life, living in damp and damaged homes and dealing with cleaning up and drying of properties and refurbishment has been shown to be an important source of stress following a flood (Tapsell and Tunstall, 2001; Thrush *et al.*, 2005).

Impacts on communities

Research on the long-term impacts of flooding on communities is scarce. The research on the social impacts of flooding usually focuses on the impacts on individuals or households rather than on communities or neighbourhoods. As with the impacts on individual and households, the impacts on communities are likely to be long lasting:

> '*In the longer term, communities suffer from divisions brought about by a disaster such as those caused by the distribution of funds set up to repair the damages and alleviate the stress. These divisions are easily accentuated by poor administration and limited foresight in planning. Health problems and family breakdowns also stretch far into the future, and with serious consequences for members of a*

[4] See for instance for an explanation of PTSD: http://www.mind.org.uk/Information/Booklets/Understanding/Understanding+post-traumatic+stress+disorder.htm (Accessed: 24 July 2007)

community. The sense of loss and feeling of loneliness in the longer term is hard to qualify as often people lose not only their homes and possessions, they can lose their friends, their confidence, their dignity, and for a while at least, the fabric of their community' (Ketteridge and Fordham, 1997).

There is some evidence, often anecdotal, of economic impacts on communities or areas which may include a drop in investment in the flood-affected area and effects on the housing market if there has been substantial outmigration following an event (Werrity *et al.*, 2007). Outmigration can have knock-on economic effects:

'People who are able to move away (after a flood) *have the choice of doing so, resulting in a potential decline in house prices – all of which may lead to a less affluent population moving in to the neighbourhood. Those who are unable to move (e.g. older people or those who cannot afford to absorb a loss in property value) are left behind, resulting in a less affluent population with concomitant impacts on local shops and businesses'* (Walker *et al.*, 2006, p33).

Walker *et al.* (2006) also cite anecdotal evidence of other impacts including businesses moving out and the area become poorer after a flood. In addition, they argue that more affluent communities tend to have more resources to campaign for flood defences, which not only protect their homes from flooding but also maintain property prices and allow them to secure flood insurance.

However, there is some indication that house prices creep up again in the medium term and so property price drops may only be temporary. Economic impacts on communities can be mixed, as some businesses will gain from increased trade while others will lose. The case study in Carlisle (Watson *et al.*, 2007) undertaken as part of this research provides some evidence that the economic impacts on communities are likely to be variable: several businesses stopped trading following the flood. However, three years after the event, house prices in the affected areas were reported to be at 'normal' levels by council officials. In addition, a large regeneration programme is underway in Carlisle (called *Renaissance*) for which the flood event acted as a catalyst.

4.1.4 Factors that affect the social impacts of flooding

The literature reviewed reveals a number of factors that can influence the effects of a flood as well as the seriousness and duration of those effects. For instance, receiving a timely and informative flood warning may enable better response and help reduce damage to property and health effects. Walker *et al.* (2006) provide a useful summary of characteristics of an individual, household or neighbourhood that may influence differential impacts of flooding (see Table 4.1).

As well as the individual, household and community characteristics described above, other recent UK research on the impacts of flooding shows that other factors such as flood characteristics, having insurance or having to leave the home following a flood may affect the magnitude and duration of social impacts. It is also recognized that the social impacts of flooding are affected by a combination of these factors. This section reviews some of these factors under several headings:

- flood event characteristics
- individual characteristics
- community characteristics
- evacuation
- insurance.

Table 4.1: Differential social impacts of flooding (Walker et al., 2006, p45)

Social impacts	Evidence of differential effect depending on individual, household or neighbourhood characteristics
Economic impacts	Ethnicity, age, income and property type all have a bearing.
Non-economic losses	Age and property type shape the extent of this impact.
Physical health	Pre-existing health status, age and gender all have a bearing on the experience of health impacts.
Psychological health	Gender, age, social class and household composition all have a bearing on psychological health impacts.
Evacuation & temporary accommodation	Age, gender and income relevant. Levels of social capital likely to be important in community response and resilience.
Household disruption	Gender, ethnicity, age, property type and tenure type all influence how individuals and households are affected.
Community and neighbourhood changes	Suggestion that deprived neighbourhoods and those with low levels of social capital will be particularly hard hit.

Flood characteristics

The following characteristics of a flood event have been shown to influence the impacts on people and property:

- **Depth, velocity and duration**. These characteristics, particularly depth and duration influence damage to the house and consequently time and money spent on repairs and need for evacuation. Depth of flooding is a key factor in damages to the fabric of a building (Green *et al.*, 1994) which will impact on the repair works needed and the length of evacuation or living in poor conditions, such as living upstairs, turning a spare room into a kitchen and so on (Carroll *et al.*, 2007). Participants in focus groups in Carlisle were surprised by the depth and velocity of flood waters and also by the length of the stay of waters in the property. This led to most people losing all possessions in the ground floors and substantial damages to the structure and fabric of many buildings (Carroll *et al.*, 2007). Depth of flooding will also impact on damage to contents (Green *et al.*, 1994) and has been found to be correlated with long-term psychological health effects (RPA/FHRC *et al.*, 2004) and increased stress (Werrity *et al.*, 2007) in flood victims.

  Although floods in the UK do not usually have a high mortality rate, deep and/or fast-flowing waters dramatically increase the risk to life from a flood event (Green *et al.*, 1997). Flash floods in particular are often characterised by deep and fast-flowing waters and as rapid events that cause a high toll in terms of deaths and other impacts.

- **Frequency of flooding**. The frequency of flooding in an area can make residents more aware of the risk and adopt measures to reduce the impacts. However, the frequency of flooding may lead to increased anxiety about future flooding and also declining property values (Werrity *et al.*, 2007).

- **Timing of a flood** has been shown to increase the impacts of the event. Floods occurring during the day tend to bring less stress to the victims (Green *et al.*, 1994).

- **Source of flooding**: river, sea and pluvial[5] floods have an effect on the speed of the flooding and may therefore affect the time available for warning. The source may affect other characteristics of a flood, such as duration; for instance, slow-rising river floods may take a long time to recede.

[5] Caused by (extreme) rainfall

- **Presence of sewage and/or other contaminants**. The presence of sewage results in more damage to the house and contents (Werrity *et al.*, 2007). Moreover, the perception of contamination can be a significant stressor for those flooded, even if the actual threat from pollution is low (Tapsell and Tunstall, 2001).

It is likely that a combination of the above characteristics will be present in any event. For instance, victims of the Easter 1998 flood in Banbury and Kidlington (UK) reported that the following factors had an effect on the impacts of the flood: the timing of the flood; the speed of flooding; flood duration and depth; the temperature of flood water; and the presence of contaminants (Tapsell *et al.*, 2003).

Social characteristics

This section looks at some of the individual characteristics that the literature highlights as potentially affecting the likelihood and magnitude of the impacts of flooding, including:

- age
- gender
- socio-economic status/income
- disability
- ethnicity
- prior experience of flooding

These and other characteristics have been linked to a greater vulnerability to the impacts of flood risk. For definitions of vulnerability and a review of literature on vulnerable groups and flooding, see Thrush *et al.* (2005b) and Twigger and Scrase (2006). However, broad classifications of vulnerability are problematic, for instance, not all elderly people are vulnerable: '*an elderly person may not be vulnerable just because of age, but when combined with living alone, not having a car, having a low income and disability, vulnerability may increase. Ethnic minorities may not be vulnerable because they are minorities but because they lack access to services and information, or because of language difficulties'* Tapsell *et al.* (2005a).

Age

The literature highlights two age groups which potentially suffer worse impacts during and after a flood: the elderly and children.

There is no agreement in the literature as to what constitutes being 'elderly': for instance, the Flood Hazard Research Centre considered 'elderly' as being over 75 and this was one of the three groups selected for their Social Flood Vulnerability Index (SFVI) (the other two were single parents and the long-term sick) (Tapsell *et al.*, 2005a). The justification given for choosing that age is: '*epidemiological research has shown that after this age there is a sharp increase in the incidence and severity of arthritis (and other conditions) and this illness is sensitive to the damp, cold environmental conditions that would follow a flood event'* (Tapsell *et al.*, 2005a, p13). A review by Thrush *et al.* (2005b, p7) states that:

> *'The disaster research literature applies the 'older people' category to people aged fifty-five and above, yet not all will fit the stereotypical picture of the frail and impoverished older person. Chronological age does not in itself engender vulnerability but interacts with many other factors: for example, pre-existing health and fitness; mobility; income; and family support.'*

Therefore, age per se does not determine suffering worse impacts, but people that are living on their own, widowed, living on low pensions and disability benefits (Ketteridge and Fordham, 1997) or isolated from the community (Drabek, 2000) are likely to be

worse affected and more likely to be elderly. The elderly tend also to lose more irreplaceable items as they have been accumulating these for longer (Ketteridge and Fordham, 1997). Older people are also more likely to live in one-storey properties such as ground floor flats, bungalows and mobile homes (Walker *et al.*, 2006). Households living in these types of properties suffer greater economic losses as a result of flooding (Green and Penning-Rowsell 1989, cited in Walker *et al.*, 2006, p33).

The elderly have been found to report more severe health impacts than younger victims (Green *et al.*, 1994) and many ailments appear to be aggravated by flooding (Ketteridge and Fordham). Elderly people may be more likely to have poor health and having prior health problems is a key factor affecting the extent of health impacts on flood victims (Tapsell *et al.*, 2002; RPA/FHRC *et al.*, 2004; Green *et al.*, 1994).

Participants in focus groups in Carlisle expressed concern that some elderly people had had difficulties coping with builders and insurers and that they were open to exploitation by these people, for instance by builders replacing original fixtures with cheaper alternatives. It was also suggested that the flood, which killed two elderly ladies, may have 'hastened the death of others' (Carroll *et al.*, 2007). There is anecdotal evidence of increased deaths of older people after a flood but this is difficult to prove as many people, particularly the elderly, may move away such as to a retirement home after a serious flood (Ketteridge and Fordham, 1997).

Children are not often catered for in the aftermath of a flood (Ketteridge and Fordham, 1997). However, the impact on children can be just as devastating and is often overlooked, as it is assumed that adults will look after them. Children were found by a qualitative study in Carlisle to be frightened by rain and the possibility of flooding as much as adults. Other impacts included: insomnia, fear of water, impacts on social life as a result of their friends being scattered and being subject to taunts by other children (Carroll *et al.*, 2007). Children may also suffer stress if their families are separated and in addition their coping mechanisms may not yet have developed, particularly for younger children (Ketteridge and Fordham, 1997). Several women participants in focus groups felt that their children had been more seriously affected than themselves (Tapsell and Tunstall, 2001). Many children had suffered the same health effects as adults and had been affected by other impacts such as the disruption of routines and the loss of pets and possessions. Participants also reported behavioural problems with the children including tantrums and nightmares and anxiety during rainfall which may have been transferred from parents to children (Tapsell and Tunstall, 2001).

Gender

The literature shows that women may also suffer more the effects of flooding (Tapsell *et al.*, 1999; Tapsell and Tunstall, 2001) particularly if they are looking after children: '*women's experiences of flooding are often defined by their role as mothers*' (Ketteridge and Fordham, 1997, p194). The stress of the flood is compounded with their children's anxieties and fears and many women spend more time at home than their partners (Ketteridge and Fordham, 1997) so they often have to deal with the repairs and much of the disruption. The role of many women as carers not only for children but for other members of the family is another factor that may increase the impacts of flooding:

> *'As well as suffering the emotional impact of flood events themselves, women carry the primary responsibility in caring for other family members whose health or psychological wellbeing may have been damaged. For many women, care-giving arrangements (child-care, day centres for older relatives) may have been disrupted by relocation, making their lives all the more difficult'* (Thrush *et al.*, 2005b, p9).

Women are also more likely to be single parents than men: almost 23 per cent of children in England and Wales live in lone parent households, and 91 per cent of those

families are headed by women[6]. Being a single parent was one of the three social groups included in the Flood Hazard Research Centre's SFVI because:

> *'Previous FHRC research has shown that lone parents (of either sex) are more likely to be impacted by floods because they tend to have less income and must cope single-handedly with both children and the flood impacts, and with all the stress and trauma that this can bring'* (Tapsell *et al.*, 2005a, p13).

In addition, research suggests that single women in particular can be 'taken advantage of' by builders and loss adjusters (Tapsell and Tunstall, 2001).

Disability and prior illness

UK research reviewed by Thrush *et al.* (2005) signals physical and mental disability as well as long-term illness as factors needing special support in flood events. The authors also cite post-event surveys conducted by BMRB that show that almost a fifth of households surveyed contained at least one long-term ill or disabled member, and that many of those households would find it 'difficult or impossible' to act on a flood warning (Thrush *et al.*, 2005, p12). Prior illness is one of the four variables including in the SFVI: '*post-flood morbidity (and mortality) is significantly higher when the flood victims suffer from pre-existing health problems*' (Tapsell *et al.*, 2005a, p13).

There are different types of disability, each of which presents different difficulties in the event of a flood. The following table shows some potential problems that different types of disability may cause during a flood (adapted from Norman, 2003):

[6] Office of National Statistics survey cited in BBC News Online, 7 May 2003, 'Quarter of children have single parent'

Table 4.2: Potential difficulties experienced for different types of disability

SENSORY DISABILITIES

Deafness - Main potential problems during a flood

1. Lack of warning due to inability to hear conventional warning signals and alarms (e.g. sirens).
2. Limited access to public information after the disaster has struck (e.g. radio announcements).

Blindness - Main potential problems during a flood

1. Lack of awareness of visual alarms and instructions.
2. Inability to move out quickly from a crowded or unfamiliar situation.
3. Disorientation caused by rapid, repetitive audible alarms and sirens.
4. Extreme reluctance to leave familiar surroundings when the request for evacuation comes from a stranger. Increasing age exacerbates this problem.

PHYSICAL DISABILITIES: (e.g. wheelchair users)

Main potential problems during a flood

1. Frequently unable to independently and quickly leave a high-risk area. Heavy smoke-stop doors can be a barrier to exiting.
2. Access and egress problems can occur at reception centres and emergency accommodation facilities. Accessible toilets are especially important.

Source: Adapted from Norman (2003, p8-10 after Smith and Parr 1987)

Ethnic minority groups

The literature reviewed by Tapsell *et al.* (2003) suggests that ethnic minority groups may take longer to recover from disasters and face a disproportionate risk of psychological distress. One reason for this is that culturally specific attitudes and beliefs of these groups may prevent them from seeking help.

Although ethnic groups in the UK are many and present large differences, the literature reviewed by Thrush *et al.* (2005b) found that minority ethnic groups may be more susceptible to the impacts of flooding as they may be more likely to live in poor areas and be socially excluded, have poor command of English and difficulty in accessing information and support. The consequences of flooding may be particularly serious for certain members of these groups, for instance women. Non-English speaking Asian women participants in focus groups in Banbury were less likely to know who to contact to obtain information about flooding (Tapsell *et al.*, 1999).

In the 2003 follow-up study in Banbury and Kidlington, Tapsell *et al.* (2003, p62) found that:

> *'In 1998 and 1999 it was observed that ethnic minority communities, particularly non English-speakers are likely to be more isolated following flooding. Most of the Asian women also stated that they did not know where to go to seek help or advice. For the Asian community in 2002 it was still largely a matter of helping themselves and each other. However, one Asian family were from a different area in Pakistan from the rest of the community and they had felt particularly isolated as no help had been offered by the other Asians in the community, and they had no other relatives in the UK.'*

Income/financial resources/socio-economic status

Those on low incomes will find it more difficult to cope with the costs of cleaning up after a flood and replacing damaged possessions. Additionally, they may struggle to cope with other expenses associated with a flood event, for instance meals out of the home or accommodation if they have to leave their properties. Low socio-economic

status may be associated with lower education levels which may increase difficulties in accessing information or dealing with insurance claims.

Wealth and financial resources have been found to have a significant 'buffering effect' against the severity of a flood event (Green *et al.*, 1994) as 'those with savings or other sources of finance use this as a buffer against the worst tangible and intangible impacts of a flood' (Ketteridge and Fordham, 1997). Additionally, financial deprivation is one of the four variables included in the Flood Hazard Research Centre's Social Vulnerability Index (Tapsell *et al.*, 2002) as those who are financially deprived are also less likely to have contents insurance and would have more difficulty to replace furniture and other possessions and it would also take them longer.

Prior experience of flooding[7]

Prior experience of flooding has been linked to an increased likelihood of receiving a flood warning and taking protective action (Fielding *et al.*, 2007; Tunstall *et al.*, 2006).

Knowing what to do in a flood has been found to be a key factor in undertaking protective and damage reducing actions in response to a flood warning and during a flood event. Conversely, not knowing what to do leads to an increase in the stress suffered during the event (Fielding *et al.*, 2007; Carroll *et al.*, 2007). In theory, those who have experienced a flood event should be better prepared to cope with the effects of a subsequent flood.

However, Green *et al.* (1994) found that previous experience of flooding does not necessarily buffer the consequences of an event. Moreover, frequent flooding may increase anxiety about future events (Werrity *et al.*, 2007). Qualitative research findings in England indicate that prior experience can also hinder response and preparedness in some circumstances: some people may not expect a worse event than the one they have previously experienced; some flood victims just want to 'move on' and forget about their experiences - for them, preparation increases anxiety and worry about future flooding, others particularly if they suffered considerable damage before may feel that their actions will not reduce damage or make any difference (McCarthy, 2004).

Community type

Research on social impacts has mostly focused on the impacts of floods on individuals and households and not on the impacts on communities (Walker *et al.*, 2006). However, it is clear that some communities may be more affected than others: '*research in developing countries concludes that poorer communities and those with lower levels of social capital are hit harder by flooding than their more affluent and better-integrated counterparts*' (Walker *et al.*, 2006, p29).

Deprived communities may be particularly hard hit by a flood. Walker *et al.* (2006, p44) emphasise that while '*not all vulnerable individuals and households are deprived, it is nonetheless true that deprived neighbourhoods contain concentrations of vulnerable individuals*'. Certain characteristics that make individuals and households suffer the impacts of flooding more are more prevalent in deprived areas, including: poor health, which may increase the health effects; lower levels of flood risk awareness; lower incomes and higher unemployment which reduces the likelihood of having insurance and savings to buffer against some of the impacts. Additionally, more deprived communities have been shown to have lower levels of social capital which, in turn, could reduce their ability to cope with the aftermath of a flood (Walker *et al.*, 2006).

[7] See also Section 3.1.2 on the effects of preparedness and experience on response.

Evacuation

Green and Parker (1993, p2) defined evacuation as 'movement, normally using the individuals concerned own resources, towards a place of safety where that safety is created by separation by distance or topography from the hazard.'

They also differentiate evacuation from shelter and rescue: *shelter* involves separation by a physical barrier rather than distance and *rescue* is distinguished from evacuation in that those at risk are unable to escape from the hazard using their own resources (Green and Parker, 1993).

Evacuation can take place before or after an event:

- A precautionary or pre-event evacuation takes place before the hazard has occurred. In some cases, precautionary evacuations can be a form of land use control, such as property on a floodplain purchased by the government and its residents relocated elsewhere. However, most precautionary evacuations are undertaken because there is a forecast of a hazardous event, such as a dam break or toxic material release (Green and Parker, 1993). Pre-event evacuation is the main protective action against hurricanes (Sorensen *et al.*, 1987).

- Aftermath or post-event evacuations take place in the aftermath of the event because of deterioration of living conditions in the area. Research suggests that this type of evacuation should be avoided or reduced to the shortest possible duration as it disrupts the social support network of the victims and makes it more difficult to put their lives back together (Green and Parker, 1993). Disruption is particularly important if the relocation is permanent (see also Bland *et al.*, 1997). Post-event evacuation is necessary when flooding lasts for a long period of time or when there can be serious health and safety risks. The loss of services such as electricity or heating can also warrant leaving the home (Ketteridge and Fordham, 1995).

Evacuation may last for days, months or even years. For instance, in Carlisle, as many as 400 homes were still uninhabitable one year after the flood event[8] and 11 families had yet to move back to their homes 30 months later[9].

However, some people may decide to stay in their homes if they cannot afford to pay for accommodation or accommodation is not available as all the hotel rooms may be taken by other flood victims. Fear of looting, having pets to look after, having nowhere else to go, looking after an older neighbour or simply not wanting to leave their homes and keeping the family together are other reasons why people do not evacuate (Tapsell and Tunstall, 2001; Thrush *et al.*, 2005a; Carroll *et al.*, 2007). For instance, some people in Carlisle stayed in their properties while these were being repaired with the consequent health and safety issues (Carroll *et al.*, 2007). Disruption and discomfort from living in these conditions are understandable as homes are damp, smelly and may be noisy and cramped. Cooking and laundry is often impossible (Tapsell *et al.*. 1999; Thrush *et al.*, 2005a).

In Carlisle, some people had to stay with relatives, sometimes for months, much longer than planned which led to tensions in the family (Carroll *et al.* 2007). Staying with relatives has also been found to increase the reported severity of a flood event (Green *et al.*, 1994). However, those who stay with families could be considered lucky as other types of accommodation become expensive due to high demand. Some people have to move several times and live out of suitcases for long periods and families are split

[8] BBC News online (7 January 2006) 'Flood families homeless a year on'
[9] BBC News online (9 July 2007) 'Flood families in 30-month wait'

(Carroll *et al.*, 2007). Splitting families is one of the main negative aspects of evacuation (Ketteridge and Fordham, 1997).

Evacuation is a traumatic experience as '*people have strong ties to their home, whether or not they own the property*' (Ketteridge and Fordham, 1997, p195) and a big stressor for victims (Tapsell and Tunstall, 2001). Even on returning, many people may feel unsettled or unhappy in their homes and 'not at home' for many months after (Carroll *et al.*, 2007).

The role of insurance

Having insurance should reduce the effects of flooding, as insurance can help recovery from the financial effects which are related to health effects. However, dealing with insurers and loss adjustors has been consistently highlighted as a key factor influencing both short-term and long-term psychological effects of flooding and increasing stress levels, as does dealing with builders whilst living in temporary accommodation (Tapsell *et al.*, 2003; RPA/FHRC *et al.*, 2004; Werrity *et al.*, 2007).

For most people participating in focus groups in Carlisle it was their first experience of making a major claim to an insurance company, and many did not know what to do or who to phone, or what they could claim for. Many people were also dissatisfied with their insurers, with the main complaints being: delays with the claims, attitudes of loss adjustors, lack of information on what they could claim, etc. Although many people felt they had been let down by the insurance companies, it was also highlighted as a positive example that one company had set up a cabin locally from the Monday after the floods to offer advice (Carroll *et al.*, 2007).

For certain vulnerable groups, such as those on a low income, insurance is sometimes unobtainable or unaffordable. Moreover, those living in areas of high crime may face higher than average premiums which again make insurance unaffordable to certain groups (Ketteridge and Fordham, 1997). Research in England by Whyley *et al.* (1998) found that '*uninsured households were disproportionately likely to have low incomes, few savings, and to be facing financial difficulties*'.

Summary

The social impacts of flooding are many and widespread. Some of these impacts are also long-lasting particularly the psychological health impacts. Interactions between impacts also compound the effects of a flood, e.g. suffering economic losses may affect mental well-being. Certain characteristics of a flood event such as depth, velocity and duration combined with the characteristics of those affected and other factors such as having insurance or being evacuated have been shown to affect the seriousness and duration of the impacts. There are important gaps in the current knowledge of social impacts of flooding in the UK, for instance, the long-lasting effects of a flood on a community have not been researched in the UK. Identifying the key factors that influence the impacts of flooding should help in targeting efforts to improve community resilience to flooding.

4.2 Response

This section focuses on public responses to flooding. We have defined response as the actions that people undertake before and during a specific flood event in order to reduce or eliminate damage to property and harm to people or pets. These actions may be undertaken following a flood warning or not. In turn, the actions that people undertake may influence to some extent the impacts of an event as discussed in the previous section and therefore the process of recovery.

The section looks at the most common actions that people undertake during a flood and/ or following a flood warning and the barriers and facilitators to undertaking such actions. The section also discusses the concept of 'appropriate action' both from the point of view of the Environment Agency, i.e. the actions that they expect/ would like the public to undertake following a flood warning and the public. This section also looks at the factors that determine response to flooding and particularly response to flood warnings as this is an area of Environment Agency responsibility.

4.2.1 Most common actions undertaken during a flood and 'appropriate action'

This section summarises the most common actions that research shows are undertaken before or during a specific flood event. This section also examines the concept of what constitutes 'appropriate action'.

Most common actions

The most usual actions undertaken before and during a flood can be divided into:

- *Moving people and pets to safety.* This was the first action reported by participants in focus groups (Thrush *et al.*, 2005a) on realising that they were at risk of flooding. In some cases, evacuation was a common response (Thrush *et al.*, 2005a; Werrity *et al.*, 2007).
- *Moving valuables and cars*. This includes moving valuable or personal belongings upstairs (Fielding *et al.*, 2007; Environment Agency, 2005a; Thrush *et al.*, 2005a; Werrity *et al.*, 2007). Moving rugs and other valuables were common actions taken by flood victims in another survey (Tunstall *et al.*, 2006). However, only a minority of respondents gave high priority to saving irreplaceable items or important documents. Moving cars was a common response reported in Werrity *et al.* (2007) and Environment Agency (2005a).
- *Trying to stop water entering the property*, for instance by using sandbags and floor boards or barricading or sealing doors and widows. This was identified as a priority action for respondents in Werrity *et al.* (2007), Tunstall *et al.* (2006), Thrush *et al.* (2005a), and Environment Agency (2005a).
- *Trying to confirm the warning or seek advice or help*. Listening to the local radio and listening for warnings were two of the three more common actions revealed in the secondary analysis of a BMRB survey by Fielding *et al.* (2007). Contacting other family members was a common response of elderly participants in focus groups (Thrush *et al.*, 2005a). Trying to warn others is another common activity during a flood (Tunstall *et al.*, 2006).

The concept of 'appropriate action'

The Environment Agency has compiled a list of possible actions that people may undertake in response to flooding. The full list of actions is included in Appendix 1 and they fall into the following seven categories

1 - Do nothing

2 - Form own assessment of flood risk

3 - Get advice about what to do

4 - Help others

5 - Protect personal property

6 - Take steps to minimise water entering the property

7 - Prepare and mobilise people/animals to a safe place: prepare to evacuate

Appropriate action is defined by the Environment Agency as '*undertaking action from Category 4, 5, 6 or 7 in response to flooding'*[10]. However, we argue that every flood event has different characteristics which may affect the perceived level of risk and the ability to respond. Additionally, as discussed above people's characteristics and the type of property they live in also affect their ability to respond. Subsequently what constitutes appropriate action in one instance may not be so in another.

For instance, the recommendation of moving belongings upstairs '*is not a measure available to all (e.g. those living in bungalows, basement flats or caravans) and may also prove difficult for those who are frail or disabled*' (Walker *et al.*, 2006, p34).

Respondents to an Environment Agency post-event survey were asked to name the appropriate actions that they felt they should have taken in hindsight (again from a list prepared by the interviewers). Protecting personal property (37 per cent), preparing to evacuate (30 per cent) and taking steps to minimise water entering the property (26 per cent) were the most frequent actions that respondents thought they could have taken in hindsight (Environment Agency, 2006) consistent with what the Environment Agency considers appropriate responses.

The review by Fielding *et al.* (2007) highlighted the lack of research on what constitutes appropriate action in response to a flood warning. Work by the same authors showed that participants' understanding of 'appropriate action' was not very different from the Environment Agency's. However, the authors also found that people were '*concerned with limiting rather than preventing damage and including actions that were designed to alleviate psychological as well as physical or material discomfort. Our participants included the safety and comfort of pets, family members and vulnerable neighbours and focused more upon belongings of sentimental value than upon expensive items. This was particularly the case with previously flooded individuals, some of whom had already lost treasured personal belongings*' (p67).

In the Carlisle case study (Section 6), participants reported that they wished they had saved things of sentimental value, although at the time they tended to try to save objects of economic value.

What constitutes appropriate action depends on factors such as '*personal circumstances, attitudes towards material losses, degree of being prepared for a flood event'* (Fielding *et al.*, 2007, p67). Reducing damage to property may not be the most appropriate action during some floods which may be life threatening, such as flash floods, and for some vulnerable households where evacuation in advance may be a more suitable response (Tunstall *et al.*, 2006).

Trying to stop water entering the home, for instance with flood boards or sandbags is another common (and understandable) action during a flood. However, Tunstall *et al.* (2006, p19) warn that there is '*a question as to whether sandbagging is an appropriate or effective response to a flood threat and as to whether property owners time would not be better spent in moving items rather than trying to keep flood waters out. There is also evidence that sandbagging to keep waters out may be undesirable where flood waters are likely to reach over a metre in depth, because the pressure of the water at such high depths may give rise to costly structural damages to property*'. It would seem that there needs to be more understanding of what actions would be effective in different flood contexts so as to be able to provide more specific advice to people in floods.

Lack of knowledge on what to do during a flood or on receipt of a flood warning, is likely to be a key constraint to undertaking effective action. For instance, over half of respondents to an Environment Agency post event survey said they should have had

[10]Environment Agency, Frequently Asked Questions FRM, v5 August 2006

more advice on how to prepare for the flood, for instance where to receive further warnings, get sandbags and general instructions on what to do in the event of a flood (Environment Agency, 2005). Although those who receive a warning are encouraged to contact Floodline to receive advice on what to do, many people still do not receive a warning during an event (see for instance Environment Agency (2005a) and Environment Agency (2006). In other cases, the time available from receiving a warning may not be long and valuable time could be lost while trying to obtain more information. Having more information on what actions to take in the event of a flood which could be in the form of a 'flood checklist' has been suggested by some flood victims (Tapsell, 1992) which as well as serving a safety guide, would help reduce 'the anxiety of not knowing how to cope with a flood event' (Tapsell, 1992, p79). The Environment Agency and others now produce these checklists on their websites.

4.2.2 Factors that affect response

This section looks at the key factors that seem to influence people's ability and willingness to respond during or before a flood and/or following a flood warning. Key factors that may include:

- Flood characteristics - including depth and severity of the flood.
- Individual and household characteristics - demographics, prior experience, family composition, type of property.

The research also suggests there may be other factors: help during a flood, for example from neighbours or relatives has been found to reduce damages caused by a flood (Tunstall *et al.* 2006). However, other studies have found that help from neighbours can be 'a hindrance' (Thrush *et al.*, 2005a, p37).

Flood characteristics

The severity of a flood and certain flood characteristics such as speed, force and volume of flood waters have been reported as barriers to taking action on receipt of a flood warning (Thrush *et al.*, 2005a; Fielding *et al.*, 2007). Darkness, which can cause fear and add to the difficulty of taking action, is another important factor (Thrush *et al.*, 2005a). This is related to the timing of the flood, which is a key factor shaping impacts; for instance, if flooding occurs in the nightime people have less time to prepare or may have to do so in darkness (Green *et al.*, 1994; Tapsell *et al.*, 2003).

The extent of flooding - whether floodwaters enter the home (as opposed to just affecting the garden or outbuildings) may increase the likelihood of undertaking damage reducing actions which could be interpreted to indicate that people wait until they are fairly sure that their property is going to flood before taking action (Tunstall *et al.*, 2006).

Individual, household and community characteristics

In this section we look at some characteristics of individuals, households and communities that have been shown in recent research to influence the ability and likelihood to respond to a flood event or to a flood warning. These include demographics such as age, household composition, type of property. This section also looks at whether having prior experience and/or awareness of the risk of flooding facilitates taking action during or before an event.

Prior experience of flooding, awareness and preparedness

Previous experience of flooding has been shown to lead to a reported increase in undertaking speedier and more appropriate actions (Fielding *et al.*, 2007). The same study found that those with previous experience of flooding reported willingness to act at an earlier stage; conversely, people with no experience of flooding were more likely to wait for a severe flood warning before taking any action[11]. This is particularly worrying as only those areas at risk of severe flooding and with a minimum number of properties would receive a severe flood warning. Tunstall *et al.* (2006) similarly found that flood experience was an important factor in responding to flood warnings. In particular, the authors looked at monetary savings and found that those with prior experience of being flooded in their homes saved more property than those without experience. In some cases, those who had previously been flooded had well-rehearsed routines for moving property out of harm's way.

Being aware of the risk of flooding and pre-flood measures such as finding out if a property is at risk, understanding flood warning codes and having information on what do on receipt of a warning have been linked to more actions taken during or before a flood (Environment Agency, 2006) .

Thrush *et al.* (2005a, p37) summarised factors related to (lack of) awareness, preparedness and knowledge of flooding that participants in focus groups reported as acting as 'barriers to action' following a flood warning:

- *'No prior experience of being flooded.*
- *Disbelief that flooding would reach houses. Difficulty of making mental leap to take action; feelings of invulnerability.*
- *Trust in 'usual' pattern of flood or river level, especially where there was a history of frequent flooding.*
- *Uncertainty when to abandon house; lack of knowledge regarding buildings' resistance to water.*
- *Uncertainty/ignorance of most appropriate action.*
- *New residents' ignorance of local flood history.*
- *Not knowing how best to move large items.*

Socio-economic factors and type of property

Employment status (employed took more actions) and long-term illness (fewer actions) were the only significant demographic factors in the secondary analysis by Fielding *et al.* (2007). Single-person households mostly composed of older respondents were found to be less likely to undertake actions than households composed of several members in the Southwest and Northeast regions response to flooding survey (Environment Agency, 2005a).

Other factors which can hinder response to a warning (Thrush *et al.*, 2005a) include being responsible for children or older or infirm neighbours, particularly if alone at the time of a flood, and not being able to lift heavy items.

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[11] The Environment Agency issues four warning types which '*are not issued as a sequence of messages. They are used, as appropriate, to indicate the impact of flooding in a given area*' (2005b, p7). These are:

- Flood Watch (Flooding of low lying land and roads is expected. Be aware, be prepared, watch out!)
- Flood Warning (Flooding of homes and businesses is expected. Act now!)
- Severe Flood Warning, (Severe flooding is expected. Extreme danger to life and property. Act now!)
- All Clear (Flood Watches or Warnings are no longer in force for this area)

Source: www.environment-agency.gov.uk

Type of property can also affect response: single-storey homes such as caravans and bungalows often do not provide dry storage or space to move possessions to (Thrush *et al.*, 2005a); these type of properties do not have an 'upstairs' where pets or people can be moved to. Other characteristics of a property that can limit response include narrow staircases and restricted space upstairs (Tunstall *et al.* 2006). Tenure is another factor: those who live in rented properties are less likely to take action during or before a flood (this was also found in the German case study, see Section 7).

4.2.3 Response to flood warnings

Some people undertake damage-reducing actions that do not follow directly from a flood warning. Those who respond without receiving a warning may do so in response to awareness-raising campaigns but others may take action '*on the basis of their own judgment, prior experience and common sense*' (Tunstall *et al.*, 2006, p32).

Coverage of the flood warning service is increasing, but in 2006/07 the proportion of properties at risk of flooding offered a flood warning of any type was around 50 per cent across England and Wales, with variations by Environment Agency Region and Area. The Floodline Warnings Direct service is offered to properties in areas at Maximum Level of Service[12] and can also be offered to those at Intermediate and Minimum Level of Service if the appropriate flood warning dissemination methods are not operationally viable (for example, if there is too short a lead time to use loudhailers) or cost-effective (if installing sirens would be too expensive). FWD take-up varies between Environment Agency Regions and Areas and levels of service, but the national average for take up of FWD was 30 per cent across all levels of service in August 2007[13].

Even if coverage of the flood warning service reached 100 per cent (which is not considered feasible - the Environment Agency's own target is to reach 80 per cent) and every property at risk were offered FWD, not everyone would necessarily sign up for the service. In addition, transient populations such as tourists and students would not necessarily be covered. Even if the warning system was perfect and everyone received a timely warning before a flood, action would not necessarily follow from a warning. Improving flood warnings is therefore likely to remain only one aspect of reducing the impacts of flooding on people and communities.

A number of variables can affect the public's response to a hazard warning. Fielding *et al.* (2007, p13-15) summarises these variables in three broad categories:

- *Characteristics of the warning message. Certain characteristics of the warning message can facilitate response, including providing specific and locally relevant information and consistency and frequency of the information received; the source of the message will also influence its credibility and consequently the response - warning messages transmitted by family or friends or face-to-face seem to increase public response; environmental cues, e.g. heavy rainfall, can also increase the likelihood of response.*
- *Individual factors. The literature reviewed concludes that demographic and socio-economic factors have an impact on vulnerability and risk perception. However, there is no agreement on which such factors, e.g. age, ethnicity, are consistent predictors of vulnerability. Perceptions of risk and vulnerability have on the other hand a clear effect on response, e.g. a belief that one's home is at*

[12] Based on risk of flooding and number of properties, see FWLOS work instruction. This is discussed in more detail in the reports for Work Package 1 of this project.
[13] Steve Merrett, Environment Agency, personal communication.

risk or a feeling of vulnerability heightens response; fear of looting has been found to reduce the probability of response.

- *Social factors. Several authors have highlighted that warning response is a complex social process that often occurs in groups; factors that increase response include having strong social networks, being responsible for children or having an illness and being in the same place as the rest of the family.*

Acting on a warning is a far from simple process for those involved. Mileti and Peek (2000, p183) describe the six-stage process on receipt of a warning:

- *The first stage is hearing the risk information.*
- *In the second stage, the risk information must be understood. Understanding is not meant to refer simply to interpretation, but also to the attachment of meaning to the information. Those meanings can vary among people and may or may not conform to the understandings intended. A 50 per cent probability may be interpreted as almost certain by some or relatively unlikely by others. In this sense, understanding includes the perception of risk.*
- *The third stage is belief in the risk information and in the accuracy of what is being communicated; in this way, belief also includes risk perception.*
- *The fourth stage is the personalization of risk; that is, the perceived implications of the risk being communicated on the receivers themselves; thus, personalization also encompasses risk perception.*
- *The fifth stage involves people deciding what to do about the risk, while the sixth involves performing that behaviour.*

People will typically go through all six stages each time new information is received, which means that response to a warning follows a series of decisions. People also actively seek more information or confirmation of the threat (Mileti and Peek, 2000). '*If people do anything after receiving a flood warning, they will try to confirm it some way'* (Drabek, 2000, p 367). Confirmation behaviour may include waiting until the flood waters reach the property to act.

Drabek (2000) reviewed literature around response to warnings and found other individual characteristics that influence it: age, with older respondents less likely to respond to a warning and also to receive one; women were more likely to respond than men; ethnic minorities were less likely to respond in part due to lack of trust and bad experiences with local authorities; lower socio-economic status meant people were less likely to receive a warning and to respond; fate control: fatalist people who think they cannot change their future are less likely to respond to a warning. In the cases of age and lower socio-economic status the likelihood of not responding to warnings may be related to other factors, namely being isolated and not connected with other social networks that act as pathways to receiving more warning information.

Even more than receiving a warning, knowing what to do is a key factor. Receiving a warning will not necessarily lead to action if some people may not be able to act because of individual characteristics but also because of lack of information and advice on what to do (Thrush *et al.*, 2005a). The literature reviewed by Fielding *et al.* (2007) shows that despite evidence of a link between flood knowledge and response, information on what to do on receipt of a flood warning is sparse, especially when it is most needed during the event. People's behaviour can be mistaken as irrational or panicky when it is merely lack of knowledge on what to do; not knowing what to do can also lead to increased stress during the flood. Fielding *et al.* (2007, p16) conclude that '*A lack of relevant knowledge therefore not only constrains appropriate response, it also exacerbates the long-term adverse effects of flooding with personal, social and economic consequences*'. Participants in focus groups in Carlisle (Carroll *et al.*, 2007,

p32-33) reported having been unsure of what to do during the flood, for example whether to stay or leave their properties, wait for rescue, etc and found the experience '*traumatic*' and many felt '*terrified and isolated'*. This also led to some reporting doing '*inappropriate things'* sometimes just to keep busy. This is a key issue as distress experienced during a flood event has been shown to have an influence on whether or not a household reported experiencing health effects after the flood (Green *et al.*, 1994).

The social context in which people receive a warning may be another source of constraint: Drabek (2000) signals the family as the '*most important social group*', families with young children are more likely to respond. The literature reviewed by Drabek also highlights the influence of the family situation on evacuation behaviour: families tend to evacuate together and if members of the household are missing the rest of the family will tend to wait for them and delay leaving the home. Another group to consider are transient populations: tourists often depend on local people as they lack familiarity with the area (Drabek, 2000).

Personal experience of a hazard seems to heighten awareness and preparedness for future events and thus the likelihood of responding to a warning (Fielding *et al.*, 2007). It seems intuitive that experience translates into awareness and consequently both into undertaking preparation actions and facilitating response during the event. Indeed, Mileti and Peek (2000) found that a recurrent theme in the research on public responses to warnings is that the public's response depends not only on their perception of being in danger but also that the actions they are taking are appropriate to the circumstances. Drabek (2000, p365) argues that if '*individuals have a high perception of risk they will respond more quickly and adaptively to flood warnings*'. However, although risk perception is related to prior experience it is not equivalent to it, and people who have experienced a flood but suffered no damage may expect the same next time (Drabek, 2000).

Response and level of Environment Agency warning[14]

In a survey of at-risk populations, Fielding *et al.* (2007) examined the impact of the different flood warning codes on the actions taken and found the following:

- Most respondents would take action regardless of the level of flood warning, but percentages increase with the severity of the warning.
- 'Do nothing' responses decrease with the severity of warning: 22 per cent would do nothing at 'Flood Watch' but only six per cent at 'Severe Flood Warning'.
- Types of actions varied with severity of the warning: at Flood Watch the most likely type of action was to protect personal property followed by forming an assessment of the risk; at Flood Warning protecting personal property remained the most likely action followed by preparing for evacuation; the latter action was found to be the most likely at Severe Flood Warning. This shows that people take proportionate amounts of action relative to the type of warning they are given, so whilst the set of warnings are not set up as a scale of severity the actions elicited are carried on a scale of increasing importance.
- Other characteristics of respondents affected the likelihood of taking actions: single pensioners were the most likely group to undertake no action at flood watch; women, particularly middle aged, were more likely than men to undertake no actions at Flood Warning and Severe Flood Warning; home owners were significantly more likely than tenants to act to minimise the entry of water into their homes.

[14] Flood Watch, Flood Warning, Severe Flood Warning, All Clear

Source of the flood warning

Results of the secondary analysis of a post-event survey by Fielding *et al.* (2007) showed that receiving information and advice from trusted sources before the flood led to an increase in the percentage of respondents reporting 'effective action'. A 'trusted source' does not necessarily imply an official source: in a recent post event survey undertaken on behalf of the Environment Agency in the North West of England (Environment Agency, 2007) informal warnings from neighbours, relatives or friends and personal telephone calls were respectively found by respondents as the most informative warnings. The survey analysis also concluded that Environment Agency warnings were no more effective than warnings from other sources in driving appropriate action. This is an important point - ensuring warnings are issued by trusted sources is where Environment Agency efforts should be focussed, not on whether or not the source is the Environment Agency.

4.3 Recovery and adaptation

This section summarises research on flood recovery and adaptation. In this report we define the recovery period as starting when the flood waters recede and the process of getting the property and people's life back to normal starts. The length of recovery will be affected by the impacts suffered from the flood, both direct impacts caused to the property and contents and health but also other 'secondary impacts', such as. the stress of dealing with builders and insurers, living in temporary accommodation. Leaving the home, we argued above can exacerbate the impacts of flooding and the time spent outside the home will also be a determinant of the length of recovery. It is likely that factors which affect the duration and likelihood of suffering impacts from an event, i.e. flood and individual characteristics, etc will also determine the length of the recovery period. The flood and its aftermath may also affect relationships, work, household finances or whole communities.

Some factors will also increase the capacity of people to recover and the speed of the process. These factors can be financial, such as having insurance or savings, but also being part of social networks and receiving help, advice and support during and after the flood.

By adaptation we mean living with the risk of flooding, for instance changing everyday behaviour or adapting the home in order for the risk to become 'normalised' in everyday life. Adaptation to other risks such as fire or burglary by installing alarms or getting insurance are examples of this 'normalisation'. Adaptation can be in the form of making structural or behavioural changes to minimise potential impacts of flooding. Adapting could also involve moving away if there is a high threat of future flooding or high anxiety/ worry about future events.

Research on recovery

We have bounded the recovery period as starting after the flood waters have receded and covering everything that flood victims do to get their properties and their lives back to 'normal' or back to something similar to what it was before. It also covers recovering from any physical and psychological effects of the flood.

Recovery can last days to several years although it could be argued that some people never completely recover from a flood as some impacts such as worrying about suffering another event may never go away. It is often what happens during this period that has a major impact on the likelihood of suffering long-term effects. Certain groups within communities have been shown to suffer more the effects of flooding (see Section

4.1 on impacts of flooding); these groups may need particular attention from the authorities during recovery (Tapsell and Tunstall, 2001; Walker *et al.*, 2006).

Flooding is a traumatic experience for many people and for some '*the worst experience of their lives*' (Ketteridge and Fordham, 1997, p197). However, the recovery period and everything it entails (cleaning up, dealing with insurers) is a major cause of stress on flood victims (Tapsell and Tunstall, 2001) and can be worse than the actual event: '*For the majority of participants it was after the flooding that their problems really began: coping with the recovery process and the stresses associated with this'* (Tapsell and Tunstall, 2001, p22). The most severe flood impacts have been reported by flood victims as occurring sometime after the event (RPA/FHRC *et al.*, 2004). Research indicates that people do not always report their health effects to doctors (Tapsell *et al.*, 1999; Tapsell and Tunstall, 2001) which can affect their recovery.

This was also found in previous research by Tapsell *et al.* (1999, p40-41): '*Much of the stress experienced due to the Easter flooding* (1998) *related to the recovery period and was associated with the disruption which it had upon the households affected. This included living in properties being repaired, having to cope with recovery with little or no help, and the amount of time spent in organising recovery and dealing with insurers and builders. For some flood victims the worst aspect of the flooding was associated with the recovery period, actually cleaning the house, dealing with the smell, the debris left behind in the house, the damp, and dealing with assessors and builders'*.

Cleaning up after a flood has been described as '*horrendous*' by participants in focus groups in England (Thrush *et al.*, 2005a, p41): '*It was arduous, unhygienic, time-consuming, 'constant' and extremely unpleasant, all the more difficult for older people, the disabled and for parents trying to support a young family during a very traumatic time*'. The presence of sewage effluent, common in floods, also adds to the difficulty and unpleasantness of the task.

The length of the recovery process varies, but it is a slow process that does not finish when people return to their homes (Ketteridge and Fordham, 1997; Carroll *et al.*, 2007). Many participants in focus groups in Carlisle felt they had '*lost a year out of their lives'* following the flood (Carroll *et al.*, 2007).

Recovery can also take much longer than a year. Parker *et al.* (1983) interviewed one hundred households that had been flooded in 1978, and found that over 50 per cent had still not recovered five years after the flood. The most significant impacts for these households were, in order of importance: the post-flood disruption to life, the stress of the flood event and worry about future flooding. Direct damage to the house and contents was regarded as relatively unimportant by respondents.

The length of recovery may also be affected by factors external to the flood event, such as prior health of victims (RPA/FHRC *et al.*, 2004; Tapsell and Tunstall, 2001; Green *et al.*, 1994), financial aspects and savings, or having to deal with insurers and problems with builders (Tapsell and Tunstall, 2001; RPA/FHRC *et al.*, 2004; Werrity *et al.*, 2007; Green *et al.*, 1994). Carroll *et al.* (2007) refer to 'secondary factors' which exacerbate the impact of primary factors (flood and evacuation). These factors '*are exploitation by bed and breakfast owners, landlords and builders, dealing with loss adjusters and insurance companies, the threatening behaviour of young people and actions of neighbours*' (Carroll *et al.*, 2007, p39). Similarly, the main stressors for flood victims were found to be ' *having to leave homes, losses and damages to property, coping with inconvenience and the recovery process including insurance claims, builders, financial concerns, and health issues. People were also concerned about the possibility of future flooding'* (Tapsell and Tunstall, 2001, p22). Participants in focus groups (Tapsell and Tunstall, 2001) had strong feelings about '*having to fight*' for advice and help in the recovery process which affected their health and well-being. Qualitative research has

also uncovered feelings of degradation or not being treated like a person during the response and recovery phases expressed by flood victims (Ketteridge and Fordham, 1997), being branded as '*flood victims*' (Carroll *et al.*, 2007) or feeling like refugees (Tapsell and Tunstall, 2001).

Partners are an important source of support but the stress of a flood and the recovery may have negative effects on relationships (Tapsell and Tunstall, 2001; Tapsell *et al.*, 2002; Carroll *et al.*, 2007; Ketteridge and Fordham, 1997). Positive aspects that emerge after a flood include strong community spirit. However, this may disappear when people realise other members of the community may have received compensation (Ketteridge and Fordham, 1997). Allocation of grants appeared to cause some resentment in Carlisle (Carroll *et al.*, 2007). Relationships within the community can also suffer due to the stress of the flood and the recovery period (Tapsell and Tunstall, 2001; Tapsell *et al.*, 2002) as well as the financial divisions, with some people having insurance, receiving compensation, and so on (Ketteridge and Fordham, 1997). In the Stockbridge example (Section 5), a fund was set up to aid those without insurance which was viewed with resentment by those who had kept up with their insurance payments.

Many people find it hard to work while trying to organise recovery and have to take time off work, which can be paid or unpaid and can cause a loss of income particularly for those who are self-employed. In some cases, people may lose their jobs as a result of their workplaces being flooded (Tapsell and Tunstall, 2001).

In terms of factors helping recovery, during the flood and the post event period people in Carlisle developed a series of coping mechanisms (see Carroll *et al.* 2007) and used external support from family, neighbours, organisations such as Communities Reunited, counselling and medication. Social support from family, friends or the wider community is a key factor in reducing the trauma of a flood event (Thrush *et al.*, 2005a). Tapsell *et al.* (2005b, p.18) review of research and literature cites the following factors as potential recovery indicators which '*relate to the capability of the people to overcome the consequences of flood impacts*' and include:

- *Financial reserves of affected households and communities*
- *'Substitutability' of lost items (where photographs and other memorabilia cannot be substituted).*
- *Cohesion of social systems and external support provided by family, friends and neighbours, local authorities, emergency services, the government, voluntary associations and private donors.*

Tapsell *et al.* (2005b, p18) refer to other factors which illustrate the complexity of people and communities' ability to recover:

> 'Not only the individual genetic predispositions that express themselves in terms of people's temperament, personality, and intelligence, but also qualities such as social skills and self-esteem. These in turn are shaped by a variety of environmental influences. Other factors that contribute to a person's ability to recover include spiritual, emotional and psychological capacity, as well as a sense of community and other less tangible factors, such as trust in authority figures, political climate, local government policy, emergency service capabilities and welfare services, capacity for change, preparedness and capabilities of local government' (Dwyer et al.., 2004, cited in Tapsell et al., 2005b).

Research on adaptation

The following is a useful definition of adaptation in the context of flood risk:

Adaptation to the flood hazard denotes a long-term increase in coping capacity which can arise from a combined change in individual behaviour, resources, infrastructure and functions of individuals and their community (Parker, 2000; Brooks, 2003; Few, 2006; *cited in Werrity et al., 2007, p9).*

Adaptation should aim to 'normalise' the risk into everyday life and for those at risk who have not been flooded before, to realise that it could happen to them.

Clearly, providing new infrastructure such as flood defences or improving drainage is an important form of adaptation included in the definition above. In terms of individual and household responses to flood risk, McCarthy *et al.* (2006, p10-11) distinguish between 'physical changes to properties' and 'behavioural' measures to either minimise water entering the property or reduce the consequences of flooding (Table 4.3):

Table 4.3: Physical and behavioural adaptation measures (adapted from McCarthy *et al.*, 2006, p10-11)

Physical preparation	Behavioural preparation
• Made sure I am covered by insurance against flooding • Raised the property off the ground • Keep sandbags at the property • Have floodboards/ floodgates/ airbrick covers • Made permanent changes to the house interior • Have permanently raised furnishings • Purchased water pumps • Put up walls or changed grounds around property • Floodproofed exterior walls	• I keep an eye on the level of the river • Keep alert for flood warnings during high-risk months • Make sure I am aware of bad weather forecasts • I listen for reports of other areas flooding • Keep ditches and drains around the property clean • Have a plan of what to do when my home might flood • I know where I would evacuate to • Signed onto the flood warning messaging system • Avoid keeping irreplaceable items or goods of sentimental value on ground floor of my home at all or at certain times

Community initiatives such as flood action groups have been formed in some areas of the UK following flood events. The roles of these groups vary from one area to another but some groups are very active in providing information and support in areas at risk of flooding (Tapsell *et al.*, 2003; Thrush *et al.*, 2005a).

Those who have experienced a flood may be more likely to take measures to protect themselves from a future event. Flood risk awareness and flood experience is consistently signalled by recent research (Tapsell *et al*., 2005a; McCarthy *et al*., 2006; Tunstall *et al*., 2006) to be key factors in the willingness to adopt flood warning technologies and preventative measures. For instance, those with previous experience of flooding have been found in research in the UK to be more likely to adopt flood warning technologies (Tapsell *et al.*, 2005b). Fielding *et al.* (2007) found that those who had been previously flooded had more awareness and understanding of the Environment Agency's flood warning codes than those without experience. Additionally, those with flooding experience used additional methods of assessing flood risk, such as checking river levels. These findings are consistent with those of Thrush et *al*., (2005).

Some people change their behaviour following a flood, for example by move possessions to higher parts of the house, get cheaper furniture for downstairs, replace carpets with flood resilient flooring. (Tapsell *et al.*, 2002; McCarthy, 2004). The experience of being flooded can serve as a learning process for some victims. Tapsell

(1992, p79) found that many participants in focus groups "*had used their previous flood experience as a learning process. Various ideas and coping strategies had emerged on how to deal with flooding, in particular with regard to precautions that can be taken beforehand to reduce damage, as well as actions that can be taken to clean up after the floods*'. So it could be argued that making those who have not been previously flooded aware of the risk and of the available adaptation measures is particularly important.

However, making preparations for a future event can lead to increased anxiety about flooding and some people will not make any preparations in order to '*move on'* (McCarthy, 2004). For instance, one participant in the focus groups four years after the Banbury and Kidlington flood admitted that she did not want to look at any literature produced by the Environment Agency because she did not want to be reminded of the flood (Tapsell *et al.*, 2003). And although participants in the same research were not averse to 'self-help', it was felt that if the authorities did their job correctly it would not be necessary to help themselves (Tapsell *et al.*, 2003). Similarly, research in Germany following the 2002 floods found that the perception that the authorities will provide flood protection is one of the barriers to undertaking self protection measures (Grothman and Reusswig, 2006). The researchers recommended that in order to overcome this barrier '*public authorities will have to communicate clearly that public flood protection – permanent levies or impermanent protective water barriers – does not provide total security*' (p119). They also recommend that public risk communication should target groups that show the lowest amount of self-protection activities; in their research, tenants were one such group.

Access to information on flood protection products is essential; a few participants in focus groups in Banbury and Kidlington were not sure what the term 'flood proofing' really meant and were unaware of the sorts of products available with the exception of sandbags (Tapsell *et al.*, 2003). The research on the 2002 floods in Germany concluded that:

> '*To motivate residents in flood-prone areas to take their share in damage prevention, it is essential to communicate not only the risk of flooding and its potential consequences, but also the possibility, effectiveness and cost of private precautionary measures'* (Grothman and Reusswig, 2006, p101).

4.4 The role of institutions and organisations in facilitating recovery and adaptation

The importance of the support offered to flood victims by government, local authorities and other organisations is highlighted by Tapsell *et al.* (2005b) who consider this support as one of the factors that influence people's recovery from the impacts of flooding. Conversely, '*some of the anxiety suffered by flood victims can be linked to the loss of confidence they expressed about local authorities and their perceived inability at predicting the flood, issuing warnings, and providing adequate protection and support*' (Tapsell *et al.*, 1999, p43). Additionally, whether the organisation that provides flood warnings, in this case the Environment Agency can maintain the trust of the public is key to whether more people will respond to flood warnings (Parker *et al.*, 2006) but also whether more people will be prepared to register for the system.

The research by Tapsell *et al.* (1999) also highlighted the lack of information regarding other aspects of the flood, such as potential contamination of the flood waters.

The role of authorities in flood response is often perceived by flood victims as poor and offering no support; and although there is not much evidence that support from the

authorities helps recovery, there is evidence that people perceive it to be so (Tapsell *et al.*, 1999; Tapsell and Tunstall, 2001; Carroll *et al.*, 2007). Participants in focus groups in the North East of England felt that the recovery period could have been reduced if they had received more support and advice (Tapsell and Tunstall, 2001). Participants in the same study were asked what form of support would have been more useful after the flood and two main forms of support emerged: practical help for example to move furniture or clean up or provision of toilets and telephones, and advice and information. Counselling or having someone to talk to were also mentioned as was help with insurance and information about making claims. There was agreement that having a '*one stop shop'* where flood victims could obtain advice and suggestions of who to contact would have been very useful. This approach was also highlighted as successful in Boscastle as it provided both valuable information on the flood event for the Environment Agency and also a chance for residents to 'tell their story' (Environment Agency, 2005c).

Communities Reunited (CR) was formed in Carlisle following the 2005 flooding. It was a partnership between Carlisle City Council, Cumbria County Council and Carlisle Churches Flood Response Team. The main aims of CR were to '*keep in touch with those affected by the floods, help them with practical support and advice and bring dispersed communities back together*[15]'. Its main tasks were tracking down flood victims and identifying where they were living and keeping this information up to date in a database. They also offered a drop in centre for advice and support, holding workshops and advice days and sending a regular newsletter. '*This was a case of effective inter agency working and having one organization as the starting point (the drop in centre) for assistance*' (Carroll *et al.*, 2007, p.87).

The insurance industry is another key stakeholder in recovery from flooding. The role of insurance has been discussed above in that it has the potential to act as a buffer against some of the financial effects but also has been shown to be a source of stress for flood victims. Qualitative research by Tapsell *et al.* (1999) found that the elderly and members of ethnic communities in particular may need help with insurance claims.

Communication between organisations and flood victims is essential: for instance people and organisations may have different perceptions of the causes of flooding and potential solutions. Some flood victims perceive that there is a loss of interest by the organisations after the flood event hence the need for dialogue which is key to understanding what is being done by authorities to address the issue (McCarthy, 2004). Public or other meetings, where people feel they are listened to and where they can ask questions and receive information and advice can be helpful in recovery (Tapsell and Tunstall, 2001).

The authorities can also have an important role in helping adaptation for instance by providing advice on flood proofing measures, promoting adequate insurance, increasing awareness and information and providing flood warnings. The Environment Agency has knowledge about flooding and also, through all the research commissioned, about social impacts; it should use this knowledge to provide advice to influence other organisations.

In summary, the role of authorities during and following a flood may be perceived negatively by flood victims. Communication between agencies and flood victims is essential, not only because receiving advice and support may help recovery from flooding but it can also work to build trust in an authority. This may be of particular importance for increasing the uptake of adaptation measures for example signing up to receive warnings or flood proofing a house following a flood. A 'one-stop-shop' approach is both preferred by victims and shown by research as the most efficient way

[15] BBC News online (19 September 2005) 'Stress support for flood victims'

of providing help and information needed by flood victims particularly in the immediate aftermath of a flood.

One of the key issues identified in the interim report by the independent review body of the June 2007 flooding in Hull is the lack of co-operation between agencies, in that case the local council, water company and the Environment Agency (Coulthard *et al.*, 2007).

Section 5 presents an analysis of the flood event and its aftermath in Stockbridge (Yorkshire) in 2000. This case study (carried out by David Wilkinson, part of the project team) provides insights into the barriers and facilitators to positive recovery for a community together with an analysis of the role of the institutions within that process.

4.5 Summary

The social impacts of flooding are widespread and long lasting both on individuals and households and on communities. A key theme emerging from the research is that floods highlight both the connections and disconnections that people have with formal networks such as government, agencies, insurance. This is consistent with findings from a review of key authors by Tapsell *et al.* (2005b, p 17) on the fundamental causes of human vulnerability. These include: a lack of access to resources, information and knowledge; limited access to political power and representations, (lack of) resource availability, (lack of) access to services and social isolation. However, other relationships and networks such as family or friends may attenuate some of these differences and offer help and support in a flood (Tapsell *et al.*, 2005a).

However, the research also shows that the worst impacts are caused by what happens after a flood, particularly dealing with insurance and builders. A key implication of this is that improving flood warnings and people's response during a flood will only reduce the social impacts to a certain extent.

The Stockbridge case study (Section 5) highlights the role of local authorities and local leadership in recovery and response. Although the Environment Agency is not the leading organisation in these phases of the flood event, it can greatly benefit from being part of a partnership to deliver effective response which in turn helps recovery.

In terms of what the institutions and particularly the Environment Agency can do to improve response, recovery and adaptation to flooding there are key findings:

- More targeted flood warnings that provide credible messages (see Work Package 1 Final Report[16]) that should lead to appropriate action for different types of flood, area and people. Linked to this, and crucial, is creating and maintaining the public's trust in the Environment Agency and its ability to forecast and warn, and increasing the public's awareness of flood risk and what to do.
- Providing information, advice and support during the recovery process. Some of this information is held by the Environment Agency, for example when it is safe to return home or dealing with contamination. Other types of information, such as filling in insurance claims, installing flood-proofing products or counselling may be best provided by other organisations (the HPA provided public health advice during and following the 2007 floods). Setting up a one-stop shop would require the Environment Agency to collaborate with other organisations.
- Providing information and support on adapting to flood risk, particularly locally relevant information based on the characteristics of an area and its residents and the

[16] Twigger-Ross *et al.* (2008)

actual flood risk. Again, this would have to be done with other partners such as the insurance industry, community groups and parish councils.

These actions could help reduce the impacts of flooding on people and communities and boost trust in the Environment Agency. In taking these actions, the Environment Agency should be aware of the people most likely to need support, including those most affected by flooding, with the lowest awareness of risk and/or disconnected from formal and informal network of support. Support from Environment Agency Head Office would be essential here. Head Office could also be useful in lobbying national organisations to work together.

5 A case example of response and recovery: Stockbridge re-visited

David Wilkinson[17]

5.1 The flood event

At 5.00 am in the morning of 30th October 2000 the Stockbridge neighbourhood of Keighley (Yorkshire) was flooded by the River Aire. Stockbridge is a poor, ethnically mixed community. The housing stock consists of mostly Victorian terraced houses and budget-priced 1930s semis, privately owned or rented. There is also a small amount of relatively new housing built on the flood plain, both privately and housing association owned. For the most part, it is a relatively low income community.

Some people had about an hour's warning, others none at all. By 10.00 am people were arriving at the Keighley Leisure Centre (about half a mile away) where the local authority (Bradford Metropolitan District Council) had set up an emergency response centre. Some arrived without shoes and socks and many were upset and disoriented by the experience. There was also a growing realisation that many had no household insurance.

Around 300 residential and three commercial properties were affected, involving over 500 people. It was to be between six to 12 months before most people were back in their homes. Not only was this a traumatic event for individuals, it was traumatic for a fragile community. What happened next is a positive story of what frontline interagency collaboration, fully involving local people, can achieve.

5.2 What the institutions did

Graham Thompson was then the Area Manager Services for Older People for the Keighley area, part of Bradford Metropolitan District Council. At around 10.00 am that morning he was alerted from his headquarters that the flooding had occurred and that Victoria Hall, part of the Keighley Leisure Centre, had been made available through the Authority's emergency plan. There was an emergency flood plan for Ilkley on the River Wharfe which runs parallel to the Aire and to the north which is also part of the Bradford Metropolitan District at this point. But there was no plan for flooding along the Aire. The Wharfe did not flood.

Graham went straight to Victoria Hall where many of the flood victims had been assembling for a couple of hours. Councillor Andrew Mallinson, one of the three ward councillors, had also arrived by this time. (He had not been flooded.) Andrew talked to Graham about the paramount importance of communicating with all those affected and finding ways of working with them to understand the problems and seeking ways to address these.

This led Graham to decide to set up daily meetings for all who wanted to attend. The meetings held at 6.00 pm continued to be held on this daily (except weekends[18]) basis

[17] Sustainable Futures. http://www.sustainablefutures.co.uk/default.jsp

for the next four weeks or so. They were also attended by members of many other council departments and other agencies who were involved in the response. He also was able to bring together a core team of people seconded full time for several months from the wider Social Services Department. With Graham, this core team played a crucial role in enabling many other council services, the emergency services and other agencies to co-ordinate their activities. This of course included the Environment Agency.

The response to the Stockbridge flooding emerged through a significant conversation between the ward councillor and the area social services manager within hours of the flood. Graham was never given a formal role, but was supported by the Council, particularly his own department to act 'entrepreneurially'. He had an important council member and two council directors as 'sponsors'. It was recognised that he had taken a lead role.

Graham with Maria Wilkinson, his development manager now seconded full time to the core team, developed some guiding principles for the relief efforts. They formed the foundation for the rest of the response which lasted for the best part of a year. Effectively they decided:

- set up a small full-time core team of people who would liaise with and bring in other agencies who were, or needed to be, involved;
- ensure the core team would have a continuous daily presence at the Victoria Hall leisure centre including weekends, to respond to residents' needs, questions and anxieties;
- pay particular attention to residents' experiences and use these as the basis for action. People were brought into, or near to, the core team who were thought to be able to do this, rather than seek to impose predetermined professional solutions;
- communicate with and involve residents and agency staff and seek to build trust, especially through the core team and with the assistance of a central telephone enquiry service and social services communications staff;
- seek answers to residents' questions as soon as possible after being asked;
- work with other council services and agencies to ensure residents' needs were dealt with as constructively as possible.

Actions and events that followed included:

- Every affected person who could not find their own alternative accommodation was found somewhere by the first evening and had transport arranged. Nobody had to be housed at Victoria Hall for the night.
- Where necessary, everybody was provided for the first night with essential personal cleanliness items and medical advice where that was required.
- Meals were provided at the leisure centre for the first three weeks following the flood from that first day.
- Advice or information that would assist the recovery process was made available.

[18] The flood took place on a Monday, thus making the need for weekend meetings less vital, though a continued presence was maintained.

- Meetings, coordinated by Graham Thompson, were held every day for the first four weeks and then on a less frequent basis. Attendance in the first few days was as high as around 400 people of all ages.
- Eight editions of the *Flood Information Bulletin* were produced by the Social Services Department and distributed between 3 November and 11 December 2000.
- Many agencies and organisations were brought in, involving around 500 staff and volunteers including twelve departments of Bradford Council, Yorkshire Electricity, Transco, British Telecom, Yorkshire Water, the Environment Agency, police, health (acute and primary care trusts), fire services, Royal Mail, benefit, and a range of local businesses, voluntary groups, ward and other councillors, the MP and many others.

The first few public meetings held at the leisure centre in the immediate aftermath of the crisis had particular significance. People were confused and angry and there was considerable expression of this, mainly focused on Graham Thompson, the coordinator. Andrew Abbott, who was later to become Chair of the Stockbridge Neighbourhood Development Group, said with much agreement from other members of the group,

"*It is embarrassing to remember how some of us behaved then. And Graham just took it all and remained completely unruffled. He was incredible. We were upset and confused and out to blame someone. I have apologised since. We quickly learned that the best way forward came through collaboration and that people were there to help us. When we had questions that couldn't be answered immediately, they always came back with answers as soon as possible. We see so many of these staff as friends now*."

Within a few days, the mood had changed and new beginnings were created. High levels of trust started to be built between residents themselves, between agencies solving problems together and between agencies and residents. Graham Thompson had created a framework, a way of meeting, where emotions and anger could be expressed and where residents and the staff involved could collectively begin to get on with the work of rebuilding lives, property, the local environment and the community itself.

It also enabled a productive relationship to develop between the Environment Agency and especially the Area Flood Defence Manager, David Wilkes, and residents to start planning for improved flood defences. In the beginning the Environment Agency was a major target for complaints about the inadequacies of both flood defences and the flood warnings. But residents are now much better informed about the complex world within which the Environment Agency has to operate to secure scarce resources for making improvements and are much better placed to have an influence on this and flood warning systems.

A big problem that came to light on that first day was that many people had no insurance cover. Nearly half the households affected had no contents cover and about a quarter had no buildings cover. An independent trust fund was set up supported by Bradford Metropolitan District Council and a number of banks, building societies and other organisations. Most of the money was distributed to meet the needs of those without insurance cover. (This was quite contentious for some of those who had kept up with their insurance.) Again, similar core principles of working were applied. The same core team provided most of the servicing to Trust members. By now they had extensive knowledge of what happened and its impact locally and high levels of trust with local people through the processes of working that had been set up and through numerous home visits. It was also decided to approve one building contractor,

supervised by the Council's Environmental Protection Service and one local provider for white goods and one for carpets. The latter two were within walking distance, recognising that many residents did not have cars. This was done to build partnership and trust in the supply of services and goods.

In a matter of days, the social context in which the Environment Agency was developing its response had been transformed. Staff were able to connect easily with other stakeholders, especially the various functions of the local authority and residents themselves. This is something that the Environment Agency would not have been able to achieve on its own. For a start it simply has not got the resources or the specialised local knowledge, contacts and connections with other bodies. It would be quite unrealistic for it to ever create this for every locality which might flood, by whatever means. Recent events (July 2007) have shown just how unpredictable flooding events have now become together with the combination of river and drainage causes. During the response and recovery period, it was able to benefit from the 'social capital' created through the Bradford Social Services response.

The American social scientist Robert Putnam describes social capital "*as referring to social networks, norms of reciprocity, mutual assistance, and trustworthiness*". The positive effects are the ways "*that people in relationships can reach goals that would have been far beyond the grasp of individuals (or organisations) in isolation. At the same time, these people get the intrinsic satisfaction of being part of a community*" (Putnam 2004, p2). Putnam goes on to describe two key forms of social capital: bonding and bridging. Bonding capital is bounded within communities. It may be perceived as functional within the boundary, but inward-looking and excluding from the outside. Bridging capital builds links of understanding, trust and reciprocity across different communities (communities here refer to organisations and their departments as well as to residential and social communities).

The way in which the Stockbridge recovery effort was set up and subsequently functioned, clearly developed social capital very rapidly. The key dimension here was of course, the creation of bridging capital in an initial context of crisis which was loaded with anger, anxiety and loss on the part of those who had been flooded, together with the doubt and uncertainty of those attempting to make appropriate responses. None of those who had been flooded or who were responding to it, had any first-hand knowledge of either being flooded or responding to it, except for Environment Agency staff. Putnam notes that "bridging social capital is harder to create than bonding social capital - after all, birds of a feather tend to stick together". Communities, or organisations for that matter, that have only bonding capital "can end up looking like Belfast or *Bosnia*" (Putnam 2004, p3).While the level of distrust and anger did not begin to touch the historical legacy of these places, the 'bridge building', needed to be done in a context of great anger and confusion that enveloped all those involved. What it takes to operate in this way is explored further in the next section.

5.3 The key factors that facilitated this positive response.

These are largely described in the section above. In summary they can be described as:

- The initial meeting and discussion that took place between Councillor Andrew Mallinson and Graham Thompson, the Area Manager - Services for Older People. They highlighted the need for a rapid information flow between all those involved.

- The setting up of a small full-time core team and the 'template' decisions taken described above about how they would work with those who had been flooded as well as with those involved with the response. This naturally flowed from the meeting between Andrew and Graham.
- The 'sponsorship' from above in the Council, especially within the Social Services Department, but also from the Director of Development Services together with the early involvement of an elected member. Effectively the response was spawned and crafted from 'below' and was not part of a preordained plan. However, the Council had the good sense to support it and crucially make resources available to support this local civic entrepreneurialism.
- The support of the Keighley constituency MP, Ann Cryer, was also important.
- Drawing everybody in - widening the circle of inclusivity. This included all those who had a stake in, and could make a contribution to, the recovery effort. The central manifestation of this was involving people in the big daily 6.00 pm meetings. But it was also part of the way of working adopted by the core team in developing and facilitating relationships between those flooded and those responding from so many different organisational 'communities' (silos).
- Living with the flack. This was particularly modelled by Graham Thompson and is well illustrated in the quote from Andrew Abbot above. It was this empathic acceptance of people's emotions, angry and hostile as so much was in the early days, that was to prove so crucial so quickly.
- Building social capital, especially bridging capital. This was achieved through all the above. It was the creation of this capital that enabled the response and the recovery to take place much more smoothly and rapidly than would have otherwise been probable.

The application of emotional intelligence?

There is a further way of shedding insight into why this response was so successful. This is through the perspective of emotional intelligence (EI). This set of ideas was popularised by Daniel Goleman (1996). In the book *The New Leaders* (Goleman 2002), he describes four domains of EI: self-awareness, self-management, social awareness and relationship management. These, with their associated competences, are set out in box A.

The experience of flooding is a traumatic personal experience and triggers powerful emotions. In floods such as this, the temperature inside the houses drops instantly to the temperature of the river water which is also mixed with sewage brought up from the drainage system. Those who make themselves available to flood victims within hours of the event and who represent 'authority figures' from institutions that may have been seen as connected in some way to the causes of the problem are likely to be targets for people to vent their anger. Officers from the local authority, the Environment Agency or the water companies can expect to be in the firing line in these situations. Where large numbers of victims are together this emotional overload is likely to be contagious.

Faced with this, it is a very understandable reaction to say as little as possible, probably relying on professional explanations and formal position, and keeping out of the way as much as possible. Nobody wants to carry the anger and blame of several hundred people in a formal arena for something they have little or no part in the cause. It is one thing to perform one's defined professional role, but quite another to shoulder the responsibility to bring together all those who are needed for a full response and recovery. This also means facing people's emotional stress as well as their many physical needs, head on. In such emergencies, the two are inseparable.

Graham and his team started from the EI domain of social awareness. By consistently chairing the big daily meetings and promising to come back with answers through the meetings or through his team in one-to-ones, he was demonstrating this awareness and particularly the competences of empathy and service. (See box A) He was also self-aware enough to know how to manage his own emotions of uncertainty, fear, and considerable apprehension and keep his attention focused on the social awareness needed. In the domain of self-management, he was strong on emotional self-control, transparency and adaptability. Through this combination of social awareness and self-management, he was able to foster strong relationship management between those who had experienced the trauma of flooding and the many people from a wide range of institutional settings who could organise resources to help and support. This was not about inspirational leadership and vision building. In one sense it was far more prosaic - and far more important in this context. In terms of Golman's domainal competences it was about being a change catalyst, managing conflict, building bonds, cultivating teamwork and collaboration and ultimately, developing others.

In therapeutic terms he created what can be termed 'a holding environment' which enabled emotions to be expressed in a place of increasing safety and trust, while at the same time addressing the practical problems that faced people. These started with "where are we going to sleep tonight?" through to the awful realisations that this scale of flooding would mean that people would be out of their houses for many months and often up to a year or more. And then there were the many problems of the lack of insurance. This is just a glimpse of the successive problems flood-affected people have to work through but are well enough known to those who have experienced flooding or been close enough to those who have.

This 'holding framework' provided the arena in which all those involved, flooded and 'helper/supporters' could work through and deal with the emerging and unfolding succession of emotional and physical needs involved. Ronald Heifetz in his seminal study, *Leadership without Easy Answers* (Heifetz 1994) describes this as “giving the work (of change) back to the people”, again both the flooded and the helpers/supporters. Less than a week after the flood, this was happening. Thus began the move from response to recovery.

The application of emotional intelligence (EI) to this response which included this large element of taking personal responsibility for the situation (nobody up the local authority hierarchy said he had to do it like this) rapidly led to the formation of bridging social capital which could then be applied to the full response and recovery effort. Putnam says that developing this kind of capital, rather than just bonding social capital, can often be difficult to do. In this case it was to make the crucial difference.

Of course, Graham did not work out how to go about all this with the concepts of EI, bridging social capital and holding frameworks in mind. He was familiar with some of these ideas, but his professional training and experience of many years in social work had perhaps attuned him more to these sorts of insights. He had worked in community development for a while and chaired, and spoken to, large gatherings through his national involvement with the British Association of Social Workers (BASW). I have introduced this analysis in an attempt to shed greater light on what is involved in this type of response. It is also to say that it is far more than trying to follow some sort of procedural guidance. The application of EI seems to me to be the critical factor here. When Graham read a draft of this paper he wrote:

“With hindsight (or in fact without it!!), it is a considerable relief that I was not aware of the theoretical context in which we were all operating – at least at the time! It may have well inhibited us….But it always impresses me, as I hinted when we met, to read about events such as the Stockbridge saga in a theoretical context and I thank you for providing it in such a readable, and, most importantly, hopefully useful way for others to connect and analyse their own experiences too.”

EI is a contested notion. There are questions about whether it can be accurately distinguished and defined plus whether it can be measured. From my own experience as a professionally trained coach and in leadership development, the concept makes considerable practical sense to those in positions of executive leadership. While I share a scepticism about its measurement, I have little doubt about its use in action as a personal development tool for many and especially for those who hold or take on formal leadership positions. There seems little doubt that EI can be developed in people and that this can have very beneficial results. Joint development training for staff from local government and the Environment Agency based on personal and professional development through the application of these tools could be a way forward to responding to flooding events more appropriately.

These skills and tools could also be applied to the longer-term recovery from flooding events at the local level as well as to the strategic need for far better coordination of both strategic and localised prevention plans. Section 5.4 describes the lack of bridging capital at the strategic and catchment levels, thus making any real strategic approach to flood minimisation, prevention, and where necessary, living with flood risk, very difficult indeed.

One illustration of initial and somewhat bizarre institutional resistance to respond to the situation was the Post Office's determination to meet its statutory obligation to deliver mail to the address on the envelope. This meant posting mail through letter boxes to land in flooded and abandoned houses. Fortunately they soon came to see that this wasn't an entirely sensible way of proceeding.

5.4 The relationship between short-term response and longer-term recovery

Residents, with support and encouragement from the local ward councillors, the MP Ann Cryer and Bradford Council's Keighley Area Panel staff, set up their own Neighbourhood Development Group and set about actively rebuilding their community and infrastructures in continuing partnership with key agencies. In fact some residents expressed the view that a lot of good came out of the flooding because the processes that followed to 'rebuild' Stockbridge had been so helpful in enabling people to meet and connect with each other and revive a community spirit that had scarcely previously existed.

Through the experiences and close links with the Environment Agency in particular, residents became much more aware of the causes and the increasing risks of flooding. What had been a stretch of river carrying water down one side of their neighbourhood is now seen as part of a living system where a whole host of decisions being taken upstream can impact on their lives. Changing moorland and forestry management methods, agricultural practices and urban developments have all been increasing the speed with which water runs off the land into streams and rivers contributing to sharper peaks and troughs in flows. They became concerned about how these decisions are taken, especially through the planning processes of local authorities upstream and also how floodwaters can be increasingly held on flood wash plains.

The Environment Agency sponsored a project to bring together flood-affected people from different locations along both the Rivers Aire and Calder, both to help them share experiences and longer-term concerns about flood prevention. While Stockbridge got improved defences built, for a number of other localities, where many fewer people were affected, there was little realistic chance of defences being built. The overall focus had to be on alleviating causes of flooding and on flood prevention.

The project also explored ways in which public planning agencies and key land users can be brought together to address these issues with those most affected by the consequences. But the outcome was disappointing. All the local authorities along the Aire catchment had increasing awareness of the flooding issues in their planning and land drainage departments. The centre of Leeds itself had missed a serious flood by a matter of inches. The flood at Stockbridge could have saved it then and the improved defences can only make Leeds marginally more vulnerable. (The provision of defences for Leeds remains a significant local issue. But recent extensive flooding in both South and East Yorkshire will inevitably lead to escalating demands for what at very best can only be a much smaller finite capital financial pot.) But the connections between the Environment Agency and the key people in the local authorities was weak and transitory. This was also true of the connections between the local authorities along the catchment themselves and also with the water company. Both local authority planners and drainage engineers tended to meet for professional gatherings according to traditional regions and not link to each other along river catchments. The flooding this summer (2007) suggests again that there is a great need for key stakeholders, hopefully with real leadership input from the Environment Agency to set their strategic water management plans in a whole catchment context and to plan and implement local improvement schemes within this. The recent scale and diverse range of causes of these recent floods also points to the need to make the implementation of the Defra policy, *Making Space for Water* a real priority, rather than treating it as high level policy rhetoric.

There were examples of good collaboration on a piecemeal and one-off basis such as the recovery at Stockbridge. Relationships, where they existed seemed good. But there was no strong lead to work together on catchment-wide strategies for improving the management of water in general and minimising flood risk in particular. In the long run, it seems that this lead could only come from the Environment Agency. But the perception of other agencies was that by and large the Environment Agency was only interested in their formal duties to consult on plans they were obliged to develop through statute such as Catchment Flood Management Plans (CFMPs). Largely as a result of the Stockbridge flood, Bradford Metropolitan District Council carried out its own inquiry into water management across the district.

The study revealed growing awareness amongst many locals of the complexity of the Aire catchment system and the factors that influence it (Wilkinson *et al.*, 2005). But, in general this has not been mirrored by greater institutional collaboration. There are local and specific examples of this, but these are down to the work of individuals who have seen the fundamental need to collaborate to achieve results locally.

The full report on this is published by the Environment Agency, Joining Up: Stockbridge Pathfinder (Wilkinson *et al.*, 2005). The findings and recommendations are reported in Appendix 2. A further scoping study into stakeholder engagement in the development of the Aire and Calder Catchment Flood Management Plans (CFMPs) has also been published on the Environment Agency's website (Wilkinson and Wade, 2006) .

There has been no systematic research on the longer-term recovery at Stockbridge itself. Our work with the Neighbourhood Development Group led by Andrew Abbott (who was also a member in the Bradford Water Management Inquiry Panel) there is little doubt that the area recovered quickly, house prices moved upwards and improved in line with local conditions, and community involvement and spirit was better in the medium term at least than it had been before the flood. This suggested the continuing building of both bonding and bridging social capital for the years following.

Anecdotal evidence also suggests that mental and physical health were not detrimentally affected. Counselling services were made available and again anecdotal reports at the time suggested that these were barely needed or used. This suggests a hypothesis that the way the response and recovery effort was led and organised not

only responded to the individual and community physical and building repair/infrastructure needs, but also to their socio-emotional needs as well. This would make an interesting study in its own right, especially looking at comparative health data from other areas that have experienced flooding.

5.5 What could the Environment Agency do to facilitate positive responses in the future?

The Environment Agency has already commissioned and published a considerable amount of research on the flood management cycle from warning to response, recovery and prevention/mitigation. A continuing theme in this work is the need for real partnership working with stakeholders. To date this seems to have limited impact on practice. It may be that the longer-term social, economic and political impacts of the recent floods may produce a much needed shift in mindsets at higher levels. There is now so much stress in so many organisations on silo-driven targets and key performance indicators (KPIs) that the incentives for 'joining up' are lowered. See for example, the Environment Agency's research on Improving Poor Environments. The further problem is that if partnership working itself is made into a KPI it can lead to simply going through the motions and a tick box approach. Instead of being the means to a much bigger end, it becomes an end in itself. Of course it might be rather different if all the stakeholders did the rating of the KPI achievement.

The evidence from Stockbridge, Keighley, points to the key role of local authorities and local leadership in effective recovery and response. The analysis in this case study points to very real importance of emotionally intelligent responses that take account of and work with empathic responses to the personal and social traumas that inevitably go with the experience of being flooded. The Environment Agency does not have the resources or the local knowledge to do what Graham Thompson, his team, and the local authority as whole, could do and pull together. Nor should this be its role. However it benefits greatly when this happens. It was quickly seen in a positive light by most residents long before the new defences were planned. Given that all the key stakeholders were on board, the new defences were planned and built in about two years, a very rapid response time. In these instances it is a partner with local government in the lead. But at the strategic, more preventative level, the roles need to reverse.

This suggests that the Environment Agency should work much more closely with local government, especially the Local Government Association (LGA) on raising awareness of all aspects of water management, including responses to flood events. The suggestion has already been made above that a cadre of people could be developed to both take the lead and act as resources in crisis events. Above all, knowledge needs to be networked rapidly and brought to bear in the moment. Each flood event is both caused and impacts in locally specific ways. This is why responses have to be crafted on the hoof, in the instant, to respond to these unique local sets of circumstances. The hypothesis derived from this case study is that speedy and effective response is likely to lead to better recovery and cement better partnership working. In turn this social capital is available then to work at the strategic, catchment levels.

Local Authorities also play a major role in land use planning and management - as do other stakeholders of course. With the water companies, they should be key partners in strategic water management plans and the development of interagency collaborative improvement schemes within these. There are lessons here as well from what happened in Stockbridge. Graham Thompson took personal responsibility for the orchestration of the 'whole' and was visible and steadfastly consistent - actions matched words. His approach was emotionally intelligent. These are the hallmarks of

the kind of leadership that is required for this kind of work. Graham acted in response to an emergency situation. But in leading partnerships these same elements of personal responsibility, the use of emotional intelligence, centrality, visibility and consistency are required. This needs to be a much clearer and more explicit part of the Environment Agency's role. Only it can hold the strategic role at the catchment (and river basin) level and orchestrate the collaborations at scheme levels.

Marcus *et al*. (2007), based at the Harvard University School of Government, look at the role of what they call “meta-leadership” in national emergency preparation. “The answer is leadership” they say boldly. “Meta-leadership refers to overarching leadership that connects the purposes and the work of different organisations or organisation units”. They pick out ten traits, unique skills and capabilities that are required. These are: courage, curiosity, imagination, organisational sensibilities, persuasion, conflict management, crisis management, emotional intelligence, persistence and “meta-leadership as a valued effort”.

Could Graham Thompson's (and perhaps many others’) knowledge and experience have been used during the recent flooding episodes? It is likely given what has been reported that he and his expertise could have made a considerable difference to a great many people. Was it used? No, it has simply been ignored and forgotten. He has now retired and lives in the Yorkshire Dales. But like several of us, he could only wonder at what was being reported by the media and what a huge difference could have been made for so many people had better responses been made above that done by the basic emergency services of Police and Fire. There may well have been other examples of excellent response efforts on the Stockbridge lines. Will it be documented and the knowledge shared and networked? Will some kinds of process-based benchmarks be set for the future? Given current organisational cultures and mindsets, sadly this seems unlikely. Could Bradford Metropolitan District Council react as well again to some future event on this scale?

6 Understanding response and resilience in post-flood communities: Lessons from the Carlisle pilot study

Nigel Watson, Gordon Walker, Will Medd, Elham Kashefi[19], Sue Tapsell[20], Clare Twigger-Ross and Amalia Fernández-Bilbao[21]

6.1 Aims and Objectives

The aims of this study were to:

1. Critically examine different interpretations and conceptualisations of *resilience* in the context of flood hazard management.
2. Investigate how local communities in Carlisle, Cumbria, have attempted to recover since the devastating flood of January 2005.
3. On the basis of the findings, offer practical recommendations to improve the way in which the Environment Agency and other organisations prepare for and respond to major flood incidents.

The concept of resilience, including its many interpretations, is examined in Section 6.2. Section 6.3 outlines the background and research methods, with findings from the pilot study discussed in Section 6.4. A summary of the main findings is provided in Section 6.5, while key conclusions and recommendations are presented in Section 6.6.

6.2 The Concept of resilience

This section examines the concept of resilience and the different meanings that have been given to this in the policy and academic literature. Some of the implications of these different meanings for responses to flooding are considered, in order to provide a preliminary framework for analysing the Carlisle case study results.

6.2.1 Introduction

The concept of resilience has gained increased attention in recent years across a range of policy domains. Most notably, within civil contingency planning there has been a marked shift in priorities away from conventional emergency response towards building resilience through improved preparedness (www.ukresilience.gov.uk). In parallel, there has been a proliferation of interest in resilience thinking within the academic community, exemplified by the new 'resilience alliance'

[19] Lancaster Environment Centre, University of Lancaster
[20] Flood Hazard Research Centre, Middlesex University
[21] Collingwood Environmental Planning

(http://www.resalliance.org) which is concerned with building resilience in socio-ecological systems as the key to sustainability.

The proliferation of new interest brings with it the need to be cautious in any simplistic adoption of any particular definition or interpretation. Rather, there is a need to reflect on the different accounts of resilience, and the different ways in which resilience might emerge in the context of improving institutional and social responses to flooding. For example, while it may be convenient to frame flood management simply in terms of building resilient social and institutional systems, the concept of resilience itself can have quite different meanings in the context of say personal, household or organisational resilience compared with the resilience of a flood warning system or a flood prevention barrier. Furthermore, the simple fact that an individual is able to respond purposefully to a flood event may be seen as an indication of some form of resilience. However, such responses may do little more than duplicate existing vulnerabilities by 'putting things back to normal' and therefore actually contribute very little in terms of longer-term resilience and preparedness.

6.2.2 Interpretations[22]

Often used in contrast to notions of 'vulnerability', different concepts of resilience have emerged across a wide range of research disciplines: psychology (Luthar 2000), organisational science (Marcus and Nichols 1999), information technology (Riollia and Savickib 2003), biomedicine (Biros and Adams 2002) and geography (Pelling and Uitto 2001; Pelling 2003). Resilience is variously characterised as persistence, resistance, stability, stasis, continuity, innovation, adaptation, transformation, immunity and recovery. However, at its most basic resilience can be defined as "*the ability of a system to absorb disturbance and still retain its basic function and structure*" (Walker and Salt 2006). Resilience can therefore be understood as the flip-side of vulnerability - the more resilient a system is, the quicker it can recover and with less change. As such, we can think of resilience as a kind of *absorptive capacity*.

One implication of this interpretation is that the more vulnerable people are, the harder it becomes to recover, the longer it takes and the more change that might need to take place in the process. Viewed in this way, resilience appears to be about the ability to cope with a shock or disturbance, such as a flood, by *resisting forces* which might otherwise bring about systemic collapse or change. A resilient system might therefore be characterised by an ability to maintain its function(s), structure(s) and identity in the face of potentially disturbing forces.

The literature on socio-ecological resilience has gone some way towards developing a typology of different forms (see Adgar 2000; Berkes *et al.* 2003; Gundersen and Holling 2002). Some key differences between engineering, ecosystem and social-ecological resilience were outlined by Folke (2006) (Table 6.1). For engineering resilience, there

[22] The definitions of resilience used in this research differ from the Environment Agency's interpretation: flood resilience is viewed by the Environment Agency as one component within flood management. Flood resilience is defined by the Environment Agency (2007) as the ability of a community to withstand flooding without loss of life or excessive flood damage. It can be sub-divided into three main components:

- **Social** resilience (ability of people to respond to, and recover from, flooding)
- **Infrastructure** resilience (transport links, services, access)
- **Buildings** resilience (layout/master planning, design levels, structural integrity, services, provision of safe access, evacuation routes)

In relation to buildings, PPS25 practice guide distinguishes between flood resilience and flood resistance:

- **Flood resistance:** Constructing a building in such a way to prevent floodwater entering the building and damaging its fabric.
- **Flood resilience:** Constructing a building in such a way that although flood water may enter the building its impact is reduced (no permanent damage, structural integrity maintained and drying/cleaning possible).

is essentially one optimum state for the system to be in and so resilience is a measure of recovery in terms of *return time*. The resilience of ecological and social systems has tended to be defined in terms of *robustness* (Adgar 2000).

Table 6.1: Sequence of resilience concepts, from the more narrow interpretation to the broader social-ecological context (adapted from Folke 2006, p259)

Concept of resilience	**Characteristics of resilience**	**Analysis of resilience**	**Assumptions of system dynamics**
Engineering resilience	Return time, efficiency	Recovery, constancy	Vicinity of a stable equilibrium
Ecological/ecosystem resilience and social resilience	Buffer capacity, withstand shock, maintain function	Persistence, robustness	Multiple equilibria, stability landscapes
Social-ecological resilience	Interplay disturbance and reorganisation, sustaining and developing	Adaptive capacity transformability, learning, innovation	Integrated system feedback, cross-scale dynamic interactions

In sharp contrast, the analysis of resilience in more complex socio-ecological systems emphasises the importance of adaptive capacity, which involves positive and negative feedback loops leading to learning, innovation and adaptation. For example, Conway (2007, p274) observed that:

"The important thing about resilience is that it is a process involving anticipation, planning and design, response and, most crucially, learning. A resilient society is a learning society – one that learns from mistakes and the dynamics of its environment. This is also true for individuals…."

As such, resilience appears to involve *purposive change* in response to the opportunities and demands created by a disturbance, such as a flood. Resilient systems have the capacity for self-organisation, which enables structures and processes to be *reconfigured* to ensure long-term survival. In practical terms, this would imply that a resilient person, household, organisation or community would have the ability to change their practices and structures in the aftermath of a flood event. As a result, the person or entity would not only be able to function in the new (post-flood) environment but would also have the capacity to anticipate and prepare for the possibility of similar shocks in the future.

The applied literature on socio-ecological resilience is oriented towards the identification of effective strategies for managing sustainability in an increasingly turbulent environment characterised by complexity, change, uncertainty and policy conflicts (Berkes *et al.* 2003; Folke 2006; Gundersen and Holling 2002).

Whilst the socio-ecological approach offers an important framing for understanding the dynamics of resilience, there are some limitations that we need to keep in mind in thinking through the development of policy to enhance resilience (Medd and Marvin 2006).

First, the emphasis of the literature is on the need to develop better management strategies to achieve "adaptive capacity". While it can be valuable to explore the adaptive capacity of households, business and communities in response to flooding, attention should also be given to the ways in which different elements of resilience might interact, either positively or negatively. Efforts to promote continuity may run counter to efforts aided at adaptation. For example, strategies designed to enable continuity of occupation in the floodplain may alter public perceptions of risk and therefore discourage adaptive behaviour, such as the re-location of existing housing or the introduction of land use zoning for new housing. Similarly, the adaptability of say a household or business may impact on the community. The re-location of one family may encourage others to take similar actions. Conversely, the loss of a particularly active and valued member of the community might undermine adaptive capacity at that scale.

Second, it is particularly important to see how resilience is played out across socio-technical infrastructures, the dynamics of which often stretch beyond the interactions of clearly demarcated eco-system boundaries. For example, in the July 2007 floods, electricity cuts were experienced by residents who lived some distance from flooded areas. Furthermore, there were suggestions that some communities received a disproportionate level of help and attention while others similarly affected by the floods felt forgotten and ignored. Social networks may also be important in accounting for and developing resilience. Households and communities in all their shapes and forms have social relations to varying degrees that spread across different locations. They are also not static or spatially bounded, and therefore we cannot understand the "resilience" of a community, and thereby it's ability to respond, without reference to wider social, institutional and infrastructure networks.

Third, once building resilience becomes a strategy in itself, as for example in the formation of 'UK Resilience' (see Medd and Marvin 2006) there are important questions about how the concept is translated across scale and implemented within local institutions and practices. For example, how does a national strategy like *Making Space for Water* become translated into local practice? Is such a strategy appropriate to the needs of particular communities or might it inadvertently limit resilience by imposing standardised procedures or structures which do not 'fit' the local context? This raises fundamental questions about the nature of policy implementation in relation to flood management. Should 'successful policy implementation' be taken to mean the accurate translation of national statements of intent into local practices (a programmed approach), or should 'success' be measured in terms of the extent to which local actors are able to interpret or custom-fit the policy in order to effectively manage the actual flood risk (an adaptive approach)?

6.2.3 Summary

In summary, at the conceptual level and within specific applications, researchers have interpreted and applied resilience in three very distinct ways (Table 6.2). 'Type 1' resilience is the capacity of a system to resist exogenous shocks and disturbances by virtue of its *robustness and absorptive capacity*. 'Type 2' resilience is the capacity of a system to return to its previous state by *restoring* damaged structures, processes and procedures. By contrast, 'Type 3' resilience refers to the capacity of a system to *reconfigure* itself and *adapt* to changes in its operating environment on the basis of experience and learning so that it is able to function. These three different types of resilience have important implications for flood hazard management, as each suggests a different set of system characteristics that require different response strategies as well as distinct planning orientations.

Table 5: Alternative interpretations of resilience

Resilience Type	System Characteristics	Response Characteristics	Planning Orientation
Type 1 ***Resistance***	Steady state/stable - Continuity of functions - Robust/ability to absorb shocks and disturbances	Preparedness via: - Early detection of shocks - Issue of effective warnings - Multiple lines of defence - Hazard resistant design or retrofit - Organisational redundancy and overlap/duplication	Present is better than the past and the future
Type 2 ***Restoration***	Unstable - structures, processes and functions sensitive to shocks and disturbances	Rapid normalization via: - Temporary evacuation/housing - Compensation and insurance cover - Repair of services and infrastructures - Support services: physical and psychological health, social care, legal and technical advice	Past was better than the present
Type 3 ***Re-configuration***	Open-ended - Responsive to feedback (+/-) - Self-organising	Adaptation via: - Increased rates of knowledge acquisition - Trial-and-error experimentation - Flexibility in distribution of resources	Future can be better than the past and the present

While some clear distinctions can be made between resilience as resistance, restoration and reconfiguration, there are strong similarities in terms of flood management practices. Many systems have the ability to 'flip' from one relatively stable state to another by passing through 'tipping points' (Gladwell 2000). In flood hazard management, these tipping points represent thresholds where perceptions of our capacity to cope with the event are fundamentally altered. For example, for a given flood event we may be initially confident in our ability to resist the threat (Type 1 resilience). However, if that response proves to be inadequate and flood damage

occurs then the response may ‘tip’ towards efforts to restore normality (Type 2 resilience). However, if catastrophic damage and disruption arises from the flood event and the previous type 1/2 management response is judged to have been inadequate, a further ‘tip’ towards re-configuration (Type 3 resilience) may be required to bring about more radical vulnerability-reducing reforms and adjustments to the specific institutional arrangements for flooding. However, it is important to note that the tips from one form of resilience to another may be contested. In particular, professional flood incident managers may perceive a need to shift from Type 2 to Type 3 resilience much earlier than other actors or groups who firmly believe that things should be, and can be, returned to ‘normal’. However, it is also possible that flood incident managers may hold on to the ideas of resisting the threat or putting things back to normal when in fact a fundamental threshold has been passed and an altogether different type of response capability needs to be developed.

In terms of normative flood management policy, the three different types of resilience can be thought of as elements of a single integrated approach. Indeed, one of the main lessons to emerge after more than 50 years of social science research on hazards is that society should not rely on any single measure for protection, and that a more sophisticated ‘multiple-means’ approach should be developed that effectively combines resistance and restoration as short-term measures with re-configuration and change in the longer-term.

6.2.4 Questions for resilience analysis

In the context of framing case study research with a community that has experienced a serious flood, a series of key questions can be posed about resilience, moving from issues at the individual and household level, through to broader community processes and social networks.

The individual

To what extent were individuals in the post-flood period focused only on recovery and returning things ‘back to normal’?

What obstacles stood in the way of recovery?

Did people, businesses and institutions recognise the need to prepare for potential future floods as well as recover from the last one?

To what extent have people developed coping strategies in relation to receiving and responding to flood warnings?

What have they done physically in ‘flood proofing’ their houses and businesses, if anything?

Have they put in place better insurance?

Do they have a ‘plan’ of what they will do in the event of future flooding? What would they do differently from before?

What knowledge of flood risk have people now accumulated, and how are they drawing on this?

The household

How does the particular resilience of a household relate to the resilience of the wider community?

How do engineering strategies (including flood defences and flood-resistant building design) impact on household, business or community forms of resilience? Do defences reassure to the extent that other forms of resilience are not pursued?

The community

Do flood events lead to any fundamental change in the social fabric of the community or are 'strategies' simply 'layered on top' with the aim of helping those who are most vulnerable to the effects of floods?

What different forms of 'community' were apparent during the recovery process, who was included in these and how have they contributed to building future resilience?

How much have different communities or groups collaborated, cooperated or competed?

Does 'bonding' (in social capital terms) occur in the aftermath of a flood, and what does it enable the community to accomplish that it could not before?

6.3 The Carlisle pilot study

6.3.1 Introduction

In order to explore the substantial set of questions emerging from the resilience review, a small scale pilot study in Carlisle was undertaken. Carlisle provided the example of a flood with substantial impacts for households, businesses and the wider community that happened sufficiently long ago to enable the process of recovery and potential resilience building to be examined. Given that there were only sufficient resources to undertake research in the one case study area this work had the two objectives of:

1) developing some preliminary insights into how the extended process of recovery is experienced by householders and businesses and the extent to which this includes the building of resilience to better cope with future flood events;

2) testing out a methodology for examining the experience of recovery and resilience through a combination of focus groups with flooded householders and businesses and interviews with key personnel in local organisations.

The limited scale of the research work means that the results and insights discussed later do need to be treated as preliminary, with the aim of developing a larger future programme of work across a number of different flooded communities. Given the varied nature of floods, flood impacts and community profiles, generalising from only one set of experiences has to be treated with caution. However undertaking the pilot research has enabled methodological issues to be explored and clearly demonstrated the type of results and insights that can be revealed.

6.3.2 The January 2005 Flood

At 15.30 on 6 January 2005, the Met Office issued a warning to the North West Region of the Environment Agency in respect of heavy rain over Cumbria and other areas. This was the first indication of one of the most significant floods to occur in England and

Wales in the last few decades. The warning also included strong to gale force winds, which proved to be a significant feature of the event.

The rainfall started over the mountains in Cumbria in the late evening and continued until around midday on 8 January. During this period, some precipitation gauges recorded over 200mm of rain, the heaviest of which extended in a band from the mountains of Great Gable and Scafell, across Helvellyn and the eastern Lake District, and across the Howgills into the Yorkshire Dales. The rain was caused by a strong airflow of unusually warm, moist tropical air, which was forced northwards ahead of an Atlantic cold front. Towards the end of the event, the rain was enhanced by strong frontal uplift and convection as a depression passed to the north.

Flood Watches for all the whole of Cumbria were issued on 7 January in response to the Met Office's warning. In response to the developing situation, the Environment Agency opened the flood incident room in their Penrith office at 7.00 am on 7 January and issued the first Flood Warnings around midday (Environment Agency 2006). In total, 1,865 properties were flooded in Carlisle in January 2005 leading to 3,000 people remaining homeless for up to 12 months following the floods (Carlisle City Council and Cumbria County Council 2006). The floods are said to have caused £250 million worth of damage (Carlisle City Council and Cumbria County Council 2005).

Various parts of the city were flooded due to overflowing rivers as well as surface and ground water surcharges. The specific affected areas were Warwick Road area in the eastern part of the city, Denton Holme, Shaddongate and Caldewgate in the centre/ west of the city, Willow Holme industrial estate to the north of the city, parts of the City centre, Low Crosby, Warwick Bridge area to the east and out of the centre, and Etterby Terrace in the north of the city.

Warwick Road area was the worst affected, with 1,147 residential and commercial properties flooded, reaching a depth of almost two metres in some homes (Environment Agency 2006). Two elderly people drowned in their homes in this area. In Denton Holme, 317 commercial and residential properties were flooded, partially due to foul and surface water being gravity locked by the River Eden and causing surcharging of the sewers. Willowholme industrial estate suffered flooding from the Eden and the Caldew as well as from surcharging of sewers and highways drains (Environment Agency 2006). At this location, a total of 221 properties were flooded including the bus depot, a permanent travellers' site, student accommodation, many businesses and the United Utilities' power substation and sewage treatment works. By the 8 January, the electricity substation was submerged under 1.5 m of water, which led to a power cut in 60,000 properties across the city. Lack of electricity also meant that mobile and landline phones became inoperable (Environment Agency 2006). In the city centre, 66 properties (including the civic centre, police and fire stations) were flooded up to two metres by a surcharge of the sewers and overtopping of embankments (Environment Agency 2006). In Rickerby and Etterby Terrace (situated on the right bank of the Eden), 31 properties were flooded. In Low Crosby and Warwick Bridge area to the east and north east of the city, 83 properties, some located on farmland, were flooded due to surface water and breaches of the embankments (Environment Agency 2006).

The City Council and Cumbria Council received financial support from central government for the recovery phase; for example, the Office of Deputy Prime Minister provided the City Council with £1.5 million (Prescott 2005). Soon after the floods, in August 2005, a regeneration project titled *Carlisle Renaissance* was launched in order to develop a new vision for the city. Almost four months after the floods, Communities Reunited (CR) was set up as a support mechanism (and a 'one-stop shop') for the victims of flooding. CR was funded for 18 months.

6.3.3 Research methods

Initially, several Environment Agency and local authority reports were reviewed in order to develop a basic understanding of the flood events of January 2005. Following this, a Flood Incident Manager at the Environment Agency Penrith Office was interviewed on the local communities, how they were affected by the floods and how the Environment Agency responded during and after the flood. The interview explored how the Penrith Office has changed its way of working in response to flooding since 2005.

Following this, a mixed-methods approach for the research project was used, combining face-to-face interviews with representatives for key organizations involved in the flood response and focus groups involving residents from some of the affected areas in Carlisle. The rationale for using interviews was that it provided a cost-effective means for in-depth examination of the individual organizational responses and gaining insight into how they might have worked together. Focus groups were used to assess the experiences of the residents, as we were particularly interested in the role of the community in responding during and after the flood. The researchers believed that focus groups would provide useful forums for people to share their views and experiences and that the resulting discussion would provide valuable insights into what happened.

6.3.4 Focus groups

Focus groups were recruited via the three established Flood Action Groups (FAGs) that the Environment Agency was in contact with in Carlisle. We organised three two-hour sessions over two days, with each session dedicated to one of the groups. We invited four members of each group to attend, and asked each participant to bring along another member of their neighbourhood who was flooded but was not active in any group. Two of the three groups were recruited using the telephone. The third group was recruited at a Multi-agency Response Plan meeting in Penrith in which residents active on flooding issues participated. Not all those who agreed to come turned up on the day. Nevertheless, the success rate was quite highly, varying between 50-80 per cent among the three groups. Those who did attend received a fee of £20.

The topic guides for the focus group discussions were drawn together by Sue Tapsell, a flood researcher based at the Flood Hazard Research Centre, Middlesex University (see Appendix 3). Two of the groups were facilitated by Sue Tapsell, with support from Lancaster-based researchers, while the third was facilitated by Nigel Watson from Lancaster University. All focus group conversations were recorded with permission of the participants and were professionally transcribed. The transcripts were analysed by identifying the key themes of discussion as they occurred, whether they were in response to a direct question from us or not. The analysis is presented separately for residents and the business group.

The Milbourne Street focus group was made up of five residents (three women, two men), three of whom were active members of the Milbourne Street community association. Their ages ranged from 39-65. All but one were tenants of Impact Housing Association. The other was a home owner. The length of time participants had lived in the area ranged from four to 25 years.

The Carlisle Flood Action Group focus group was made up of five residents (three men and two women) and had the participation of Paul Hendy who chaired the Carlisle Flood Action Group. All but one of the participants were active members of a flood group. Two participants (one woman, one man) lived in the outlying area of Low Crosby and had lived there for five years. Three participants lived in the Warwick Road area and had lived there between nine and 52 years. One participant no longer lived in the area. All were home owners.

The Willowholme Business Group was made up of three people, each from different businesses on the estate. One of the participants had moved out of the Willowholme estate due to the floods. One participant owned a construction engineering company, the other operated a transport business.

6.3.5 Interviews

Excluding the initial meeting with the Environment Agency Flood Incident Manager based in Penrith, four interviews were conducted by Clare Twigger-Ross with the following people at the beginning of November 2007:

- Head of Scrutiny and Emergency Planning Services, City Council of Carlisle
- Community Development Officer, City Council of Carlisle
- Chief Executive of Renaissance (a regeneration and economic partnership)
- The Vicar for Denton Holme, who was a key figure in Communities Reunited

Each interview was digitally recorded and professionally transcribed. Analysis of the interview transcripts was done in conjunction with the focus group analysis using the same grounded approach. Emerging themes from the interviews were related to institutional and social response to the flood and to the different facets of resilience.

6.4 Research findings

In presenting the results of the focus groups and interviews, we move from an initial discussion of the experience of the 2005 flood, what alerted people to the impending flood and the actions they took, through the impacts of the flood and people's experience of support and recovery to finally evidence of adaptation and resilience building.

6.4.1 Flood warnings and awareness of risk

Many participants were not registered with Floodline Warnings Direct since either they were not aware of its existence or, even if they had heard about it, they did not perceive themselves as being at risk of flooding. Those who were registered reported that they had received the warning call hours after they had been flooded. Some were alerted by neighbours or the police being present in the vicinity but they ignored the warning because in their assessment the water wasn't going to enter their property.

For example, one focus group participant from the Warwick Road area stated:

'We just heard voices on the front. This was just after three o'clock in the morning and we came down and the police were there and the fire engines were there and everything. And the policeman said, "Oh it will be gone by morning". So we went to bed !'

Several participants said that they would have ignored the warning even if they had been registered and had received an automated call informing them they were at risk of flooding. Being flooded was not on their risk register, it was an unthinkable possibility.

There was also some evidence to suggest that warnings issued via telephone (either automated or in-person) were not always taken seriously and significant and avoidable damage to property occurred as a consequence.

Another focus group participant from Warwick Road observed that:

'Nobody knew what it was going to be like. One thing that should have happened as well as the Environment Agency phone calls was that, if you like, police with loud hailers should have gone round "You are going to be flooded, you are going to be flooded, take this seriously". It should have happened because it was crazy, the number of vehicles that were written off and everybody would have had time to drive them two streets away and save them'.

In response to a question about how people first learnt that a flood was going to occur, a participant from Milbourne Street stated:

"…when there was water, I didn't know until the water was there. I was fast asleep. Apparently somebody had knocked at the door but I didn't hear it."

Furthermore, many people commented on the speed with which the water came into their streets and into their homes, and how this prevented them from taking any action to protect their property or their belongings in any event.

Despite the very small size of the business focus group, some useful insights into flood awareness and warnings were gained. The business owners felt that they ought to have been informed that their business units were built on a flood plain when they took out a lease for their properties from the council. The one participant who was registered with Floodline Warnings Direct said that he had received a call, but had ignored it because there had been warnings before when flooding did not actually occur.

Another participant in the Warwick Road focus group who had been closely involved in the Communities Re-United initiative commented on the need to educate and warn people about the speed at which flooding can occur:

"This is one thing that really needs to come out in flood warning packs and it doesn't come out clearly enough. They say prepare yourself for flooding but what they don't say is, this could happen in seconds".

The Head of Scrutiny and Emergency Planning Services, City Council of Carlisle also highlighted flood warnings as something that did not go very well during the event partly due to the unique characteristics of the event:

"clearly warning didn't work and there was a lot said about that. I have sympathy for the Environment Agency because it's becoming increasingly clear that previous patterns of flooding no longer held true you know. You used to be able to say when the water reaches a certain level upstream at a certain time it will reach you know, a certain level downstream in so many hours. And that doesn't seem to hold good anymore because of changing in the weather patterns. But clearly warning people didn't work and people were angry about that"

A key finding here is that people in Carlisle made their own personal assessments of the risk and many of those who were aware were still unprepared for the speed at which the flooding occurred. Furthermore, people undertook their own evaluations of the flood warning messages, in some cases choosing to ignore them and in others not reacting quickly enough. Despite the small scale of the pilot study, the findings do support the claim that people do not react automatically in a pre-determined way to warning messages, which is widely reported in the research literature on responses to flooding and other forms of hazard.

6.4.2 Action taken before and during the flood event

Focus group participants from the Warwick Road and Low Crosby areas believed that even if they had received a warning, there would have been little they could do to prevent the flooding of their homes. Participants felt that potential damage-reducing devices, such as household flood barriers and air-brick covers would have been of little or no benefit since the flood water rose up through the floor in many cases, rather than entering the home as surface water. Those who had concrete floors were shocked to see the water breaking through and damaging the concrete.

None of the participants had any household plans in place before the floods in January 2005. Some people did try to move electrical items and white goods onto worktops, some moved sofas onto beds, while others managed to save their official documents by moving them upstairs. Most reported having lost their cars and there was recognition within the groups that this could have been avoided if the speed as well as the height of the flood waters had been anticipated sooner. Positively, most people reported attempting to help their neighbours.

Some of the participants were particularly limited in what they could do prior to the flood due to the type of accommodation they were living in. For example, one person from Milbourne Street stated:

"I'm in a flat, a ground-floor flat, there was nowhere to take anything…."

and…

"I did try to move my sofas when my brother arrived, but it was already wet…I put it on the bed but my bed was wet. I didn't, other than the television, I didn't save anything."

Similarly, participants in the business focus group felt they were completely unprepared for a flood, particularly an event of such speed and force. Indeed, they argued that the speed at which the flood water had entered the estate had prevented effective action being taken to avoid damage. Those who were on-site at the time of the floods had to be rescued from roofs of vehicles by the fire brigade the next morning. The security guard working on the estate had water up to his neck all night before he was rescued the next morning. Not surprisingly, those who were not aware of the flood risk had no plans or had taken any preventative actions. One business owner reported having changed his flooring since he had encountered minor localized flooding prior to the January 2005 floods, but had had no other contingency plans in place.

Although tentative and based on a small number of participants, these findings suggest that many people have a particular idea of what a flood event involves, which in reality may be quite inaccurate. There appears to be a general expectation that flooding is a relatively slow-onset hazard and that the primary signal and threat arises from surface water flows. In the case of Carlisle, the flood had neither of these two characteristics and consequently very little effective action was taken by residents and business people immediately prior to the event.

6.4.3 Impacts of the floods

The physical and psychological health impacts of the floods were major and significant for the lives of people affected. Participants reported having nervous breakdowns, having to look after spouses who had breakdowns, becoming homeless and sleeping on people's floors, having anxiety and sleeplessness, and developing stress-related conditions such as rheumatoid arthritis.

For example, one participant from Milbourne Street commented:

"I needed to get away for a while to a B & B, the insurance company were fine about it. Into a week in that B & B I had a total and utter complete breakdown. I couldn't make any decisions, I couldn't eat, I couldn't drink. I'd only been in Cumbria for two and a half years so I knew people but not that well, and I didn't know where things were in Cumbria. I'm still finding out. That was a rough time...I couldn't get rented accommodation for love nor money because I was a single bloke. Priorities were being given to families."

Losing treasured personal belongings (such as irreplaceable family photographs) had a significant impact on the distress experienced by participants. For one participant who had lost virtually everything she owned and did not have any insurance, the impact of this had been severe. She stated:

"I lost all my pictures of my mother and things and you know, she's dead now and I can't get them back. I've got one little photograph of her and it's just things like that you can't replace them. There's no amount of money, no amount of insurance that can replace anything like that…I had letters from my nanna from when I had my son you know, she died before I got him out of hospital and you just can't get that back. You know, you've got to get over it and you do but as I say people just have now idea of what you have lost and it's almost like being raped".

Another participant remarked:

"I had two pieces of furniture that I wish I'd kept now, sentimental value that belonged to my nanna and the insurance man just said 'throw everything out, just get rid of it', and we did".

As well as dealing with the loss of their personal belongings and having to organize the repair work, householders spoke about facing immense stress from the fear of being broken into. Some were broken into while they had work men in.

A Warwick Road resident explained:

"Somebody broke into mine, the men who were putting the new kitchen were in the back and they came and gone upstairs, I mean, the first thing I did after the flood, I got locks put on the bedroom doors. And he'd gone upstairs and he couldn't get in so he put his foot through the doors and the workmen were downstairs working".

In the focus groups and also in the interviews, many people spoke of the problems arising from dislocation:

"…*Just being out of their place. What happens is, you know, they live here, they are in temporary accommodation there, little Johnny goes to school over there, they work over here…the car's been drowned in the flood and because they are stressed they can't solve problems." (City Council interviewee)*

The stress of recovering after the floods and facing the financial loss proved too much for some residents. Participants spoke of one man who had tragically killed himself after his van and all his tools were stolen in the days following the floods. Furthermore, the sense of fear that it might all happen again has stayed with many participants, nearly three years on.

Examples of some of the comments made by focus group participants include:

"I've many a time gone for a walk at two o'clock in the morning down to the river to see how it's coming up, even though we've got flood barriers."

"Every time it rains. It's that sense of permanent fear and the trouble is that part of your brain says it's only a shower but the rest of your body just says, could this happen again. And I think you live in this permanent fear… I think it will take a lifetime."

"Well when the rain comes, I'm right down at the river, that's what I do."

"It's always there. I don't care what anybody says, you can turn the key and put it away but it's still there at the back of your mind you know, when you get torrential rain, I'm looking out the window, it's the drains I'm looking at, it's the drains."

Some participants, however, said that they were no longer worried about the threat of flooding as it was not possible for them to live in a continued state of anxiety:

"Speaking for myself now, I don't seem to take much notice of it because you can't live your life always in the expectation of something happening you know. I think you do get a bit blasé about it now."

The impact of the floods on children was presented by various participants in different lights. On the one hand, some people believed that some children were scarred by the floods and would still cry during heavy rainfall. Others reported that their children found the whole experience exciting and had fully recovered.

Valuable insights regarding the impacts of the floods also emerged from the business focus group. All the businesses suffered damage to their units and their machinery or stock due to the extreme height of the flood water (up to 14 feet high in places) and it not draining away from the site for over 36 hours. Similar to the householders, the business participants reported being afraid of theft and criminal damage in the immediate aftermath of the floods, especially since the whole of the city was in darkness. In the absence of police presence, the businesses had been forced to organise private security for the estate. One participant had no insurance cover at all for his business (although the vans were insured) and he reported this as an advantage in the recovery process, because they were able to clean the unit themselves and the business was up-and-running within four days. He felt that this recovery time would have been considerably lengthened had insurance companies been involved, and he may have gone out of business and lost his home if he'd waited any longer as he would have lost large contracts because of the delay.

One of the participants had lost £250,000 of stock in the floods and was unable to claim for the whole amount as he was under-insured. He was forced to sell his businesses and reported that another four businesses on the estate had been made bankrupt and had been forced to close down. The other two participants had been able to resume their businesses within four days. One participant mentioned losing £80,000 worth of unclaimed invoices as his computer and paper records had been destroyed in the floods and he had no way of following up unpaid bills.

The physical and mental health impacts of the floods were as profound on the business owners as for the residents whose homes had been flooded. Examples of comments made by business owners included:

"A lot of them were devastated…I know couples have split up, I know people that have hit the drink, I know people who are on Prozac tablets, Valium tablets, you know, strange thing, stress that's what it is."

"I won't tell you no lie, at some points my nerves have been shattered like you know. I couldn't go through it again, I wouldn't start up again, I couldn't, no."

"I found it very challenging…It was like going to war or something like that. But that was what you thought and you just got on with it and sort it, do it and get the business. But to do it twice, no I don't think I would cope the same."

Participants also reported a lasting effect on their wellbeing, and a sense of dread that the floods could happen again. The following exchange between participants illustrates some of these lasting effects:

P1: Frequent sleepless nights, I'd find myself going to work at half past two in the morning to clear the office or something like that.

P2: Stupid things like that wasn't it? I was the same.

P1: You knock off at twelve o'clock and two hours later you are going back to work, why you doing that?

P3: My wife would ring and say, "Where you at?" and I would say, "I'm at the unit". She'd say "What you doing" and I'd say, "Walking around the estate". We were walking around the estate weren't we, it was like half three in the morning.

P1: Yes, I did that for quite a while.

One participant mentioned that this sense of dread had also affected some of his employees as they felt they no longer had job security. The participants believed that the sell-on rates for their businesses were now substantially lower because Willow Holme was now perceived as a flood-prone estate.

The impacts of the flood event were also felt by the organisations responsible for response and recovery. For instance, the city council headquarters were badly affected and so were some of the services that the council provided. They had serious business continuity issues.

In terms of longer term impacts on the affected areas such as people and business moving away and house prices, council officials' view was that house prices on the roads affected are similar to those in other parts of the city. In addition, their view was that not many people had moved away with the possible exception of the businesses in Willowholme. This was taken as a sign that the affected areas had mostly recovered from the flood:

"Well I set myself a milestone if you like, a yardstick, by which I was going to judge whether recovery was complete as it were…if I saw, properties on Warwick Road for sale, in the market, readily reselling at prices similar to that before the flood. And we saw that some time ago so that was my yardstick." (City Council interviewee)

The interviewee acknowledged that it was difficult to know how far people had recovered personally, because after the initial event it was hard to maintain contact:

"I would have liked to have thought that we could in some way sustained a relationship with affected people, but equally vulnerable ones, those least able to see themselves through it, to achieve some sort of sign-off in relationship to their personal recovery. But how you resource that, I just have no idea. I'm very keen that, and this is what part of the huge amount of advice and work I've done down in Doncaster, is to try and convert that initial data capture and that database into a case management database. So once you capture the people's information the trick is to transition that, as well as using that as a tool overall to identify needs and determine how best to respond to those needs, but then turn it into a case file. So you can then manage people as you turn those victims if you like into cases to be supported through back to normality."

The Community Support officer expressed the fact that whilst people are getting on with life as normal, this flood is still an area of sensitivity and people are still affected by it, echoing some of the participants from the focus groups:

"I think you could say the communities have got back a certain degree of normality. But undoubtedly, I think, it will remain in people's minds for a while, all those people who were particularly affected. That's a matter of judgement I suppose as to how psychologically scarred you are but I think you can talk to people and they still talk

about it and some people are still quite raw about it. In each of the areas that was greatly affected there are still a significant number of properties that are not back. So that's a reminder to people of how that happened. But I think communities have, it is a case that life goes on, people do recover very quickly and certainly in terms of community activity and community life".

The vicar of Denton considered that the community had recovered in the sense that the majority of people were now looking at the future with more optimism and felt that a great majority of residents would be able to cope with a future event having coped with one.

The findings illustrate very clearly the severity and also the diversity in the physical and emotional impacts of the floods in Carlisle. For many people, coping with the loss of personal items coupled with stress of making arrangements for repair work was extremely stressful. Many people were not prepared for the length of time that would pass before they were able to return to their homes and in many cases repair work took many months to complete because demand for skilled workers far exceeded the available local supply. Furthermore, the flood appears to have had a lasting psychological impact on many people and, almost three years after the flood, several reported that they still become more anxious and stressed when it rains.

6.4.4 Support during the floods

Focus group participants from Milbourne Street expressed gratitude to their local church, which was not flooded. Volunteers from the church and the Red Cross delivered food and hot drinks to all the affected houses during the floods and for many days after. In the days immediately following the floods, the church acted as a distribution point for kettles and microwaves, and continued to provide free hot meals for many months. Participants felt that this was the most useful help they had received and referred to the volunteers as 'a lifeline'. One person stated:

"*The beauty was though the church here, with it being higher up. They were a good lifeline because they were coming down the street, knocking on the doors. They had soup, coffee, tea, sandwiches, pies you know, and they were non-stop."*

Other agencies mentioned for their support were the police (in the Warwick Road area), the fire brigade and the coastguards (in both areas). Impact Housing Association residents were offered alternative accommodation if they chose to leave their homes. However, many participants chose to stay at home while repair work was carried out. Another person stated:

"Impact Housing put us in a hotel, which I just stayed the one night because I had a panic attack. As stupid as it sounds, I had to be back in the mess…"

Many participants were offered support from their family and friends to move their belongings to a place of safety or have an alternative place to live until their homes were in a suitable condition. However, those who were new to the area lacked these social support networks and were more vulnerable.

All participants commended Radio Cumbria for its efforts to keep them informed during the floods, which was especially important since there was no electricity, landline or mobile telephones for many days. A participant from Milbourne Street commented:

'I think Radio Cumbria was a lifeline really, for getting information. They were brilliant, because the lad stopped on air didn't he, for what, was it twenty-four hours solid...a local fellow."

The City Council acknowledged that they were slower in responding than the voluntary sector and were not able to provide support in the immediate aftermath:

"Well we entered it, I suppose, a few days after the sort of initial emergency had happened." (City Council interviewee)

The findings indicate that the voluntary sector, along with friends and family, were particularly important in helping people cope during and immediately after the flood event. The participants valued up-to-date information during this time. However, those who were new to the area or did not have friends or family in the region had more difficult and stressful experiences.

6.4.5 Support after the floods

A significant finding from the focus groups was residents' perceived lack of support in the aftermath of the flood from the local authority. In particular, concerns were expressed by some people living on Milbourne Street that they had been overlooked or forgotten by the local authority because media attention was focused on other parts of the city. One person commented:

"Well I feel as though they've forgot about us lot down here. Even when the floods happened it was all about Warwick Road and it was like, 'hello', it happened to us as well. And everything, the news, pictures, it was all Warwick Road, Warwick Road."

Another stated:

"What they forgot here was McVities biscuit factory, flooded out, the industrial estate at Willowholme, gutted, and that's where the sewage works was, the electrical depot, the bus depot, god knows how many firms down there were destroyed."

However, most participants mentioned the importance of community-level support and contact with neighbours. The shared experience of being flooded brought neighbours together and allowed people to reflect on, and come to terms with, what had happened. To illustrate, a resident from Milbourne Street commented:

"You get talking to people because you've more in common. You can just sort of help each other out you know, if you can help each other out you do, and just know that everybody is in the same boat basically."

However, some residents in the Warwick Road area felt that the community spirit had died down partly because many preferred to forget about the floods and move on, and partly because so many people had sold their houses and moved on. Many participants mentioned the help they received from Communities Reunited (CR). Interestingly, while several participants were critical of the local authority and other public organisations, the majority were not aware that CR had been set up and funded by Carlisle City Council, Cumbria County Council along with Carlisle Churches Flood Response Team.

While the response of the local authority was criticised by some people, a representative for the City Council argued that the council had organised help for some of the most vulnerable people in the community:

"A lot of people were able to start cleaning out their property. But the elderly and the vulnerable weren't able to do that and they weren't even able to go back. So we had to find a way of getting someone to liaise with them and on their behalf, go into their homes and try to salvage what could be salvaged and chuck out what was left. And then we would pressure wash and so on. So the Red Cross would go to the elderly or the vulnerable people in their temporary accommodation and talk them through where

their possessions were, how they were affected and identify items of sentimental value and financial value and try to rescue those on their behalf."

The CR project coordinator and volunteers provided advice, support and guidance to residents for 18 months, produced monthly newsletters which were delivered to 3500 houses, carried out a health impact assessment of the floods, and offered advice days on insurance and other practical matters. CR also provided free counselling and complimentary therapy sessions to residents as well as practical advice. CR provided a sort of 'one-stop-shop' for those affected by the flood:

"One-stop, yes, which was really really good, absolutely brilliant." *(City Council interviewee)*

The Reverend also explained the need for the one-stop shop, as people were being inundated with leaflets from all the different organisations offering help. CR acted as advocates for people during the recovery phase and offered advice that otherwise would have come from organisations 'competing' for business. Comments made by focus group participants included:

"For problems with the insurance company, or with any group, if you went to Paul's place you would get advice."

"If it hadn't been for that meeting place at the Town Hall, we would have been up a gum tree."

One interviewee explained that the voluntary sector was able to mobilise much more quickly than the local authority social services department:

"The social services' professional indemnity insurance did not cover them to go into houses. We managed very quickly through Ecclesiastical insurance to get cover for all the volunteers – they were brilliant and wrote a policy straight away, overnight."

Residents of Impact Housing Association living in the Milbourne Street area had the support of Impact's staff and did not face the same difficulties as home owners as far as insurance claims and repair work was concerned, since the Housing Association had responsibility for this. Some participants felt that the formation of their local flood action group had been an essential support mechanism for residents:

"O*ne person against these big organisations gets nowhere. You need a group of people to lobby…you can't do it on your own."*

In addition, a support centre offering free counselling services and therapies was established in a large supermarket near the centre of the city:

"*They were offering massage and other things and as I say, they were all trained counsellors so people found a lot of relief in that. We did have issues with the Health Authority…they were insisting there was no real need for it because people hadn't been presenting themselves to their doctors and they would only refer them to a psychologist or psychiatrist if they were going to the doctor."*

Milbourne Street area residents had formed a successful community association with the support of the Tenant Participation Worker at Impact Housing. Tenants had originally attended Impact meetings to keep them informed of repairs on their properties. Once the repairs had been completed, they continued to meet and slowly developed a community group which now has participation from home owners as well

as Impact tenants. As well as providing a social space, the group has organised three street parties and been active in lobbying the council and utilities companies for improved drains maintenance, amongst other things.

Coming together around the flood issue has meant that local groups have had the opportunity to discuss and plan for other emergencies. For example, the Low Crosby group has drawn together an Emergency Committee for their area which would then put the agreed Emergency Plan into action. There is now an inventory of vulnerable or elderly people in the area who would need priority support in case of an emergency, a skills inventory of local residents, provisions such as sleeping bags and cookers have been stored in the Parish Hall, and unofficial community flood wardens have been nominated to alert the rest of the residents in case of a flood warning. The Milbourne Street group and the Warwick Road Flood Action Group were also in the process of writing up their community emergency plans.

Participants in the business focus group were equally critical of the level of support offered by the local authority. Participants reported a distinct lack of support from the council in the few days directly following the floods. They felt that the council, as landowners, ought to have been present on site to help with recovery. To illustrate:

Researcher: And on the Sunday then, when you were able to get in, was there anyone that came to help you in any way?

P1: We never saw anybody.

P2: We never saw anybody down there and still haven't seen anybody. Any cleaning up or any sorting out, we've had to do it ourselves.

P1: Now what we saw was a fleet of insurance assessors.

P2: Loss adjusters.

P1: Locusts. Luminous jackets, big waders and suits on, one after the other, after the other. ..We were a bit annoyed at the time but in hindsight they [the council] had trouble as well.

The agency representatives on site during and immediately after the floods were the police, who had set up a road block, an Environment Agency truck and firefighters who were attempting to pump out the roads. Participants reported receiving no financial compensation from any agency they had asked for help from (such as local authorities, NWDA, Environment Agency) and felt a great injustice had been done when McVities received over one million pounds in compensation. In their estimation, businesses on Willowholme employed 100 more people than McVities factory and so they felt they should have received their share of the same amount. They also felt betrayed that Carlisle City Council had not fought for small businesses to receive compensation.

"That was their job to support local businesses. What they don't do is they don't support small local businesses. They support the McVities that could take their businesses and take it to Poland. But we live here and they know we are going to live here, they know we are not going to go to Poland."

However, the head of emergency at the council justified the help to the McVities factory because if they had decided to move the factory: "*That would have been thirteen hundred jobs."*

As well as feeling a sense of injustice at the lack of compensation compared with larger companies such as McVities, participants expressed frustration with 'the system' as a whole. For example, within three weeks of the floods, one business owner received a letter from the VAT office warning him that he had missed a payment. Occurrences such as this at such a difficult time added to the overall feeling of not being supported.

Overall, participants representing residents and businesses were very critical of the support offered by the local authority, although in reality the city and county councils had played an important part in the development of the Communities Re-United initiative.

"what we did there…was put this Communities Reunited project in place, which we were trying for the best part of a couple of years, of ongoing support to deal with all those issues for people to help them" (City Council interviewee)

It is very clear that the voluntary sector played a vital role in recovery efforts particularly in the immediate aftermath and arguably filled a significant gap in service provision that could not be covered by the public authorities, which had relatively little experience of dealing with this sort of emergency situation. The voluntary sector was very quickly organized and managed to mobilise a large number of volunteers and resources such as meals, caravans and cabins in a very short period of time. The City and County Council took longer to act in the emergency:

"Well we entered it, I suppose, a few days after the sort of initial emergency had happened. The group that had been set up these sort of emergency stations for housing people at schools and local other community venues, it was two or three days after that, that we, the County Council started to set up respite centres in the community centres as appropriate." (City Council interviewee).

The fact that voluntary organisations and particularly the church had that response capacity took council officials by surprise:

"We were aware of all these kind of organisations but never really aware of what they could do really. And I think that was particularly true of the church, I mean, in a very short space of time the church had mobilised three or four hundred volunteers, the churches together organisation, which was kind of extraordinary really. Not only did they do that but they had this kind of management structure as well, which was kind of planning, which made a lot of what the other agencies had to do at the time a lot easier because we sort of tagged onto them for a few days until we all got it together you know. We started adding that little to what each other were giving. But they were very quick to mobilise and very efficient in mobilising and I don't think anybody could realise they could do that really."

There is also evidence of members of the affected communities coming together to help each other. This was supported by the interviews with City Council officials. The establishment of local flood action groups in Carlisle was widely perceived to be a positive and necessary development. Nevertheless, some residents and business people felt a strong sense of injustice because they believed other areas and interests had received more assistance in the months following the flood.

6.4.6 Barriers to recovery

Focus group participants experienced huge discrepancies in insurance company responses to claims for buildings and contents cover. While some reported a more than satisfactory outcome with their insurance companies, others faced immense difficulties in achieving what they perceived to be a satisfactory outcome and talked at length about the stress this caused. Many reported problems with the assessments of loss adjusters as to the damage and consequent compensation that was offered (the lowest we heard of was £450 for buildings and contents). One participant had realised after the flood that his insurance policy excluded cover for flood events.

Following the floods, the amount some householders were required to pay for the excess on flooding rose to varying degrees (the highest we heard was £50,000). We were told that some insurance companies stopped insuring for flood events altogether,

and others increased premiums on properties that had not been flooded but were in the same post code area as those which had.

Another set of problems that home owners faced related to builders who were contracted to carry out repairs to their properties. Although some participants reported a positive experience with their builders, for others getting their homes back to normal was deeply distressing and stressful due to a lack of control over the process. Some insurance companies appointed builders from other parts of the country and therefore not directly accountable to the householder, or who did not finish the work on schedule or even turn up frequently to carry out the work at all.

Examples of some of the statements made by participants include:

"Our [water] came in at, it must have been waist high, but nobody came, the insurance man came and then I'd never see anybody for months. I was out fourteen months, I lost five of my family in that year, I had two break-ins; they just wouldn't come to do the work. My husband came down nearly every day to see if there was anybody in and it killed him in the finish."

"Mine were from away, they were from the Stockport area and we ended up sacking them after four and a half months of being on the premises, and it still not being complete."

Another focus group participant commented:

"The local infrastructure of Carlisle was that there was so few builders to cope with the demand that they had to be brought in from outside, there was no other alternative. We learnt from what happened here in Carlisle and went to Hull and spoke to the Federation of Small Businesses and what we've actually done is we've set up an approved list of small businesses and the trades have all got together. So all the electricians, all the plumbers, all the bricklayers, all the carpenters have all got together and formed their own nucleus and pool so they now tender for jobs. And I would say whereas probably, let's say 10 per cent of jobs here in Carlisle were local, in Hull 90 per cent is local and it's made such a difference, a total difference".

Dealing with builders and insurers was also considered a barrier to recovery by the head of emergency response of the city council. He blamed some of the problems on the lack of powers of the local authority to regulate builders and insurance companies. He gave an example of builders tipping cement down the drains that caused a block and consequent surface flooding which affected twenty properties which were flooded a second time. In relation to insurance companies he also commented:

"I really wish we had more control over insurers as well. You know, the fact they all have different practices and policies and approaches is a nightmare for the individuals affected and it's also a nightmare in terms of some of your response. And the way exemplify that onus is that some would let people throw their stuff away and just accept a claim form for it. Some insist that there's photographic evidence. Some insist that the assessor has seen it before it can go and so for any pile of rubbish out on the curb, on the pavement or on somebody's front garden, which you need to collect because it becomes a health hazard if you don't for one thing. You don't know whether you can actually take it away or not."

Living in a ground floor flat meant that one participant lost *everything* she had ever owned. This was a devastating life experience which she is still coming to terms with. One participant mentioned how many people in his area seemed to be in a state of shock and unable to look after themselves or their children in the immediate aftermath of the floods. He suggested that in this situation, it would have been helpful to have some one from the outside coming to check on people's wellbeing. It was unanimously agreed that the most amount of investment had gone into the Warwick Road area with

more street cleaning, improved street lighting and alley-gating in some parts. Residents in the Milbourne Street area, however, reported a worsening of such services on their street. They felt they and other parts of Carlisle that were flooded (mentioning Willowholme Industrial Estate in particular) had been neglected by the council.

Some local people had been trying to improve their area since the floods but felt that 'the system' was not responsive or supportive to community-led initiatives. A participant from Milbourne Street suggested:

"It would be nice to have a, I don't know what you could do, but sort of have a cross group where at the bottom the community feed in what they want and this little group find who is responsible for what so that they can get things going because we've been trying to develop the street now for five years, to raise the bedding plants and put extra sculptures, we want to put extra play things for the kids, things like that. But to do anything we have to write to the County Council, the City Council, the Highways, the Planning and it's all these different groups to get permission and we are no further forward now than we were five years ago."

Furthermore, residents had tried to become vigilant of drains and manhole covers becoming blocked but felt great frustration at the lack of response from any agency. For example:

"I just say that there should be an agency that finds who is responsible instead of the communities having to find out who is responsible. There's so many different categories and so many different groups and so many different responsibilities. It makes it very confusing for the ordinary person in the street just to come and say right I need this doing, who do I talk to, because you just get knocked from pillar to post."

A perceived lack of coordination between various agencies with responsibility for flooding was also identified as a barrier to flood resilience. A resident of Milbourne Street commented:

"I mean why can't these agencies you know, say Defra, United Utilities, Environment Agency, why can't they work a bit more closer together in hand with your Council and your Parish Council? And communicate. That's where it's all wrong. There's no communication."

Similarly, participants in the business focus group reported a strong sense of frustration at the lack of progress:

"Well, we must have been to fifty meetings, we've bashed our heads against the walls."

"We did try and that's why we went to all those meetings every week, some weeks it was two meetings a week, and gained absolutely nothing."

However, when interviewed, a representative for the City Council argued that coordination had improved a great deal in the last two years:

"I think we work much more closely now, in a more coordinated way, to approach groups whether it be to give them information or whether it be to empower them through things like the Neighbourhood Forums."

The Vicar of Denton explained that the lack of flexibility of existing structures such as social services was one of the barriers to response that the voluntary sector and CR were able to bypass and made their response more adaptable and quick. One example is that initially social services personnel did not have insurance to go into people's homes to help in the clear up whereas the volunteers were able to get insured very quickly to do that through Ecclesiastical insurance.

Another example of institutional barrier to recovery was the issue of being able to obtain counselling after the event. The health authorities argued that there was no need for counsellors because not many residents had been to see their doctors. Being referred by their GP was the only route to see a psychologist or a psychiatrist. However, on the ground it was clear that many people needed counselling and despite that were not seeing their doctors. In response, the City Council organised an alternative therapies centre in a room donated by Tesco. The centre was well used in the aftermath of the flood and still exists and has become a self funding community centre.

"I think it did seem that the Health Services weren't flexible enough to kind of accommodate some of the things that people wanted." (City Council interviewee)

One of the business premises has continued to be flooded from surface water and sewage pipes (15 times since the January 2005). Another mentioned that every time there is a flood warning he has to pay many of his staff to be on standby to move the vehicles out of the yard to prevent them being damaged in the event of another flood. Therefore, his business loses money with every official flood warning he receives. A participant also mentioned that his premiums had increased by 30 per cent a year since the floods but was still uncertain whether he had the correct level of cover.

The biggest barrier to recovery expressed by business participants was their status as leaseholders:

"We can't get our future in our hands, that's the biggest problem. If we had our future in our hands we could plan the estate, we could say that we want to do this as a group of businesses. It would cost money but we have sufficient money in our businesses to be able to do that. So if we improve what we want to improve, we can go far with planning, we can have our meetings, we can say that we need this, we need that, we need security, or we need this that or the other. At the moment we are noticing with the council the longer it takes now to move away from the flood the less contact we are getting with the council. A lot of other things now are taking precedence over us.'

Participants reported that if they were to make any changes or improvements to their units, the council would require them to sign a new lease with a large rent increase which they would not be able to afford:

'We are caught in the middle aren't we, we are stuck with these lease arrangements, and they're not ploughing the money into it and they won't sell us the property.'

Residents and business operators encountered a number of barriers which impeded their recovery efforts. Many reported difficulties with making insurance claims and negotiating revised insurance cover after the flood. Repair work often took many months to complete due to shortages in the supply of skilled labour, and such delays added to the distress and frustration felt.

"The trauma of the floods became the trauma of dodgy workmen and all that kind of stuff… once builders started moving in, there were a lot of horrific stories around builders and insurance companies." (City Council interviewee)

Several participants felt that the shock had been significant and had reduced their capacity to recover. Perhaps most important of all, many participants believed that recovery processes had been impeded by a lack of coordination among the public organisations and that existing institutional arrangements had often undermined their own efforts to re-establish their homes and businesses. In addition, businesses renting their premises meant that they had little control over recovery efforts on the estate and that the owners (the City Council) had done little if anything to help.

6.4.7 Adaptation since the floods

In many cases, participants felt there was nothing much they could do to protect their property from future floods because of the style of housing and the type of flooding risk. One participant from Milbourne Street explained:

"We are in properties that you can't protect from flood. We are in terraced houses; the dwarf walls underneath are not sealed completely. So unless you protect the whole terrace you can't protect your own building and even on top of that I think the ground is so porous that even if we did that it would come up through the floor. So basically there is nothing that you can do."

Another problem with adapting homes after the floods was that some insurance companies required houses to be repaired the way they were before the floods, rather than in line with new flood-proofing guidelines. Also, some utilities companies reinstalled meters in the original place, rather than moving them higher up. However, other householders were able to install new sockets and boilers higher up the wall, to put on lime plaster and to change the nature of their flooring to cope with another flood. A few households began to think about contingency plans in the event of another flood (such as which belongings to move upstairs first, moving their car to higher grounds).

The head of emergency at the City Council offered his explanation for the lack of contingency plans among residents. He felt that because the UK has not experienced many natural disasters, there was no culture of self-protection. He compared the situation with the US where individuals are often well prepared:

"They [US residents] have things like family plans you know, and they have grab and go bags always ready and stuff like that you know. So if you know, a flood or a hurricane or whatever comes along, they know that they'll all meet up at such and such a place and they've always got, as I say, the grab and go bag and that has with them medications and stuff to keep them going. And we don't have any of that here and although some of the stuff Government put out, it hasn't been particularly well received in the media. The latest lot, the Protect and Survive one, was quite good." (City Council interviewee)

All Impact Housing tenants were given flood gates and air brick covers to provide some protection in the event of another flood. Home owners in the Milbourne Street area were also offered these at a low cost by the same housing association.

Participants unanimously expressed concern over the lack of drainage maintenance by United Utilities, which they perceived to be a serious factor in future flooding. They attributed United Utilities' inaction to the fact that it's a privatised company with shareholders interested in profit rather than community support. There was an overwhelming feeling that the City Council had not done anything over the last three years to support residents in the event of another flood. Milbourne Street area residents felt that the sense of community cohesiveness had been strengthened since the floods, and that this had helped them in their recovery. One person said:

"I think more people definitely are speaking. You know the neighbours, at one time you'd walk up and down and just nod but now people are actually talking to each other."

Furthermore, because there was now more social contact between neighbours, they felt that this would help them be more resilient as a community, if another flood was to occur. Examples of statements made by participants include:

"I think if it happened again a lot of people on the street, I think they would be there for each other."

"…people would be thinking oh go and give people a hand, even more than what happened the last time."

In contrast with the view of residents about their lack of preparedness, the City Council community support manager felt that residents were much more aware now of what to do in case of an emergency. In his view, this was not only true of those directly affected by the flood but also city-wide and this awareness was transferable to other types of emergency.

"I think it's just people's awareness, I mean the flood was a particular kind of disaster. Had it been an air crash or a major accident of some sort I think a lot of the practices that we learnt then would remain. We'd know how to mobilise people, the community would know where to go and we would know how to respond in the local community much quicker."

However, he also felt that this awareness might wear off after a few years without another emergency happening.

Some participants from the business sector had made some changes since the floods such as moving computers upstairs, developing automatic systems for external computer back-ups, putting tools higher up on the wall, and putting other tools on chains which could be hoisted up.

However, some felt they had been inundated by sales people offering different forms of flood protection:

"Yes, we've had all the people down but the biggest problem we've got is they are all trying to make a few quid off you. Flood barriers, twenty different companies coming down, the prices go from X amount to X amount. Flood alarms, it's very hard; my business is 24-7 so the alarms are going off all the time. I've now got a little float alarm on my door so if the water hits this float alarm it rings my mobile phone and I try and get as many drivers as I can down there."

None of the participants felt that Carlisle City Council, as their landowners, had made any contingency plans for another flood event:

"Well they may have prepared themselves, the city council, they may have prepared themselves, but they have made no preparation where Willowholme is or where it's concerned because they are still tipping all that silage down there, you know, the green waste. Everybody is just getting on with what they were doing day-to-day before the flood so personally nobody has got any further forward in making any preparation for another flood."

"They [the council] are the owner of the ground so they should tell us what they've got in mind, how they would deal with it if it happened again and that could be in a form of three pages, four pages to clarify what they would do but they've made no effort whatsoever to do that."

There was particular concern about the lack of access to the estate during another flood event, as there is only one entrance/exit road. Participants had lobbied the council to build another access road into and out of the estate, but were not aware of any plans based on their request.

While Carlisle is now the focus of a new regeneration and economic growth initiative called *Renaissance*, it appears to have given little attention to the need to manage flood risk more effectively in the future. The 2005 flood did focus political attention on Carlisle and the need to improve local economic prospects. It also brought to light other issues: for example, Carlisle did not have an economic strategy, so in a sense the flood event got things moving for the City. However, an interviewee involved in the Renaissance project commented:

"*I think over time the relationship between the flood event and Renaissance has, I won't say disappeared, but there's a great deal of distance between the two…I suspect that where they will actually come back together is when the Environment Agency is working on the second phase of the flood defence works right through the city centre."*

What he implies is that making Carlisle more resilient as a place to future flood risk has not been integrated into the local economic development process. One potential consequence of this is that some locations may become more susceptible to flood damage as a consequence of inappropriate re-development. The Renaissance project has an economic rather than sustainability focus and is in a sense a missed opportunity to have got a series of organisations around the table to work on increasing resilience. Another consequence of the Renaissance project is that population will increase in Carlisle which in a sense is increasing vulnerability.

The event did however bring to light the capabilities of voluntary groups and other agencies. The interviews with the City Council officials highlighted that the flood mobilised many groups and agencies they knew little about but felt that in the event of another flood, this knowledge and experience would translate into a better and more organised response:

"It kind of mobilised a lot of agencies that we really didn't know much about. So from that point of view, in terms of how we worked with the community across the border ourselves, the county, all these other independent agencies, that now is much more coordinated than it was before. We actually discovered ourselves saying, Oh I didn't know you did this." (City Council interviewee)

"I think that the most positive thing, I think, is that our knowledge now what other agencies do and we continue to do things together now." (City Council interviewee)

The Community Support Officer said that the council was now much more involved with the community and that the flood had taught them new ways of engaging with the community. He also thought that members of the community had become more active since the flood:

"People do now and are now much more aware of what's going on and are much more willing, if they think there is going to be a problem, to raise it before it happens."

Whilst having the opinion that in a future event, members of the community would not be able to respond differently, he thought that the recovery would be quicker next time particularly because the City Council would be better prepared and more aware of the other organisations that could help:

"I think we'd certainly be able to mobilise ourselves more effectively next time because, not that we were ineffective last time, but I think we'd be more planned for it because we are now aware of things like the churches and those other organisations." (City Council interviewee)

The head of emergency response also told us that in terms of building resilience not only in Carlisle but elsewhere, he has since participated in emergency planning training and other events including Environment Agency training. He saw this as a way of sharing the lessons they had learnt locally. He also participated in a national recovery working group which has since produced a national guidance template[23]. The lack of guidance in the recovery phase was highlighted as a key gap:

[23] National Recovery Guidance- Recovery Plan Guidance Template (October, 2007) available: http://www.ukresilience.info/response/recovery_guidance.aspx accessed: 02/04/08

"No guidance on recovery and very little recovery planning. Everyone planned well for acute phase and recognised they needed to establish recovery working groups but there was no structure for those groups, there was relatively little guidance and very little planning out there. Now that's all changed on the back of our experience and that's one of things that I think we've, in terms of building greater resilience across the piece, that we've been instrumental in helping." (City Council interviewee)

A number of insights were gained on how different people have adapted since the flood. There was a strong sense of fatalism among some of the residents who believed there was little they could do because of the age and design of their properties. Several people reported that the new fixtures and fittings to their homes, including lighting and boilers, had been installed in their original positions and were equally susceptible to flood damage. Few had made any sort of contingency plans for evacuation or protecting their belongings in the event of another flood, although some businesses had taken simple steps such as moving tools and machinery, and fitting chain hoists to allow heavier items to be lifted above the flood level. Comments were also made about continued lack of maintenance and cleaning of drains, which many people regarded as a significant factor for preventing future flooding. More positively, several participants felt that there were stronger social ties among people within their community since the flood, and that they would help each other if a similar event were to occur in the future.

In terms of institutional adaptation, representatives of the City Council were more positive about being able to respond better to a future emergency. Having the experience of the flood had highlighted the capabilities of the voluntary organisations. They had also been active in planning for a future emergency. In summary, they felt they had learnt from the event and would be able to have a more organised and rapid response to a future emergency.

6.4.8 Improving resilience for the future

All three of the focus groups provided valuable insights and practical suggestions on what could be done to improve resilience further. One participant expressed the view that the effects of the flood had been exacerbated by the inability of the water to flow back out again, due to the defence wall. Another mentioned that in Low Crosby they were *'just fortunate that somebody has listened'* because two pipes with flaps had been installed in the defence wall to allow flood water to drain back into the river. There was support for the Environment Agency to be given more powers to prevent buildings being constructed on floodplains and to work more closely with local authorities and water companies to enforce the maintenance of drains. A suggestion was also made to set up one authority with full responsibility for drainage. Participants were frustrated about the continuing problem of blocked drains and becks and felt that coordination among the relevant public and private organisations needed to be greatly improved. For example, a participant in the Milbourne Street Road focus group commented:

"What caused one of your big problems was down small beck as I call it, that was blocked and a lot of the water couldn't get away. And it had been like that for months prior to the rain but nobody would take responsibility. And there were trees… there was a lot of debris in the rivers before the floods and nobody would take responsibility for it… The drains are atrocious. If you go now and open the door to the church on this side here and you look at the drain right outside the door it's blocked and it's been like that for two years and nobody seems to do anything about it."

Residents felt that national government had overall responsibility for reducing the risk of flooding and that it ought to provide more resources for flood prevention and

recovery. However, some felt that the problem in Carlisle had not been sufficient to prompt significant national action:

"It's an awful thing to say but I think in order to wake the government up London needs to flood."

Furthermore, it was suggested that investing in flood defences would have economic benefits for the government in the longer term:

"And there's a hidden cost to the government, the number of people who can't work for months and months on end that have further problems. To me, in the long term if the government were to put an extra billion pounds into flood defence work to stop people being flooded, they would recoup that in wellbeing of people."

There were split opinions about climate change and the need to adapt behaviour in response. Some felt climate change was a fictional concept. Many others felt it was a serious issue and that citizens and agencies needed to develop new ways of living to cope with the change:

"There's going to be big climate change, big, big climate changes and I think we've got to forget the past and move onto a new future to survive."

Despite the new flood defences planned for Carlisle, the City Council Community Officer felt that there was a sense of fatalism among residents about future flooding.

"I think when you are speaking to people in the community just in general conversation, I think there's kind of mixed feelings about the flood defences really. They do feel a reassurance but I suppose the only way that they are ever going to be totally reassured is if there is a flood and we don't get flooded. There seems to be still a perception that no matter what, it's going to happen again." (City Council interviewee)

Some participants were also of the opinion that government officials sent inconsistent messages to citizens regarding changes that need to occur due to climate change. They pointed out that while they were being encouraged to reduce their carbon footprint by driving less and not flying, ministers themselves had many expensive cars and spent much of their time flying to and from meetings across the world. Involving communities in emergency planning at the local level was considered to be crucial, because only they would have the local expertise and knowledge required for effective measures in their areas.

Participants in the business focus group were sceptical about the link between climate change and flooding, and attributed the flooding problem in their area to the policies and practices of the water utility company:

"I think one of the biggest contributory factors isn't global warming, it is the fact that Northwest Water doesn't exist anymore, it's utilities and so it's commercial. So the more they give to the shareholders the more shareholders are happy, the more the shares sell for. So don't clean the drains, don't clean that up, don't clear the blockage."

When asked about how resilience might be improved in the future, many participants focussed on the institutional and political obstacles to adaptation. Comments ranged from the need to ensure drains were cleaned and debris removed from rivers, which was linked to perceived problems arising from water privatisation, through to low priority afforded to Carlisle compared to more economically prosperous and politically important parts of the country. Several people believed that poor coordination was a key part of the problem and that the powers of the Environment Agency should be increased to regulate development on floodplains and the maintenance of drainage systems. The additional financial resources required for such measures were believed

to be justified because of the hidden costs associated with flooding such as loss of income and the social problems that this can create.

A key theme in the interview with the head of emergency was that the experience in previous emergencies, specifically the foot-and-mouth crisis, had helped in the response to the floods. Similarly, he felt that the experience of the flood would help in future events, for instance, the database that CR put together of flood victims could be replicated in the future:

"One of the other things we did through Cumbria Community Foundation, as well as giving individual grants, and this again reflected learning from foot-and-mouth, a key learning point from foot-and-mouth, we grant aided community-based projects. Self-help stuff if you like, and where we'd learnt in foot-and-mouth was if you could get people who were suffering the effects of the disaster together, for whatever reason really, it didn't really matter what the reason was, to share and to talk through their experiences and their problems, get it out there you, well nipping the bud isn't quite the right word, but you mitigated some of the psychological impacts. And I'm sure a lot of that headed off stress and psychological impacts becoming longer-term mental health problems…So we'd replicate groups who were looking at alternative therapies or you know, whatever it was, art projects, anything that brought people together."

The council representative has also been involved in a Department for Communities and Local Government (DCLG) initiative to write a national guidance document on recovery, and at the local level had worked on a template for a parish emergency plan. He had also acquired a number of mobile phones from an Isle of Mann company that he could use in the event of UK networks going down during a flood, which happened in Carlisle.

Another example extracted from the interview with the head of emergency shows how, by having a presence and collaborating during the recovery phase, the Environment Agency can establish relationships to draw on for its awareness and warning work:

"So where there was a local neighbourhood forum we'd have a meeting of that as a focus and the Environment Agency were always prepared and came along to those. And out of those came some of the, like, community networks the Environment Agency are now supporting in terms of delivering better warning and informing and greater resilience in communities. So that was really good, yes."

6.5 Summary

The main conclusions emerging from the case study research in Carlisle pertaining to research and to promoting resilience are presented separately below.

6.5.1 Understanding and promoting resilience

This was a very small scale pilot study and consequently the research results do need to be treated with some caution. Nevertheless, some important research findings did emerge regarding responses to the flood which provide some valuable insights into resilience as an analytical and managerial concept:

People in Carlisle made their own personal assessments of the flood risk, regardless of whether they received an official warning or not. Those who were warned, or became aware through visual references, were still unprepared for the speed at which the flooding occurred. People undertook their own evaluations of the flood warning messages, in some cases choosing to ignore them and in others not reacting quickly

enough. These findings confirm the results from previous research showing that people do not react automatically in a pre-determined way to warning messages, and that visual or verbal confirmation is often sought before action is taken.

Many of the participants had a pre-determined idea that a flood would be a slow-onset event signalled by rising surface water. In Carlisle, the flood had neither of these two characteristics. The speed of on-set and the fact that the flood waters rose up through the floors of most buildings meant that residents and business operators in general did not react quickly and avoidable damage was incurred as a result.

The nature and severity of the impacts of the flood varied a great deal among the focus group participants. For some, the loss of personal items rather than high economic value items such as vehicles and electrical goods was particularly traumatic. Many people were unable to return to their homes for many months and their distress was made worse by delays in contracting builders to complete repairs. The flood had a lasting psychological impact on many people and several reported that they still become anxious when it rains.

Voluntary sector organizations, along with friends and family, were particularly important in helping people cope during and immediately after the flood event. Normal lines of communication (telephone, radio, TV) were cut off and consequently flood victims lacked access to up-to-date information. Those who were new to the area or did not have friends or family in the region had more difficult and stressful experiences.

Regarding support in the months and years after the flood, participants were critical of the local authorities, although in reality the city and county councils had played an important part in the development of the Communities Re-United initiative. The voluntary sector played a vital role in recovery efforts, since the local authorities had relatively little experience of dealing with this sort of emergency situation. Members of the affected communities did come together to help each other, and the local flood action groups in Carlisle were widely perceived to be positive and necessary developments. Some people felt a strong sense of injustice because of perceived imbalances in the ways in which different areas and interests were helped.

Recovery efforts were impeded by a number of barriers. Difficulties with insurance claims and finding new insurance cover were widely reported. Repair work often took many months to complete due to shortages in the supply of skilled labour. The effects of shock were significant and reduced the capacities of some people to get on with the process of recovery. Many participants believed that recovery processes had been impeded by a lack of co-ordination among the relevant public organizations and that this had also undermined their own efforts to re-establish their homes and businesses. Businesses renting their premises reported that they had little control over recovery efforts on the estate and that the owners (the City Council) had done little if anything to help.

Regarding adaptation to the risk of future floods, there was a strong sense of fatalism among some of the residents who believed there was little they could do because of the age and design of their properties. New fixtures and fittings, including lighting and boilers, were typically installed in their original positions and were equally susceptible to flood damage. Few people had made any sort of contingency plans for evacuation or protecting their belongings in the event of another flood, although some of the businesses had taken simple steps such as moving tools and machinery, and fitting chain hoists to allow heavier items to be lifted above the flood level. Some participants felt that there were stronger social ties among people within their community since the flood, and that they would help each other if a similar event were to occur in the future. City Council representatives however felt that they are now better prepared for a future event.

Several participants identified institutional and political factors as key obstacles to adaptation. The need to ensure drains are cleaned and debris is removed from rivers, problems related to water privatisation and institutional fragmentation, and the low priority afforded to Carlisle compared to other parts of the country were all seen as significant obstacles. Poor co-ordination was perceived to be a key part of the problem and some felt that the powers of the Environment Agency should be increased. The additional costs of such measures were believed to be justified because of the hidden costs associated with flooding.

6.5.2 Investigating responses to flooding

One of the main purposes of this project was to develop and test a research methodology for investigating resilience in post-flood communities, using Carlisle as a pilot study. In terms of methodology, four key points emerged which will require particular attention in any future work in this area.

First, care needs to be taken regarding the selection of places to hold the focus group meetings. In the pilot study, one place (a church hall) was ideal as it was located within the community and had served as a refuge during the flood. The participants were familiar with these surroundings and comments about what had happened in the nearby streets emerged quite freely. However, another of the focus groups was held in a university library and, on reflection, that location may have been unfamiliar and possibly intimidating for some potential participants. The third focus group was held in an Environment Agency meeting room, which had both advantages and disadvantages. One advantage was that the room contained lots of printed material (maps, reports, leaflets etc) related to the flood which proved to be quite helpful in stimulating discussions. However, a disadvantage was that the room was used by other people at the same time, raising the possibility that this may have influenced what people were prepared to say within the focus group.

Second, the pilot study clearly demonstrated the importance of facilitation in focus group research. The three researchers involved in the field work all had previous experience of facilitating focus groups. However, for practical reasons, it was not possible for the same researcher to act as the lead facilitator for all three groups. Although a common discussion guide was followed by the facilitators in each case, the facilitators may have emphasized different aspects and managed the group discussions in their own ways. In future work, the use of a single lead facilitator throughout the research process would therefore be preferable.

Third, in future research more attention should be given to group composition and dynamics in the organization of focus groups. For example, while representatives for community-based organizations may add valuable knowledge and insights to the focus group discussions, there is the danger that they may be seen as ‘experts’ by other members of the focus group. Consequently, other members of the group may be less willing to express their views or may actually modify what they say to fit with the expert’s pronouncements. In the pilot study, some important groups were not included, such as children and teenagers, single families, people with different cultural backgrounds and people with disabilities.

Fourth, the pilot study revealed some of the ethical dilemmas associated with people-centred flood hazard research. For example, while the impacts of the flood were not the main focus of the study, details of the physical, emotional and mental trauma experienced by flood victims were revealed during the focus group meetings. While assurances of anonymity were given to all of the participants, focus group discussions need to be very carefully managed when such sensitive issues are being raised. For example, the facilitator may choose to move on to another topic or call a break in the

meeting if some participants appear to be distressed by the discussion. In addition, it is useful to have additional members of the research team on-hand in case any participants become upset and need emotional support. Nevertheless, there are still fundamental ethical concerns arising from the re-connection of people to previous traumatic experiences. While it was not possible to prevent people from talking about personal trauma related to the flood, from an ethical view point focus groups are not an appropriate settings for those kinds of discussions.

Finally, the focus group-based research did not capture all of the complexities of the flood, including the disruption to infrastructure such as schools, hospitals and community centres, nor the networks of social relations within the city and the individual communities that were affected. Focus groups were effective in presenting a snap-shot of individual responses and experiences but there are strong arguments for using additional methods for data collection, such as in-depth interviews, personal diaries and participant observation.

6.6 Conclusions and recommendations

The pilot study has demonstrated that it is possible to gain valuable insights from focus group and interview research into the different ways in which individuals and communities respond before, during and after flood incidents. Nevertheless, is has to be recognized that this was a very small study and that only tentative conclusions regarding responses to flooding can be drawn from it.

Some useful insights were also gained regarding how different conceptions of resilience are reflected in the everyday practices of people living in at-risk and post-flood communities. Despite recent shifts in national flood management policy, in practice a great deal of emphasis continues to be placed on strategies of resistance (Type 1 resilience). Since the 2005 flood, the Environment Agency has invested heavily in improving physical flood defence works in Carlisle and additional work is planned for the next 2-3 years in other parts of the city. Many of the people who took part in the pilot study argued that such work is essential for Carlisle and that, once complete, it will alleviate most of their fears and concerns about future flood risk. The majority of participants had a pre-determined idea of what a flood would involve and were unprepared for such a rapid-onset event where the flood water rose up through the floor rather than breaching doorways and other openings. At the same time, the findings suggest that people tend to make their own assessment of flood risk and flood warnings, often looking for verbal and/or visual confirmation before taking action.

Recommendation 1: The Environment Agency should consider changing some of the current arrangements for raising awareness of flooding and the dissemination of flood warnings. People need to be more aware of, and prepared for, the peculiarities of flooding. In flood awareness campaigns, more emphasis should be placed on the potential for rapid on-set events and the fact that flooding can arise from groundwater, storm water drains, and sewers as well as rivers and streams. Public awareness of the potential length of the recovery process, and the residual risk of flooding even where defences are in place, also needs to be increased.

More effective systems of flood warning should be designed around the principle of *multiple re-enforcing messages*. In other words, a single automated or person-to-person telephone message is unlikely to be sufficient, even if it is delivered promptly, as the recipient will evaluate that message before deciding whether it is necessary to take any action. Such messages therefore need to be consistently re-enforced using the local media (TV and radio), flood wardens, networks established via flood action groups and the emergency services. While effective warning does not prevent a flood

from occurring, it can make a community more resistant by reducing the potential for damage. For example, hundreds of vehicles could have been moved to higher ground in Carlisle if effective warnings could have been delivered more promptly.

A great deal of the work initiated by the voluntary sector and public sector organizations in Carlisle since the flood has been oriented towards restoration and recovery (Type 2 resilience). Indeed, several of the focus group participants expressed the wish for things to 'get back to normal' so that they could carry on with their lives without having to think or worrying about flooding. There was a very clear link between the specific nature and extent of the flood impacts and the recovery efforts of individuals and their families. Those new to the area and those without insurance cover were particularly badly affected. However, some people who did have insurance cover also experienced difficulties in making claims and had to wait for several months before they were able to return to their homes. The insurance companies generally contribute to this 'getting back to normal' as they generally do not support any changes to the property that are directed at increasing resilience by adapting to flood risk (such as raising the height of electrics).

In some respects, those living in housing association accommodation were given more options in the weeks immediately after the flood than those who owned their homes. Recovery was impeded in many cases by the psychological impacts of the flood, along with the loss of irreplaceable personal items. The voluntary sector played a vital role in recovery efforts and several participants felt that members of their community had helped each other in the aftermath of the flood, although some believed the level of interaction had fallen as time passed and as people moved in and out of the area. However, the response of the local authority was heavily criticized and some flood victims experienced difficulties getting access to up-to-date information. The local authorities were slow in their response because they were not prepared for an emergency of the extent of the flood.

Poor co-ordination among the relevant public organisations was identified as a significant barrier to recovery, and there were some claims of unfairness and injustice because some communities were perceived to have received more assistance than others. Another barrier related to existing institutional structures is their lack of flexibility during an emergency which slows their response: the need for authorisations, insurance for staff and so on. The church and other voluntary organisations were able to bypass all of this and provide a much more adaptive response. Another example is the insistence of health authorities that victims should see their GPs in order to be referred for counselling.

Recommendation 2: There needs to be wider recognition among policy makers and flood incident managers of the diversity of impacts and experiences among flood victims and different communities. In many respects, each individual account of recovery was unique, as personal circumstances varied so much. In particular, the emotional and psychological impacts of flooding were often identified as the major barriers to recovery, although this was also one of the areas were support was most lacking. Experiences in Carlisle indicate that 'bottom-up' flood incident strategies are needed which are designed around detailed understanding of the socio-economic and institutional characteristics of each area. Furthermore, there is a strong case for providing more emotional support for flood victims, including the establishment of self-help groups.

Such strategies need to address the psychological and emotional dimension of recovery and not just the material and physical aspects. In addition, co-ordination among the various public, voluntary and private organisations involved in the design and delivery of the strategies needs to be improved. In Carlisle, electrical wiring, boilers

and other essential fittings were typically re-installed at exactly the same heights and locations after the flood and consequently are equally susceptible to flood damage in the future. Care also needs to be taken to ensure equity in the implementation of the strategies, as evidence emerged which suggests that some communities received more help than others that were also badly affected by the flood.

Recommendation 3: Institutions and local authorities should be able to work more flexibly during an emergency and be able to react more quickly. For example, emergency plans should also refer to organisational structures and procedures as well as to the emergency services on offer. Organisations such as the Environment Agency and local authorities need to develop 'latent capacity' which can be invoked at short notice. In practice, this would involve the designation of secondary/alternative roles, the provision of training for people to be redeployed and carry out other functions when required, and the strategic distribution of resources so that they are not all concentrated in one location which might be disabled by a flood. Regarding insurance, the organisations need to have pre-arranged insurance policies in place that can be quickly authorised by the insurers and invoked at the start of an emergency. This would allow council workers to go into buildings and carry out functions outside their normal jobs or roles.

The findings from the pilot study imply that relatively little has happened in Carlisle in terms of re-configuration and adaptation to future flood risk. While there was some evidence of social capital and stronger community ties following the flood, this was eroded over time due to the inevitable inward and outward flow of people as properties were bought and sold. Some of the businesses had adapted their premises to allow machinery to be raised above flood levels. However, the majority of participants had not made any contingency plans to cope with flooding in the future. While flood gates had been supplied to several people, they did not always fit the doorways in older houses. Furthermore, there was a general feeling that devices such as flood gates would not be effective, as the flood waters rose up through the floors in the majority of properties in 2005. Positively, local Environment Agency officers are working closely with some of the community groups to develop local Flood Action Plans, although none had actually been implemented in the three areas examined as part of the pilot study. Some infrastructures, such as electricity sub-stations have been relocated since the flood and social services, the fire service and the police have dispersed their resources so that they are more likely to be able to function in the event of another flood. Poor maintenance and cleaning of drains was widely regarded as a significant problem which was perpetuating the risk of flooding in Carlisle.

Recommendation 4: The orientation of flood prevention and flood incident management needs to be reconsidered. At present, the focus is largely on enhancing resistance via improved flood defences and warning systems, along with emergency planning aimed at providing basic services and restoring infrastructures as quickly as possible. However, restoration is not the same as recovery. Some of the research participants are equally, if not more, vulnerable to the effects of flooding now compared to 2005. In the context of local Flood Action Plans, more emphasis should be placed on vulnerability-reducing adaptation, recognizing that such innovations will have to be developed in the medium and longer term alongside more traditional strategies designed to resist flooding and provide emergency relief. Such changes are unlikely to occur unless communities are more effectively engaged in decision- making for flood risk management.

Some examples of type 3 resilience emerged from the interviews with City Council officials and the Vicar of Denton. There was a degree of learning from the flood event and the impression that in the event of another emergency they would be more

prepared and better co-ordinated. A key factor was that there was a higher awareness of the role and capacity of voluntary organisations: learning from other emergencies, more awareness of the capability and roles of voluntary organisations, better co-ordination. The response of the City and County Council in the aftermath of the flood was slow and way behind that of the voluntary organisations. This may have led to a perception among residents that these authorities did not do very much.

Finally, a great deal was learnt about the design and conduct of this type of investigation. There is scope to extend this study within Carlisle to provide a more detailed longitudinal account of responses and post-flood adjustment, and also to undertake comparative work in other urban and rural communities affected by flooding.

Recommendation 5: Organisations responsible for the different aspects of flood response and recovery (including the Environment Agency) should consider supporting further research in Carlisle and in other parts of England and Wales on human response, adjustment and adaptation to flooding. With some adjustments and refinements to research design and methodology, it would be possible to generate a more substantial body of evidence upon which the future policies and practices of the Environment Agency and other relevant organisations could be based. In supporting future research, particular attention should be paid to ensuring that balanced and representative groups of research participants are recruited from the study areas.

7 FLOOD*site* case study

Sue Tapsell[24]

7.1 Introduction and aims of case study

This section covers one of the two cases studies featured in Work Package 2. The study aims to review lessons learned on response and recovery to flooding in other countries and to consider their usefulness to this project. The case study is taken from recent research conducted under the European Commission-funded FLOOD*site* project, Task 11: *Risk perception, community behaviour and social resilience*. Empirical investigations were conducted in Germany (Steinführer and Kuhlicke, 2007) the final report of which, *Social vulnerability and the 2002 flood* (report number T11-07-08), can be accessed from the FLOOD*site* website at www.floodsite.net.

7.1.1 Aims of German research and approach taken

The purpose of the research was to better understand the impacts of floods on communities and the latter's capability to respond and recover from such events. Community-based approaches to flood mitigation learn from what has worked previously and aim to build the capacity of local people to respond quickly and effectively. Understanding how communities cope in flood events, how they respond, how they behave, etc. is valuable information to share with those yet to be impacted and with time to prepare. In the German study there was a strong focus on taking a bottom–up perspective and reporting the issues from the respondents' point of view.

The project thus focused on the perceptions and subjective evaluations of actors immediately at risk, the understanding of whose behaviour at various points in time (before, during and after flood events) is crucial for both the effectiveness of preventive measures and the extent of damages and losses. The theoretical frameworks on which the research was based comprised that of social vulnerability, social capital (including social networks) and risk construction (see Blaikie *et al.*, 1994; Cutter, 1996; Bourdieu, 1986; Portes, 1998; Coleman, 1990; Putnam, 2000; Hurlbert *et al.*, 2001; Sarewitz *et al*., 2003; Nakagawa and Shaw, 2004) which are discussed at length in the FLOOD*site* report. Thus, the major objectives of the research were to:

a) characterise types of communities with regard to their preparedness, their vulnerability and the resilience related to flood events by means of indicator sets;
b) understand the driving forces of human behaviour before, during, and after floods;
c) learn lessons from the case study in order to provide insights into cultural differences when compared with studies in other countries.

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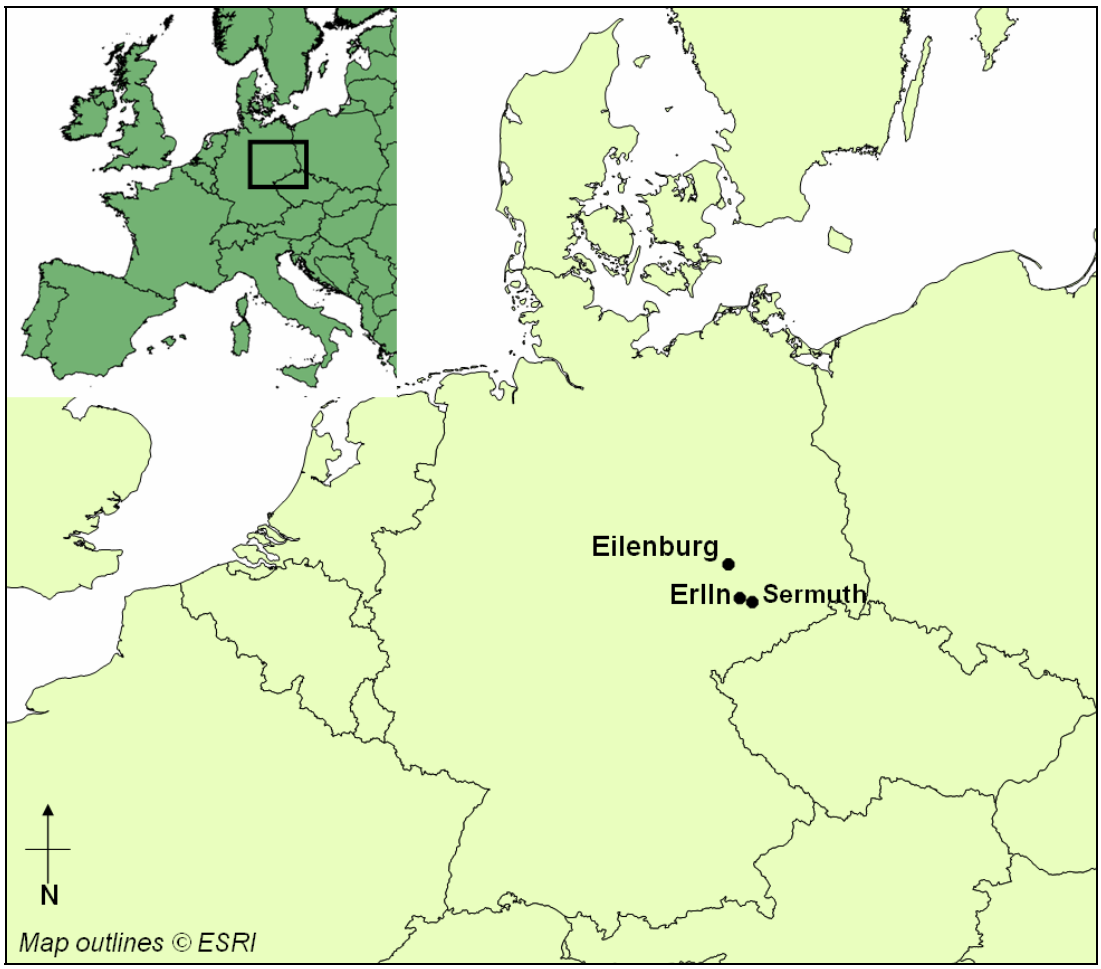
7.2 Background to case study and flooding in Germany

The focus of the German research was the extensive 2002 flood event. The research locations for the study are all based in the Saxony area of the river basin of the Vereinigte Mulde, i.e. the region between Sermuth (southern part of the river basin) and Dessau/Bad Düben (close to the confluence with the River Elbe), see Figure 7.1. In the southern part of the research area (Sermuth to Wurzen), the Mulde basin is hilly and the valleys are rather narrow. In contrast, between Wurzen and Bad Düben lowlands prevail, resulting in a lower stream velocity. Although the Vereinigte Mulde event is an example of a plain flood, the characteristics of the 2002 flooding in upstream areas of the catchment were similar to that of a flash flood (almost no preparation time, rapid discharge). The villages of Sermuth and Erlln and the small town of Eilenburg were chosen for analysis according to selected criteria. These main criteria guided the location selection process for the research and were: type of flood, flood recurrence/recentness, and community size/type. Care was taken to include examples with experience of both flash floods and plain floods and both rural and urban communities, although no large cities were included (see Table 7.1).

Figure 7.1: Location of case study areas



7.2.1 Social, political and economic context

In order to appreciate the results from the research some understanding of the local context is necessary, such as the social, political and economic circumstances characterising the region. In addition, the structure of official disaster protection and response in Germany is also relevant and needs to be taken into account. Both of these are outlined below, drawn from the final report by Steinführer and Kuhlicke (2007).

Eastern Germany (of which Saxony is a part) has been in the process of post-socialist transition since 1990. While the political structures during the Cold War era were characterised by a high degree of centralisation (including with respect to disaster protection), with German reunification in 1990 the entire system was transformed into a federal structure in all respects. Beside, and in spite of, large-scale public funding in a variety of areas (modernisation of infrastructure, urban renewal, social insurance and so on), eastern Germany has been characterised by high structural unemployment (about 20 per cent) since the 1990s. This has resulted in mass migration of the population to western Germany. A process of “shrinkage” has emerged with regard to population numbers, due to rapidly decreasing fertility rates and negative migration balance, as well as their interdependencies. This development is particularly relevant in the town of Eilenburg.

Table 7.1: Main characteristics of the Mulde research locations and flooding

	Eilenburg	Sermuth and Erlln
(a) Flood type	plain flood (lowlands)	plain to flash flood (hilly area, stretch valleys)
(b) Flood frequency (rarely = less than once in ten years, sometimes = up to once in ten years)	rarely – sometimes (flood frequency 25–50 years; extreme floods in 1771, 1954, 1974, 2002)	rarely – sometimes (flood frequency 25–50 years; extreme floods in 1771, 1954, 1974, 2002)
(c) Community size	- 18,000 inhabitants (whole town), approximately 7,500 affected by the 2002 flood	- Sermuth (part of Großbothen): around 600 inhabitants - Erlln (part of Zschadrass): around 100 inhabitants
(d) Type of community	- small town at the Vereinigte Mulde, which divides the town - Karl-Marx-Siedlung/KMS: located in the floodplain (rest of town outside the floodplain), dating from 1920s, later expansions in 1960s and 1970s	- Sermuth: village at the confluence of the Freiberger und Zwickauer Mulde Rivers - Erlln (administratively belonging to Zschadrass): very small village
(e) Last major flood event	- in 2002 (particularly city centre and Karl-Marx-Siedlung/KMS)	- in 2002
(f) Mean annual rainfall	- ca. 700 mm	- ca. 700 mm
(g) Previous investigations/ media interest	- investigations: none - media interest: medium	- media interest: low
Further information	- in the region: most severely affected locality in 2002 - large flood prevention scheme in preparation (official slogan: "the town will be safe")	- heavy damage: some houses demolished after the 2002 flood

Source: Steinführer and Kuhlicke, 2007

In contrast to the villages of Erlln and Sermuth discussed below, Eilenburg is an urban location. Approximately two-thirds of all buildings in Eilenburg are detached and semi-detached buildings. The other third are apartment buildings. The old town (heavily destroyed in the final days of World War II) and its six small rural (administratively incorporated) districts Hainichen, Wedelwitz, Kospa, Pressen, Zschettgau and Behlitz have a population figure of currently 17,500. This means a decline of 19 per cent in comparison with 1990. One of the main reasons for the negative population and economic development of Eilenburg was the closure of the largest industrial enterprise in the town, the Eilenburger Chemiewerk ECW (chemical industry).

In the 2002 flood, the historic centre, the industrial site of the former ECW, and the residential district Karl-Marx-Siedlung (referred to as KMS), close to the ECW and built in the floodplains from the 1920s onwards, were inundated due to several dyke breaches. The research was carried out in Eilenburg centre (including KMS) and Hainichen. However, not only KMS, but most parts of the city of Eilenburg are situated within the floodplain. The historic centre is located on an island surrounded by the Mühlgraben River as well as the Mulde River. Therefore large parts of the city are protected by dykes and flood defence walls, which were due to be renewed in the

summer of 2002. However, on the very day the construction work was supposed to begin (the head of the district authority was present to officially announce the beginning of the building operations!) the dykes collapsed due to the rising river. Thereafter the pre-flood planning efforts gained new importance, as the municipality was able to start rebuilding the dyke constructions around the city comparatively quickly after the 2002 flood.

Today, Eilenburg not only has one of the most costly flood defence systems in Saxony, but its reconstruction is also the most advanced in the region. Thus, different measures such as the back-spacing of dykes at a bottleneck, the heightening of a bridge for increasing the passage of water below, as well as flood protection walls, improved and heightened dykes have been implemented. In the self-portrayal of the municipality on the Internet, these different measures lead to the statement: “In 2009, Eilenburg will be flood-safe as far as is humanly possible.”

The rural village of Sermuth is located at the confluence of the Rivers Zwickauer and the Freiberger Mulde. Above Sermuth, the name of the river is Vereinigte Mulde. Sermuth as a whole contains about 600 inhabitants. The empirical investigations were conducted in two out of three Sermuth districts (Kleinsermuth and Großsermuth) with approximately 400 inhabitants. The third area, Kötteritzsch, was omitted since it was not affected by the flood. The village is divided by the Zwickauer Mulde (with the confluence nearby), both old farmyards and new buildings are found close to the stream. Other parts of the village are situated in upper areas. Since 1990, the village has lost nine per cent of its inhabitants.

Erlln is located at the end of a single one-way road just behind a dyke, providing the impression of an “autarchical” community. The village consists of 33 properties and has 92 inhabitants, among them some artists who have made the location somewhat more famous in the region than similar rural villages. The area also lost a considerable part of its population after 1990 (seven per cent due to both negative natural and migration balances. Erlln was completely inundated by the 2002 flood. The water level was 85 cm above the dyke level. One million euros are currently being invested to renew (and raise) the old dyke (by 95 cm) and to erect a second one. The village itself had to be reconstructed following the flood and heavily benefited from the millions of euros of public and private money which went into the flood area immediately after the 2002 event. The one (and only) road is completely new, and the village for the first time has been equipped with a sewerage system.

Disaster protection and warning systems in Germany

In Germany there is no single agency that is responsible for disaster protection. According to Article 70 of the German constitution, defence against dangers is the duty of the *Bundesländer* (federal states). The Federal Government supports the states in the event of a capacity overload. Different organisations are involved in civil protection both from the public sector as well as from the private and municipal sectors. These organisations include:

From the public sector:

- local fire brigades (which exist as both professional and voluntary organisations),
- Bundesanstalt Technisches Hilfswerk (Federal Agency for Technical Relief; THW),
- Bundesamt für Bevölkerungsschutz und Katastrophenhilfe (Federal Agency for Population Protection and Disaster Mitigation; BBK), which among others operates the Deutsches Notfallvorsorge-Informationssystem (German Information System for Disaster Prevention; deNIS).

From the public private and municipal sectors:

- Arbeiter-Samariter-Bund (Workers' Samaritan Federation; ASB),
- Deutsche Lebens-Rettungs-Gesellschaft (German Society for Live Saving; DLRG),
- Deutsches Rotes Kreuz (German Red Cross; DRK),
- Berg- und Wasserwacht (Mountain and Sea Rescue Service),
- Johanniter-Unfall-Hilfe (Johanniter Emergency Service; JUH),
- Malteser-Hilfsdienst (Malteser Emergency Service; MHD)

Similarly, flood warning is not in the hands of a single agency, as many different actors are involved. While in non-federal systems the chain for decision-making (involving registering, forecasting, warning and responding) often does not work well (Handmer 2000), in the German case it becomes even more complicated. Many different actors at different scales are involved who (typically) seldom communicate with each other. However, since a detailed overview is not necessary for an understanding of the local level, the most important features of the warning process for the municipalities only are introduced here. By law (*Hochwassermeldeordnung*), there are four different steps foreseen during this process all of which are announced by the *Untere Wasserbehörde* (Lower Water Authority) –see Table 7.2.

Table 7.2: Four steps of the flood warning process in Saxony

Stage 1	This is based on a constant analysis of the meteorological and hydrological situation. At the local level during this phase of the warning, the alarm plans are routinely checked and the usability of the equipment is controlled.
Stage 2	At the local level, the dykes along the river as well as endangered buildings are systemically observed. The operational readiness of responsible staff and flood protection material is controlled.
Stage 3	At the local level, the dykes are constantly monitored and mobile preventive safety measures are put in place. A task force (*Einsatzstab*) is established of people who are given responsibility during the crisis. Special communication channels are set up and further manpower for active flood defence is mobilised.
Stage 4	At the local level, the organisations responsible now have to prepare for the possible evacuation of the population. Manpower and resources are concentrated on flood defence. If the final stage of warning is no longer sufficient to handle the situation, the regional district officially declares a disaster.

Although technical measures were and are still intended to both protect people in floodplains and make or keep the rivers navigable, they inevitably led to an increased damage potential. In Germany this relationship between intention (protection and control) and unintended side-effects (reduced awareness and increased damage potential) was officially acknowledged by a report of the Federal Water Working Group in 1995. This report underlined the limits and failures of technical protection measures and demanded a change in flood control whereby organisations should put stronger emphasis on non-structural measures and that citizens should assume more responsibility with respect to mitigation measures (such as insurance, constructing safer buildings). This paradigm shift was supported on the national scale and accelerated by the heavy and costly flooding of the Rhine in 1993 and 1995, the Odra in 1997, and the 2002 Elbe floods. As a result, several amendments were made to legislation both at the level of the *Bund* (Federation) and the federal states). This new water law in Saxony means that every citizen in the region is obliged to implement mitigation measures in accordance with their abilities and available resources. This approach is in line with the much cited 'paradigm shift' from flood protection to flood risk management (Brown and Damery 2002; Tapsell *et al.* 2005; Messner and Meyer

2006; for a critical review, Kuhlicke and Steinführer 2006). This ‘individualisation of risk’ sees flood protection as no longer simply a public duty but also an individual one.

7.3 The 2002 flood event

The 2002 flood in the Mulde region was the largest event since those of 1954 and 1974. However, there had been several other major floods in the region in recent years as stated above. The 2002 flood represented a return period of between 25-50 years and many dykes were breached and overtopped by the severity of the event. Large parts of the catchments of the Elbe River experienced heavy rainfalls between 6 and 13 August 2002, with precipitation as high as 312 mm/m² per day being measured, the highest value per day measured since the beginning of routine weather recording by the German Weather Service. Within a few hours the situation along the tributaries of the Elbe was out of control. The Vereinigte Weißeritz in particular caused inestimable damage in Freital as well as in the Saxon capital of Dresden. The situation was similar along the Freiberger Mulde. Here the flood rose within a few hours. Therefore the villages of Erlln and Sermuth, which are located in the hills close to the confluence of the Freiberger and the Zwickauer Mulde, were rapidly approached and inundated by the flood. In Erlln, the dyke was breached in three locations. Due to its specific geographic situation, the village was completely isolated and accessible only by air (helicopters enabling evacuations) or by water. In Sermuth, the dyke was inundated. In both locations, the flooding of the buildings started in the very early morning of August 13. However, along the Vereinigte Mulde the 2002 flood situation differed from previous flood progression, since the 2002 wave flowed down the Mulde considerably faster and steeper than during previous events (1974 and 1954).

This short introduction highlights some crucial issues with regard to the size of the communities as well as the speed of flood onset. The chosen research locations are ideal examples of the different aspects influencing disaster reaction capacities. Eilenburg represents a town which is vulnerable to a slowly rising river, but at the same time is equipped with many different organisations from the public sector. Erlln and Sermuth in contrast are vulnerable to a faster rising flood and have no such organisations, with the exception of Sermuth’s fire brigade. Therefore it is to be expected that, for the latter communities, it is much more difficult to respond to flood hazards.

7.4 Research approach

The research comprised a mix of qualitative and quantitative approaches and included:

- a questionnaire survey (2005) of 404 flooded residents (Eilenburg 328, Erlln 19, Sermuth 57);
- 30 semi-structured interviews with decision-makers and residents (not all of which have been transcribed);
- nine semi-structured interviews with decision-makers (often with follow-up meetings);
- 11 in-depth unstructured interviews with residents affected by the 2002 flood.

In some cases the qualitative interviews helped in the development of the structured questionnaire, in other cases qualitative interviews were undertaken after the questionnaire survey to follow up on key issues.

Issues covered in the surveys

A common questionnaire was developed for use where possible in all study areas; however, site-specific factors were included where relevant. The research also aimed to compare the results from the different locations at a regional level. With the aims of the research (cited above) in mind, the surveys included questions on the following issues:

- flood preparedness (physical and mental);
- protective actions taken by residents;
- attachment to local area;
- local knowledge, networks, social capital, support;
- length of residence, flood experience and damage;
- community solidarity;
- levels of trust, responsibility and blame;
- risk awareness/perception/construction, knowledge of flooding, information received;
- what makes people feel safe, mitigation/protection;
- cause of floods and attitudes on building regulation.

7.5 Demographic characteristics of respondents

The population in the study (in particular in the biggest sub-sample of Eilenburg centre and KMS), was largely homogenous in terms of demographic and social characteristics. The majority of respondents were older with an average age of 57 (due to historical circumstances and out migration following German reunification) and with an almost equal balance between males and females. No ethnic minority groups are present in the locations. Also due to historical circumstances there was a high degree of unemployment in the affected areas (13 per cent), and only 29 per cent of respondents were in full-time employment. Almost half were retired, the majority in the urban locations. A third of respondents had low formal qualifications and a fifth were on very low incomes, although pensions in former East Germany were good and many continued to benefit from them. The majority of workers were skilled (with medium levels of qualifications) or were clerks in low positions. White collar workers in higher positions comprised around a quarter of the sample.

A closer look at household types reveals some urban-rural differences. The urban location (Eilenburg city centre) and the (quasi-)rural locations differ mainly with respect to the share of one-person and family households. Families (with children under and over 18 years) are to be found much widely in the villages and Eilenburg KMS than in the centre of Eilenburg (39 versus 25 per cent). In the latter area, the household structure is more balanced with older couples predominating, although one and two-person households dominate the entire sample. One reason for these differences is to do with property structures. While detached houses in owner-occupancy prevail in the rural and quasi-rural locations, Eilenburg city centre is dominated by older one- and two-person households living in rented accommodation. In Eilenburg, despite its urban character where one could expect to find typically ‘urban’ types of household (such as young cohabiting couples or singles), these are almost completely lacking.

This finding contributes to the general impression of a high degree of social homogeneity among the total population sample. Most strikingly, the very small percentage of younger household types (such as singles and cohabiting couples without children) needs to be highlighted. Only 15 respondents under the age of 40 live in either of these household types. Thus, these are classified in only two groups applying the age of 65 (the official German retirement age for men) as a separating line. Also families with dependent children (under 18 years) make up just 16 per cent of

the entire sample. Older cohabitating households form the biggest group (29 per cent). Due to the mass migration of predominantly younger cohorts in recent years, this is a demographic structure typical for East German regions outside large cities.

When thinking of a hazard such as flooding one might assume that in terms of the ability of a household to react in an appropriate way, structure is crucial. This can especially apply to households with dependent members (children under 18 years and/or disabled and permanently ill people) which are presumably more vulnerable than other types of households. In the sample, more than one third of the households belonged to this group, since children or ill/disabled persons were to be found in about every fifth household. Eleven respondents (three per cent) lived with both types of dependents.

What does this mean for the assumed social vulnerability to flooding of the people living in the flood-prone areas of the Mulde River? Large parts of the literature suggest that social vulnerability (as the capacity to cope with and respond to a disaster) is enhanced and diminished, respectively, by certain socio-economic and socio-demographic characteristics. Based on both the literature and on the conviction that these characteristics are highly context-dependent, in Table 7.3 summarises key socio-demographic and socio-economic indicators of vulnerability to flooding, and the most likely vulnerable groups with respect to social inequality are highlighted.

Table 7.3: Indicators of social vulnerability and their frequencies in the sample

	Total number (share)	Locations with …	
		… highest share	… lowest share
Old persons (65 years or more)	162 (41%)	Eilenburg centre (44%) Eilenburg KMS (42%)	Erlln (16%)
Very old persons (75 years or more)	57 (14%)	Eilenburg centre (17%) Sermuth (16%)	Eilenburg KMS (2%)
Households with dependent persons	139 (37%)	Erlln (41%)	Sermuth (22%)
People with low formal qualification[+]	103 (32%)	Sermuth (35%), Eilenburg centre (35%)	Erlln (11%), Hainichen (13%)
Unemployed people	52 (13%)	Hainichen (25%)	Eilenburg KMS (9%)
People with very low income (weighted per capita)[++]	66 (20%)	Eilenburg centre (18%)	Hainichen (40%)

[+] Values 0-3 of merged scale (highest school-leaving certificate plus professional training/higher education; scale from 0 (no degree) to 8 (highest degree); note that category "low" (in Fig. 3.6 above) refers only to values 0-2 of this scale (n=19)
[++] Value of first quintile for entire sample (600 €) taken as upper limit

Source: Steinführer and Kuhlicke, 2007

The dimension of gender is indirectly touched on, since it is mostly women who take care of children and the elderly. However, gender is a rather ambiguous category with respect to disaster vulnerability. Women are, on the one hand, regarded as more vulnerable due to lack of resources/power, they spend more time at home and, as already mentioned, care for dependent people. On the other hand, they are ascribed more coping-capacities due to their usually greater commitment to family work and kin relations (Blaikie *et al.* 1994).

The dimensions of unemployment, low formal qualification and low income in reality often overlap. People belonging to either of these categories are assumed to exhibit a higher degree of vulnerability to disasters (Tapsell *et al.* 2002; Cutter *et al.* 2003). This might be due to a lack of awareness but also a lack of resources with which to cope with the event and to absorb the resulting losses. However, as with other dimensions, this one is also ambiguous since one can argue that people in employment (who make up only a minority of the respondents), along with their belongings, are in a certain sense relatively more vulnerable, simply because they may not be present at the moment of a flood event. Hence, it is impossible for them to reduce at least *ad hoc* their material vulnerability.

7.6 Key research findings

7.6.1 Local attachment and social capital

Residents' and communities' response to a flood event, and their ability to cope with future flooding, can be seen to be associated with their levels of *social, community and institutional vulnerability.* One analytical tool to describe and interpret the social structures of contemporary modern societies is Bourdieu's (1986) distinction of economic, cultural and social capital. While economic capital comprises all forms of income and assets with a monetary value, cultural capital relates to formal and informal qualifications, capabilities and skills. Social capital is made up of personal relationships to others which allow for access to resources. Both cultural and social capital can be transformed into economic capital, hence it forms the basis of all other types of capital. Social capital in the form of informal networks and material bonds to a location can be examined in relation to the level of attachment people have to their local area.

The strength of ties to the local area where people live can be important indicators of local attachment and of resilience to the impacts of flooding. Social networks can provide physical, emotional and financial support. These personal networks may include family, friends, work colleagues, neighbours and other associates and acquaintances. In the study respondents displayed strong attachments to their place of residence in all locations, including those who arrived at a later point; the vast majority were strongly or very strongly attached. Half of respondents had lived in their respective town or village for their entire life, the mean length of residence being 44 years. Just over half (53 per cent) of respondents are owner occupiers (mainly rural) and 47 per cent live in a rented dwelling (largely in Eilenburg).

Some of this attachment can be illustrated by the membership of local associations, political parties or sports clubs (26 per cent involved with one and six per cent with more than one). Men were linked to more associations than women (40 versus 26 per cent) as were more people in rural areas. Solidarity among residents could be seen to represent social capital at the community level. In the study, the two rural locations reported higher solidarity than the urban locations.

One further approach employed of determining the strength of local networks was to ask about the number of people (restricted to the most important three and not in the household) with whom respondents discussed personal matters. Three-quarters reported the maximum three and 10 per cent none at all (including missing values). Young people had slightly greater networks than the elderly, with those over 70 having the lowest number. The majority of relationships were based on kinship but friends and neighbours were also important in more extended networks. Around a third of all networks were exclusively based on kin, while 15 per cent were friends. Women relied on more heterogeneous networks than men. From age 40 and over (and especially those over 60) networks were predominantly kin-based, which might be meaningful with respect to post-flood recovery as different networks are likely to deliver different kinds of support. Respondents with a low or medium level of formal qualification tended to a significantly greater degree to have networks consisting exclusively or predominantly of kin than people with higher qualifications. For those with higher levels of qualification the balance between kin and friend networks was more balanced.

Of importance is the geographical dispersion of these networks, as this may determine levels of support, before, during and following flooding. People living in the same flood risk area will face the same problems and have access to the same information, whereas those living outside the area will not. In the study, more than half of nominated

networks were located in the same town or village, with one third in the immediate vicinity, and around a quarter were located outside the district. This means that during the 2002 event these people would also have been dealing with the same situation as the respondents, which could for example reinforce flood warnings but limit support (the weakness of strong ties). Kin-based networks appear to have a greater geographical range whereas friends tend to live in the vicinity. Only those with low formal qualifications have predominantly local networks while respondents with medium and higher qualifications have more balanced geographical networks. No gender differences were identified. Predominantly or exclusively local networks prevailed in all age groups (except for the 40-49s where it was more balanced) but especially the under-30s and over-70s. For urban dwellers, networks were more locally based than for rural areas. Respondents with exclusively local networks only significantly differed in one respect – more of them were born locally and had spent their entire lives in the location.

Thus, networks of strong ties potentially provide important resources to draw on in the event of a flood, but these resources may be weakened if others are also affected by the flood. The next section discusses residents' responses during the different phases of the flood.

7.6.2 Response during different phases of flood event

Precautionary measures and preparedness before the flood

Although different phases of a flood event can be recognised, these phases also overlap and flood disasters are thus not necessarily linear events with a clear beginning and end. Precautionary measures are seen as important in reducing the vulnerability of people and properties, mainly by mitigating potential damages. Previous research shows that these measures are most effective in areas prone to frequent, small floods (ICPR, 2002). However, these measures can also be important for more severe flood events such as the 1993 and 1995 floods on the River Rhine. Damages for the 1995 flood were considerably lower due to precautionary measures being taken by people following the 1993 flood.

Around one fifth of respondents reported taking precautionary measures before the 2002 flood. These mainly involved obtaining sandbags or having flood insurance. When questioned directly about insurance, half said they held it. Age and income are seen to be factors affecting insurance take up; more people with higher incomes are likely to take out insurance, as are older people (although the latter is also affected by the continuation of policies dating back to the GDR among older respondents). However, the main factor affecting insurance and precautionary measures generally was tenure: 22 per cent of owner-occupiers had taken precautionary steps compared with nine per cent of renters. People in central urban areas generally took fewer precautions. No indications were found to explain why neither precautionary measures nor ad-hoc measures significantly contributed to reducing monetary damages. One possible explanation is the severity of the event along with its characteristics, making any measures virtually ineffective.

The majority of respondents (85 per cent) said that retrospectively they had not been prepared at all for the 2002 flood; only three per cent said that they were slightly prepared. The last major floods in the region had been in 1954 and 1974; hence long residence did not seem to have prepared people any better than those only resident for shorter times.

It was hypothesised that those who are able to recognise signs that a flood is possible are better able to take short-term measures to reduce damages. Signs may include heavy and long-lasting rainfall, weather reports and reporting of floods upstream, rapid increase in water levels, the filling of retention basins and information on the internet. One third of respondents reported remembering such signs. Differences were noted for age with (surprisingly) younger less experienced people aged under 39 reporting remembering certain signs more often than older people with presumably longer residence in the areas. Older respondents were more likely to recall the earlier floods and to remember nervous or fleeing animals as a sign for the flood while younger respondents were more likely to use other forms of knowledge such as using the internet to actively seek out information. For example, the website which hosts the river level information for the locations was only consulted by respondents under 59 years of age. When taking into account the preparedness indicator of age, significant differences were therefore found between those who remembered such signs (mainly younger respondents) and those who did not (mainly older), with the latter reporting being less prepared. It can therefore be suggested that younger age groups may interpret flood signs more adequately than older groups, despite being the least experienced in relation to flooding.

When looking at the role of social capital and social networks (such as channels of support, information, money etc.) in possibly influencing the reading of flood signs, it appears that the geographical heterogeneity of social networks was significant. A significantly higher proportion of those people whose networks are exclusively within their locality reported a higher degree of remembered signs than those with a more spatially dispersed network. However, none of the social network parameters (including geographical dispersion) affected the level of actual preparedness, which was still very low.

Warning, evacuation and other actions taken before or during flood

Literature on flood warning systems reveals that these often do not work very well and frequently fail (Handmer, 2000). In the case study locations, there was no prior flood warning issued, only a warning (or call) to evacuate. The majority of respondents (88 per cent) were present in their town or village when the call was received. However, the message given to residents was different in urban Eilenburg compared with rural Erlln and Sermuth. In Eilenburg, the speed of onset of the flood was slow and 92 per cent of residents reported receiving a warning to evacuate before the town flooded; the warning system was therefore said to have worked well. The warning was received at 6.00am and people were told to evacuate by 9.00am, as the flooding was predicted to begin around this time. This gave some residents time to move possessions, although others fled immediately without taking any actions. The flood did not actually hit until much later in the afternoon. Conversely, in Erlln and Sermuth, where only a minority of respondents (23-29 per cent) reported receiving a warning, the flood arrived in the early hours of the morning (between 3.00 and 4.00 am) and with considerable speed.

Unlike in England and Wales, 86 per cent of those who were at home and received the call to evacuate did so; however, there were large differences in the timing of evacuations, from 20 minutes in Erlln to nine hours in Eilenburg centre. Significantly more men than women stayed in their homes (19 versus nine per cent). Where speed of onset was sudden, fewer respondents evacuated. Tenure did not account for any variance.

The flood warning system was criticised after the flood as being inadequate (see Von Kirchbach *et al*., 2002). The question of whether the call to evacuate was in time was quite contested. Opinion on this was evenly mixed; however, respondents in Sermuth were most critical as only around one-third received the call in time.

In terms of material vulnerability, the time between receipt of a warning and being flooded is crucial and allows people to move valuable or sentimental possessions to reduce losses. Respondents were asked how they reacted upon receiving a warning and what actions they took. In Eilenburg most people took important documents or medicines, packed some clothes and left their homes, largely because the flood had been predicted to happen much earlier than it actually did. Less than a quarter attempted to secure possessions, although 10 per cent made a substantial effort to save items. Many respondents also reported helping others, such as neighbours. Of the 10 per cent who reported not receiving any information, the majority were in Sermuth.

On checking factors which might explain why these residents received less information, neither the composition of social networks (kin versus friends) nor their geographical heterogeneity (local versus non-local networks) could explain the variance. However, one factor that did influence how people reacted was their tenure situation. Significantly more owner-occupiers took action to reduce their material vulnerability and to secure their property and possessions than renters; almost half of renters left their homes without taking any actions compared with 18 per cent of owner-occupiers; and a quarter of owner-occupiers tried to secure many items compared with nine per cent of renters. The majority of renters were in the centre of urban Eilenburg, while in rural Erlln and Sermuth respondents made more effort to reduce their material losses.

Those who understood the heavy and persistent rainfall as a sign of flooding, as well as those who gathered information via radio and TV, more often secured many of their possessions compared with those who did not read any signs. Considerably more of those who remembered the major 1954 and 1974 floods left their homes than people who did not remember these events.

It was suggested that the source of warning (formal or informal) might be a decisive factor in influencing reactions and behaviour. A warning from friends and family might be perceived as more trustworthy than an official warning and hence would be more likely to be acted upon. Three-quarters received the warning from formal sources and only 17 per cent from informal networks. In Erlln, only official warnings were received but by a minority overall. For those who activated their informal networks, almost half had social networks that were exclusively locally based, hence they relied on people with presumably a similar stock of information and knowledge. In order to test if the source of information had any influence on the credibility of the warning, further analyses revealed that in fact respondents tended to place more trust in official *formal* sources of information and that those who received warnings from informal networks were more likely to seek further confirming information than those receiving official warnings; these differences were highly significant.

The speed of flood onset is interesting and the response by respondents is at first glance counter-intuitive in that in locations where speed of onset was slow more people left their homes without taking actions to reduce damages than in locations where speed of onset was rapid. However, the tenure situation in Erlln and Sermuth appears to help explain why higher percentages of respondents in these areas took more actions. It has also been suggested that many of the residents of urban Eilenburg probably expected to be able to return to their homes with a few hours or days and had not in fact taken the warning seriously. In hindsight, almost two thirds of respondents said that they would do things differently should another flood happen, such as securing more of their belongings.

7.6.3 Resistance and coping

In the case study surveys, “resistance” before the flood event was measured only indirectly, via material vulnerability; how people tried to reduce the damages in the long term (precautionary measures) and immediately before the flood (ad-hoc activities). Coping mostly covers the receipt of support and help from others.

In total, 98 per cent of respondents were directly affected by flood waters in their homes, but length of inundation differed in different locations (mean 3-12 days, longest in Eilenburg KMS) and 97 per cent suffered material damage. Losses were variable: in Erlln and Eilenburg KMS most reported monetary losses, although some caution is needed with the data supplied. Renters were significantly less affected than owners both with respect to buildings and contents. Neither long-term precautionary measures, ad hoc activities, nor receipt of a warning led to significant decreases in damages. In some cases damages were higher where some of these measures had been applied.

Information and uncertainty

People in Sermuth and Erlln felt considerably less informed than those in Eilenburg. For example, there was much uncertainty over the expected duration of the flood and when people could return home. Again this suggests that the warning and evacuation in Eilenburg was managed more appropriately, possibly because it was an urban area with more resources. People under 30 were more uncertain about the information received compared with older people aged 60 plus. A possible explanation is that the younger cohorts were more critical of information policy and wanted to express their dissatisfaction with the information flow during the flood.

Family and friends (informal networks) were the most useful sources for gathering information during the flood. But also fire brigades and the THW played an important part. However, if one regroups the answers with respect to the distinction “formal” versus “informal” networks, the picture becomes more diversified: The majority of the respondents (40 per cent) received their most useful information by both formal and informal networks. Again, there are differences between the research locations: in Erlln most people received most useful information from formal organisations (including the municipality; 64 per cent); in the four other localities, the information channels were more mixed.

Those in Erlln and Sermuth relied on the lowest number of different sources of information compared with Eilenburg. This indicates that social networks matter with regard to receipt of information. Network size also needs to be taken into account. People who did not receive any useful information have significantly smaller networks (despite the limitation to nominate just three persons) than people who were informed by any source (network size: 2.2 vs. 2.6). Secondly, when regarding the quality of social networks, further substantiation of the hypothesis that people with exclusively local networks were endangered by relying on people with presumably a similar stock of information and tacit knowledge can be reported: while 40 per cent of the respondents who answered that “no one” provided them with important information have exclusively local networks, only 28 per cent of those who had any information source (irrespective of its formal degree) relied solely on local networks. These local networks are predominantly built upon kin. As for flood information, data analysis reveals that respondents with exclusively local networks also had a significantly lower number of information resources than people also relying on contacts from outside the area. Thirdly, also people with contacts exclusively from beyond the district (*Landkreis*), hence those with supra-regional networks, were more likely to receive no useful information at all.

Help and support

Of particular importance with regard to the ability to cope with and resist hazards is the question of how those that are not in a position to cope with the situation on their own are supported by other people. Households with dependent persons (all households with children under 18 years and ill or handicapped persons) with respect to certain actors (volunteers, fire brigades/THW and municipality) reported receiving significantly less help than people who do not need to take care of dependent persons, but this is not the overall picture. If all sources are taken together (by an additive index of help, with 0=minimal support, 34=maximum support), there are no differences between these two groups. Rather, age, professional situation, formal qualification and the existence of certain social relations matter.

Informal networks were the most important resources for coping with the flood – family and kin, followed by friends, neighbours and colleagues, then volunteers and finally official sources. However, different respondents appeared to interpret this differently, some referring to help during the flood and others after the flood during recovery. The findings should not be misinterpreted in the sense of blaming certain groups of actors (such as the respective local authorities), since most of the actors nominated have different functions in the course of a disastrous event, and some are also more “visible” (and impressive) than others (for example fire brigades, THW and army with their technical equipment).

There is evidence that the elderly received significantly less support than younger residents. However, it is not a linear relationship but rather a group-specific vulnerability; it is in particular the group of residents over the age of 60 who received less help from the different sources. But there is no straightforward explanation for this result. On the one hand, it might be due to fewer social contacts in general because of their exclusion from important societal spheres (such as the labour market). This assumption is further substantiated by the fact that retired people received significantly less support than both people economically active and unemployed. But on the other hand, there is evidence that social networks played no major part in activating support. The correlation between the size of the social network and the amount of help is significant but weak. Quality or geographical range of these networks are important only in the sense that people with predominantly non-local contacts received more help than others, which at first glance is rather counterintuitive. However, one might argue that they were also more dependent upon this support. Finally, people committed to a local association and/or the fire brigade were prone to a higher degree of support (significant in the case of fire brigade. Hence, it was rather specific networks (and not necessarily the strong ties) which allowed for access to more help.

As might be expected, location also accounts for some variance. Erlln, Eilenburg KMS and Hainichen (high level of support) are to be distinguished from Eilenburg centre and Sermuth (low level). This is not in line with other results but, instead, the picture becomes even more differentiated with respect to the flood performance of, and in, the single localities. Finally, people with a lower degree of formal qualification tend to have received less support than people with better qualifications and, presumably, more abilities also to demand help and to contact the right actors at the right moment.

7.6.4 Recovery and reconstruction

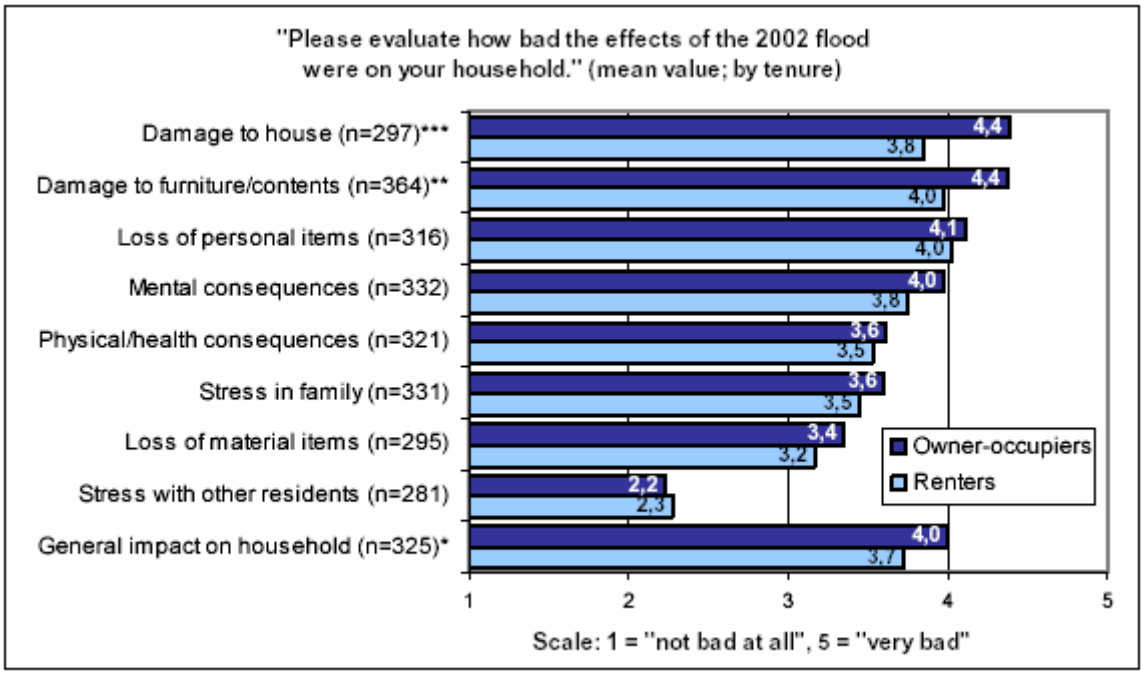
This phase of the flood entails mental recovery and physical reconstruction efforts as well as the subjective and inter-subjective abilities of the different households to cope with the long-term consequences of the event. The recovery phase comprises a return

to “normalcy”, which, beside other things, also contains the contingency of a new hazard.

Perceived flood impact

When asked about the impacts of the 2002 flood (more than three years after the event), Figure 7.2 shows that damage to the house and furniture were evaluated as the worst effects. However, the personal consequences (both with respect to physical and mental health) are also regarded as effects difficult to cope with in the long term. Material losses (which were mostly compensated) are of minor importance. With regard to the effects on the house and the furniture, tenure and gender significantly influence the perception of the effects: owner-occupiers and men tend to evaluate the losses related to the building and its contents significantly worse than renters and women, respectively. Except for the category “stress with other residents”, owner-occupiers in all dimensions perceive the consequences as worse than renters. Overall, location, age and tenure appeared to be the key factors influencing perception of overall flood impact. A higher proportion of residents in Eilenburg KMS perceived the flood events to be very severe than in other locations, but this may be related to the fact that they were evacuated for the longest period of time. When looking at health impacts, the mental health effects were rated higher than physical health by all ages, with those under 30 giving the lowest ratings for both (Figure 7.3). Owner-occupiers evaluated such impacts as being more severe than renters.

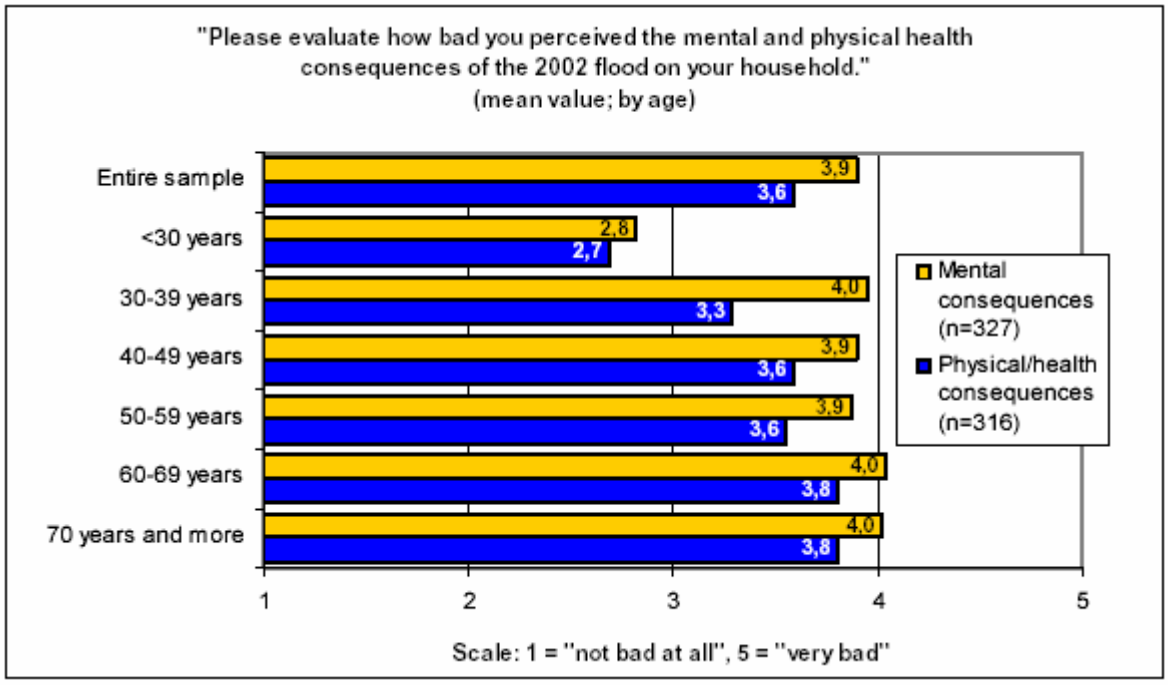
Figure 7.2: Perceived impacts of the 2002 flood



(* p<0.05, ** p<0.01, *** p<0.001; T-test)

Source: Steinführer and Kuhlicke, 2007

Figure 7.3: Perceived impact by age



Source: Steinführer and Kuhlicke, 2007

Compensation and support

A key factor in response to the 2002 flooding was the compensation paid to all flooded residents by the public authorities. Although compensation following previous floods had only covered a small percentage of damages (around 10 per cent following the

1993 Rhine flood), in total more than 100 per cent of flood damages were paid following the 2002 event – a situation without precedent in German flood history, and partly associated with the local political situation. This was termed the *Sonderfonds Wiederaufauhilfe* or Reconstruction Fund. Thus, in the surveys almost half of respondents stated that they were either satisfied or very satisfied with material compensation, and only 18 per cent reported being rather or completely dissatisfied.

Compensation payments were also made by private donors and the European Union and many people were supported by their existing social networks (*alteri*). The latter were seen to particularly come into force in the aftermath of the flood, as illustrated in Table 7.4 which shows the number of people receiving support from others. Thus, the majority of people activated at least part of their social networks during the recovery phase.

Table 7.4: Post-flood support by social networks

	Person 1 (N=365)	Person 2 (N=338)	Person 3 (N=302)	All *alteri* (N=1,005)
Number of *alteri* providing support	263	239	205	707
Alteri themselves affected by flood (among them: providing support)	39 (15)	34 (10)	30 (11)	103 (36)
Proportion of *alteri* providing support	72%	71%	68%	70%
Types of support (multiple answers possible):				
Reconstruction/clearance work	110	101	80	291
Provision of accommodation	52	42	28	122
Mental support	35	29	35	99
Financial and material support	33	38	25	96
Other (catering, child care, organisational help etc.)	60	72	62	194

Source: Steinführer and Kuhlicke, 2007

However, when those *alteri* providing support were also affected by the flood (around 10 per cent), they could not provide support to respondents during the recovery phase. As most of these social networks were local this further illustrates the "weakness of local ties". However, for the majority of respondents who reported only one person on whom they could call for support as opposed to those with two or three strong ties, these people were able to activate this support in three-quarters of cases compared with around half of those with larger networks. This indicates that people with smaller social networks are not necessarily more vulnerable in receiving support than others. Moreover, those in rural or quasi-rural areas were better able to activate their networks than those in Eilenburg. The group that was less able to activate its support networks were those with networks based exclusively outside the local region. Key social groups who were more likely not to receive support from their social networks were one-parent and low-income households, and those with low formal qualifications, but not – as might be assumed – the elderly.

7.6.5 Post-flood preparedness

In contrast to before the flood, following the flood, a much higher proportion of respondents reported taking preparedness measures for future flooding (39 versus 15 per cent before the flood). However, there was no evidence for simple cause-response behaviour, as the majority of people had still not taken any measures. Table 7.5 shows the application of preparedness measures after the flood. Tenure was the most

significant factor in influencing preparedness measures, with 43 per cent of owner-occupiers taking measures compared with 27 per cent of renters. Owner-occupier measures largely involved changes to the building itself or to insurance cover while renters made changes to furniture or interior fittings and behaviour. Higher numbers of respondents in rural areas had applied measures due to the higher rates of home ownership in these areas.

Table 7.5: Preparedness measures applied following flood (n = 155)

Type	Examples for type of measure	Applied by
Evasion*	Elevated configuration and/or shielding with water barriers	10%
Resisting	Waterproof sealing and/or fortification of cellar and basis	12%
Drawback	Adapted use and/or interior fitting of the flood endangered storeys	30%
Securing	Safeguarding of hazardous substances	8%
Behaviour	Food, medicine, sandbags, phone numbers at home	12%
Insurance	Specific flood-insurance	26%

* "Evasion" also includes moving to another place (as far as a respondent also mentioned this step as a precautionary measure). The reason is that the entire household is then out of the hazard's way.

Source: Steinführer and Kuhlicke, 2007

Age and gender were also significant in post-flood preparedness. Both the very young and very old applied relatively fewer measures than those aged between 30 and 50, and more men than women reported applying measures (43 versus 33 per cent); however, these differences may reflect who completed the questionnaire.

The majority of respondents said that their awareness of flood hazards had improved following the flood; however, no simple cause-effect relation between damages and traumatic flood experience, awareness and, in particular, preparedness was found. When looking at levels of trust in local authorities following the flood, respondents in all locations showed some increase in trust, with those in Erlln reporting significantly higher levels than elsewhere. In comparison, Erlln respondents reported slightly lower levels of solidarity along residents following the flood than those in other locations which showed improved solidarity. Formal support networks appeared to be more trustworthy for many respondents than informal networks, particularly with regard to information provision.

7.6.6 Risk constructions

It is now widely accepted that 'risk' is not one consistent and agreed phenomenon which can be measured, assessed and communicated in universal terms (see Twigger-Ross et al. 2008)s). Generally, the field of risk perception is well established within psychology and social psychology (Slovic 2003; Sjöberg 2000). Slovic (2003) has written of risk assessment as an inherently subjective process, an exercise in power where "*danger is real but risk is socially constructed*". Moreover, social scientists have increasingly pointed to problems with studying individuals 'out of context' in isolation from social, economic and political factors that impact on perception, decision-making and courses of action. Risk is thus socially constructed in the sense that norms and values, as well as belief systems and previous experiences, influence and possibly

define it for the individual; it is neither objectively given nor predetermined by special structures such as age or social group.

The aims of this aspect of the research were to investigate how people perceive flood risk, how this perception may have changed through the 2002 event, and how people perceive the usefulness of, and for responsibility for, different protection and precautionary measures. A key question was how risk perception may influence the application of private precautionary measures. A common assumption is that perception of risk will stimulate a precautionary response or that lack of action is correlated with a low level of perceived risk (Sjöberg, 2000). However, Grothmann and Reusswig (2006) have illustrated that the situation is more complex than this. Empirical investigations in Germany have shown that people are rather reluctant to accept responsibility for individual mitigation efforts (Felgentreff 2000; Felgentreff 2003; Kreibich *et al.* 2005). Sjöberg (2000) divided risk into the dimensions of probability and consequences and concluded that risk reducing actions, such as precautionary measures, are largely driven by the severity of consequences and not the probability of the event. Several hypotheses were thus developed and tested in the research:

- If people perceive another flood like that of 2002 to be likely, they will be more inclined to apply precautionary measures.
- The more people perceive their household to be threatened by another flood, the more likely they are to apply precautionary measures.
- People who regard private precautionary measures as useful apply more of these measures.
- People who feel better informed about precautionary measures apply more measures after a flood than people who feel less informed.

Risk perception before and after the 2002 flood

Respondents were asked to what extent their municipality, home and personal life were threatened by a flood. Before the flood, almost 90 per cent of respondents had not thought that they would experience a flood as severe as that of 2002. After the flood, this perception had changed and almost 70 per cent felt that such a flood, or even a worse flood, was again possible. Figure 7.4 shows the perception of flood hazard with regard to people's lives, their home and their town or village. Although around 60 per cent felt that their homes and towns/villages were at risk, the perceived risk to life from such events was perceived to be low. Residents of urban Eilenburg were the least threatened with respect to their homes, while owner-occupiers felt that their homes were more threatened than renters. Those who perceived the recurrence of an event on the scale of 2002 as likely in the future applied more precautionary measures after the flood than those who did not think a recurrence likely. However, people who perceived *the building where they lived* to be very threatened applied fewer precautionary measures after the flood than those who felt less threatened.

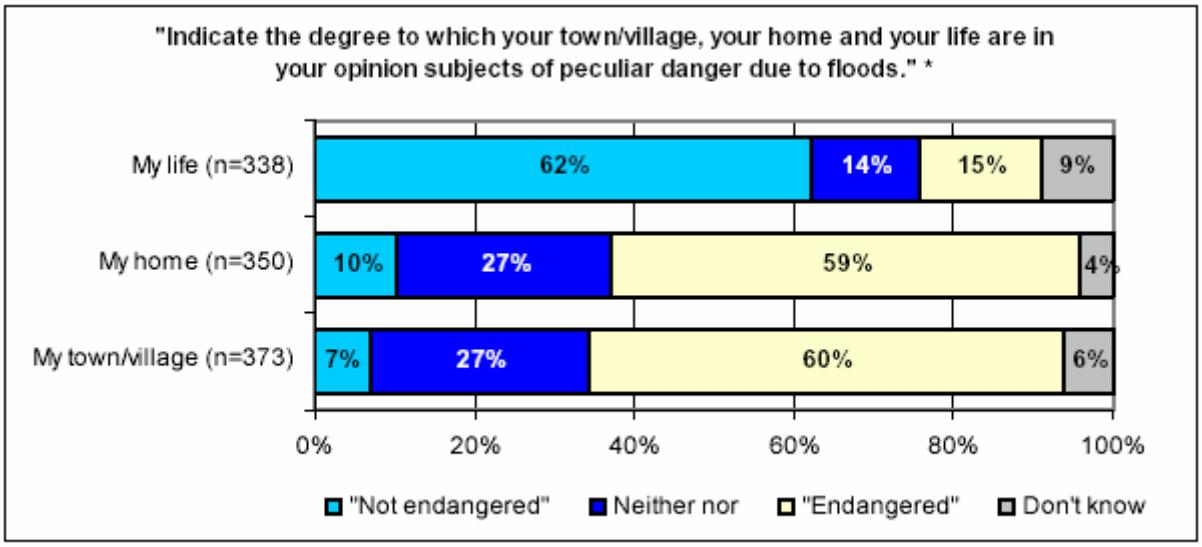
Private and public mitigation measures

In all locations, respondents perceived the collective level of preparedness of the local community as much lower than their own individual level. As current flood risk management places an emphasis on a range of management options, including structural and non-structural measures, the research wanted to investigate how people perceive the usefulness of and responsibility for different protection and mitigation measures. Respondents were introduced to a range of different measures and asked to indicate the degree to which they thought these measures were useful or not. Figure 7.5 shows that most proposed measures were rated as very useful, irrespective of their structural or non-structural character. However, it is also striking that measures based on individual actions (like private mitigation measures and public disaster drills) were

rated as *least* useful. This was interpreted as a first sign that people at risk do not necessarily share the responsibility the new paradigm of flood risk management attributes to them.

The high proportion of respondents citing the extension of warning period as useful is probably a result of criticism of the ineffectiveness of the warning received. Public mitigation measures were generally seen to be more useful than private measures. There was no linear relation between socio-economic status and the meaning attributed to private mitigation measures, and the repair of dykes was also regarded as useful by all social groups.

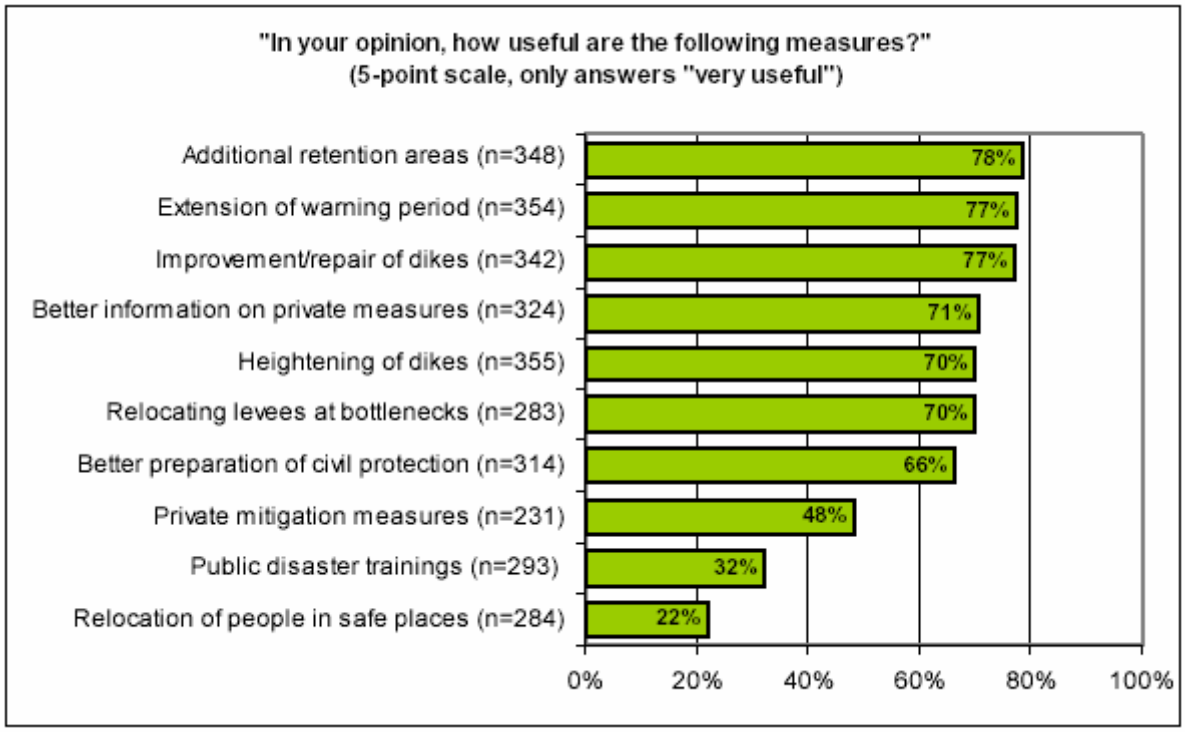
Figure 7.4: Perception of flood hazard



* Original scale (1–5) merged to 3 categories

Source: Steinführer and Kuhlicke, 2007

Figure 7.5: Usefulness of different management measures



Source: Steinführer and Kuhlicke, 2007

Surprisingly, renters ranked ‘information about private mitigation measures’ significantly higher than owner-occupiers but formal education had a negative effect. It could be that those with a high formal education might consider improvement of information as less useful because they already have access to this information. On the other hand, they might be critical in what they think about the general sense of such measures, a theory which could be justified by the fact that precautionary measures did not lead to decreasing damages during the 2002 flood. It should be noted that the reason that the relocation of people and entire communities showed the least usefulness is not surprising given that in the area where the research locations are situated many villages had forcibly been relocated in the last century due to mining activities. Therefore, the word “relocation” carries very negative connotations and is also part of real life for many of the inhabitants.

Findings showed that those people feeling better prepared for a possible future flood also feel better informed. Moreover, gender, tenure, age and formal education were shown to be significant factors affecting response. Men, owner-occupiers and those with medium/high levels of education feel significantly better informed about private precautionary measures, and retired people and those with low incomes feel less informed. This has implications for the new flood protection law, since the well educated and wealthier are more informed about the possibility of applying precautionary measures while other groups are at more of a disadvantage. A similar picture emerged when considering attitudes towards public protection measures.

There is a high degree of unanimity in favour of the sense of security and damage reduction that structural devices provide; however, uncertainty is high specifically with regard to the actual efficiency of these measures: 30 per cent did not feel able to judge whether the costs for their construction and maintenance are justified or not compared with the benefits. However, around half of respondents disagreed with the statement that dikes and structural measures are too expensive, and 30% did not know. A closer look at certain social groups reveals that in particular formal qualification and age are crucial for interpreting these assessments, with the better educated and the younger

being much more sceptical of the capabilities of public protection measures than people with lower degrees of formal education and, partly overlapping with the first group, the elderly.

Perceptions of new Saxon Water Law

With reference to the new Water Law in Saxony mentioned earlier, respondents in the study were given the statement: “The new Water Law of Saxony will include the phrase: ‘Everybody who is prone to flood hazards is obliged to implement mitigation measures in accordance with his possibilities and abilities’ and asked if they thought that this law is reasonable. The reason for asking this was threefold. Firstly, pre-survey interviews and the pilot phase of the questionnaire survey showed that many people living in floodplains were not aware of the existence of the law. Secondly, it seemed more promising to ask a question which is directly linked to the real lives of the people in the sense that the law addresses the respondents directly. Thirdly, most people were not aware of the very concept of private precautionary measures, as many interviews and the pre-test pilot study showed.

The majority of people (40 per cent) regarded the law as unreasonable, 27 per cent thought the opposite, and 32 per cent could not answer the question. There were no significant differences among the tested socio-economic variables, except that owner-occupiers were more inclined to evaluate the new law as more unreasonable than renters. Hence, perhaps unsurprisingly, those potentially more forced to implement and finance such measures are also most critical about the new law. However, it seems important to point out that people who think this law is reasonable and thus - more or less - agree with the demand to mitigate damages by private precautionary measures, applied such measures significantly more often. The main reasons given for the law not being reasonable were that: “the single citizen is unable to do anything”, people did not know what to do, the definition of the law is imprecise, and that flood protection is a public duty.

Responses were further compiled into the following three categories (including the ‘don’t knows’) regardless of whether the respondents agreed with the law or not:

- Answers pointing to an excessive demand (overload) of the individual, either because of missing information, knowledge or resources.
- Answers taking such an approach as a matter of course, hence regarding flood protection not exclusively, but also as a private task.
- Answers underlining that flood protection is understood not as a duty of the individual but rather as a public responsibility.

This last typology follows the hypothesis of an “individualisation of risk” which was introduced above where flood protection is no longer a public duty, but in some parts increasingly to be regarded as a task for the individual. Results showed that the majority of respondents understand the new flood management requirements as something going beyond the individual’s responsibility or ability. The respondents felt that financial burden for flood protection should largely fall upon the public authorities at the national, state and municipal levels in that order (Figure7.6). Out of the tested socio-economic variables, only tenure was significant. Owner-occupiers ascribed a significantly lower financial contribution to flood risk management to the citizens in flood-prone areas than renters.

Table 7.6: Opinions on the new Saxon Water Law

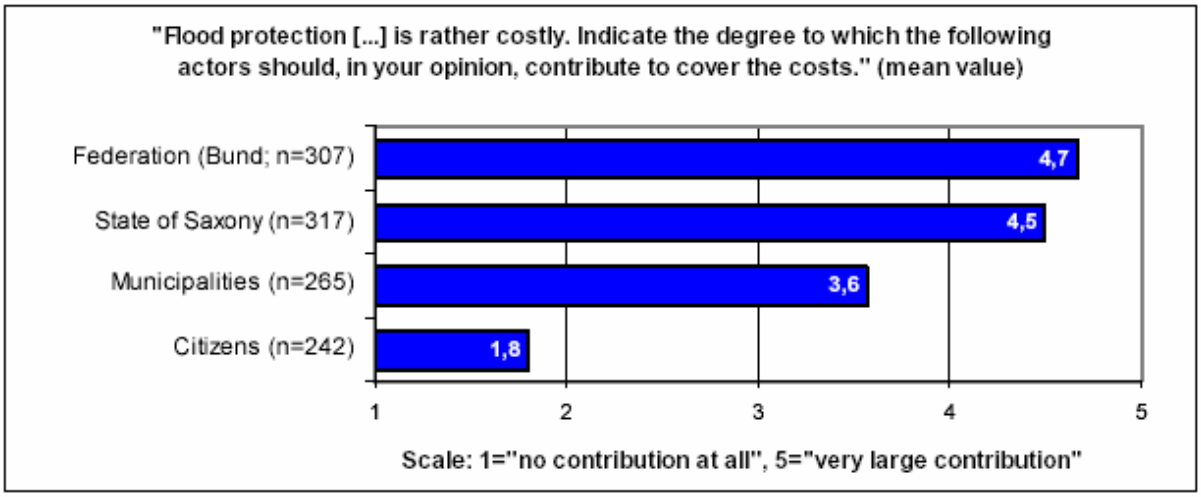
	New law reasonable (n=34)	New law not reasonable (n=87)	Don't know (n=12)	All (n=133)
Flood protection: excessive demand (overload) of citizens	–	71%	83%	54%
Flood protection: also citizens' task	100%	14%	8%	35%
Flood protection: public responsibility	–	15%	8%	11%

Source: Steinführer and Kuhlicke, 2007

7.6.7 Causes of the 2002 flood and individual classifications of risk

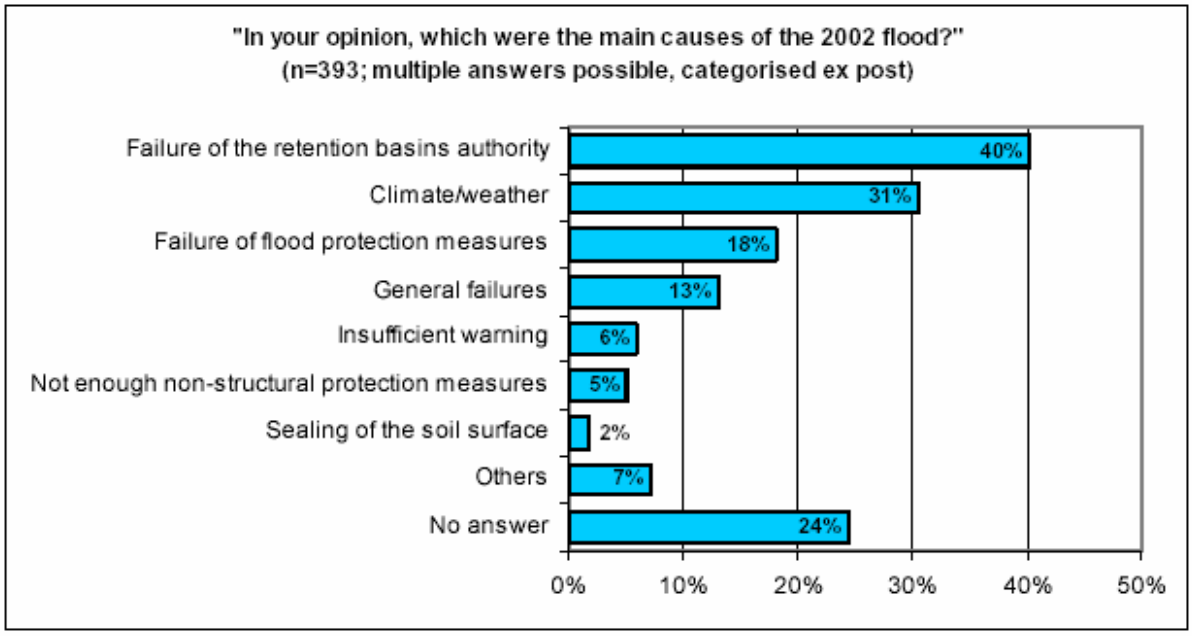
People's perception of their ability to protect themselves may also be related to what they perceive to be the cause of flooding. For the 2002 flood, the highest proportion of responses blamed the retention basins authority and the weather (Figure 7.7). Reasons given included: insufficient, wrong or no information provided before and during the flood and no or late warning. Causes were therefore attributed to an authority being to blame, to technical failure or to nature.

Figure 7.6: Perception of cost distribution for flood protection



Source: Steinführer and Kuhlicke, 2007

Figure 7.7: Causes of the 2002 flood



Source: Steinführer and Kuhlicke, 2007

When respondents were asked if, in the event of a flood identical to 2002, they would do anything differently, 62 per cent of respondents said they would, although there were variations by location (see Table 7.7). People related their answers mostly to their actions shortly *before* the flood wave inundated the different localities. Almost all of those who did nothing after they received information of a possible flood stated that they would act differently (92 per cent), compared to 60 per cent of those who secured belongings. Those with high education levels generally indicated they would behave differently next time, taking actions such as: securing more belongings (58 per cent) or specific items (24 per cent) and/or the entire building (six per cent).

Table 7.7: Would you do anything differently next time? (n=305)

	Erlln (n=14)	Sermuth (n=44)	Eilenburg centre (n=196)	Eilenburg KMS (n=42)	Eilenburg Hainichen (n=11)
Would do something differently	57%	71%	72%	71%	91%
Would not do anything differently	43%	29%	28%	29%	9%

Source: Steinführer and Kuhlicke, 2007

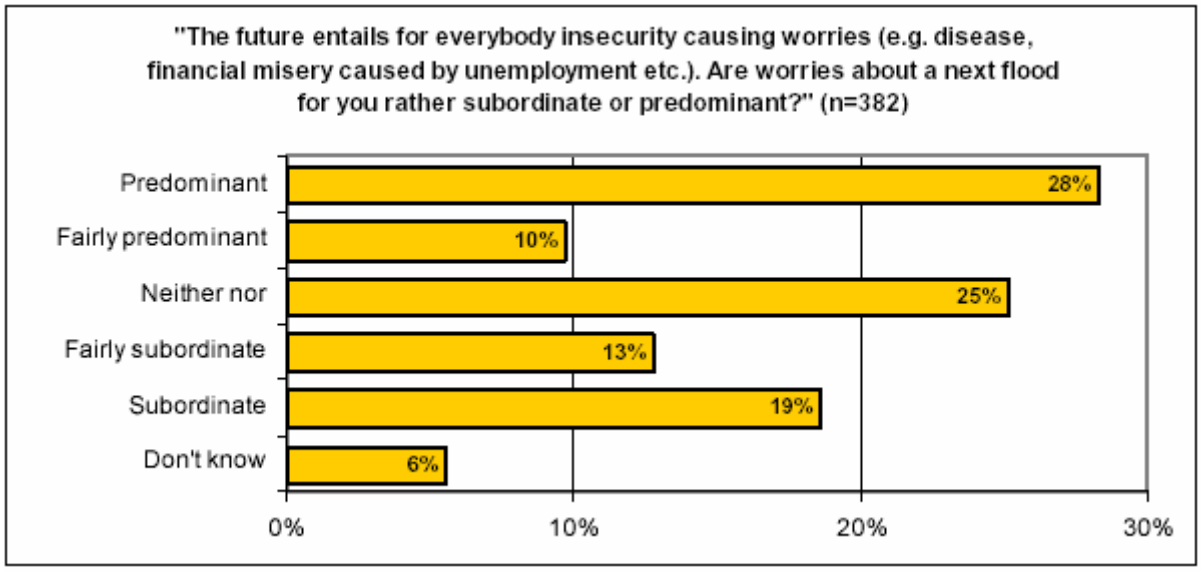
In a separate question on lessons learnt from the 2002 flood, answers ranged from having more trust in oneself and one's own decisions (instead of relying on public institutions) (14 per cent), taking the danger more seriously and securing more possessions (14 per cent), increased risk awareness (10 per cent), and being more prepared (with insurance, adapted fittings and so on) (six per cent).

Finally, respondents were asked whether worries about floods dominate people's minds or whether other problems are more important. According to Figure 7.8, floods are a relatively important issue to just over a quarter of respondents in comparison with

other worries. However, this was the last in a long chain of questions only referring to floods. The answers would have been more balanced if this question had been asked at the beginning of the questionnaire.

When taking a closer look at the respondents for whom floods are a worry of specific relevance, this was seen to be the case for those in the following social groupings: elderly people (in contrast with the very young), respondents with low formal education, and those who feel their dwellings as well as their lives may be threatened by a flood.

Figure 7.8: Worries about floods and other risks



Source: Steinführer and Kuhlicke, 2007

7.7 Summary and conclusions

In summarising the key findings of the research relating to responses to flooding the following can be highlighted:

- Networks of strong ties potentially provide important resources to draw upon in response to a flood event, however, these resources may be weakened if they too experience the flooding.

- People who did not receive any useful information prior to flooding have significantly smaller social networks than people who were informed by any source.

- People with exclusively local networks were endangered by relying on a similar stock of information and knowledge.

- Informal networks were the most important resources for coping with the flood. There is no evidence that social networks generally played a major role in activating support, however, specific networks like membership of local associations reported influencing increased levels of support.

- A minority of respondents reported taking precautionary measures before the flood, the main measures being obtaining sandbags, having insurance or securing property. This proportion increased following the flood but the majority

of respondents still took no precautionary measures, despite 70 percent perceiving future flooding as possible.

- Tenure arrangements, age and income were key factors affecting insurance take up and owner-occupiers took more measures before and after the flood than renters. Gender was also significant in post-flood preparedness.

- More trust was placed in formal sources of information than informal, while those receiving the latter were more inclined to seek further confirmation of flooding.

- Younger people (under 30) were more uncertain and critical about information received compared with people aged over 60.

- No respondents aged over 59 had consulted the website which hosts river level information before the flood.

- Households with dependent persons reported receiving significantly less help than households with no dependents; age, occupation and education were also factors affecting support.

- Those who felt better prepared for a future flood also felt better informed. However, only 38 per cent reported worry about future floods being predominant or fairly predominant over other worries.

- Receipt of full government compensation played an important part in recovery.

- Additional storage areas, extension of warning periods, improvements of dykes and better information on private measures were seen as the most useful mitigation measures followed by better preparation for civil protection – thus, public mitigation measures were seen as more useful than private measures.

- The majority of respondents were not aware of the new Water Law. Owner-occupiers were more critical of the law than renters.

- Location and local context were key factors affecting results.

Thus, in conclusion, there appears to be no linear relationship between “being affected”, “being aware” and “being prepared” for a flood. Although the level of precautionary measures applied by respondents increased in the aftermath of the 2002 flood, this should not be interpreted as a simple cause-reaction chain. Rather, many respondents either doubt about the sensitivity, usefulness or meaning of private pre-flood measures or they do not feel responsible for taking actions in this direction. The appraisal of local and regional structural measures, their efficiency and benefits is very high. Residents at risk do not refuse non-structural measures like land use changes, at least as long as they are not affected by such measures themselves. However, the distinction between structural and non-structural measures which is regularly made by flood “experts” proved not to be meaningful for respondents – what is highly meaningful in their perceptions is the dividing line between public and private responsibility. This has implications for the much discussed paradigm shift “from flood protection to flood risk management” which means significantly greater responsibility for the individual, and generally most respondents have a critical stance towards such an individualisation of risk. The example of the new Water Law in Saxony in 2004 is a good illustration as the majority of respondents perceive these new legal regulations as an excessive demand on citizens living in the floodplains. The adoption of the new law

in Saxony has largely taken place without first informing people of the existence of such a law and its implications. Although no such law has been introduced in England and Wales, there are parallels with Defra's (2005) *Making Space for Water* policy which advocates more personal responsibility, while the majority of the public are still largely unaware of this.

Finally, the results point to a significantly lower degree of information about private precautionary measures, in particular among elderly persons, people with a low formal education or a low income. These findings are important since they allow the development of a further critical perspective towards the recent discourse on flood risk management. While a holistic flood risk management approach is relatively well established within the scientific community, the results from the research reveal a different picture with regard to the local population: here traditional associations of flood protection, both its structure (technical defence) and the bodies that are responsible (public authorities) dominate. Thus a gap of knowledge between the scientific community on the one hand and the local population on the other hand is apparent.

7.8 Relevance of German case study to England and Wales

Despite the cultural, political and organisational differences between England and Wales and Germany, the findings of the German case study are useful in highlighting similar issues to be addressed in England and Wales.

Firstly, the lack of formal and precise flood warnings was highlighted as a key factor affecting response by respondents, with longer warning lead times seen as desirable where possible. The importance of raising flood risk awareness, increasing preparedness and changing behaviour, particularly where there has been no recent flooding, is also highlighted, although it should not be assumed that awareness necessarily leads to preparedness. Findings also support evidence from Work Package 1 which emphasises knowledge of, and working with, local communities in raising awareness and preparedness. Moreover, vulnerable groups within communities need to be identified and better targeted when issuing flood warnings. Increasing the capacity of more vulnerable households to respond to flooding by increasing social networks, possibly through encouraging the membership of local flood action groups, can also be suggested, although no socio-economic group *per se* was identified as being vulnerable across all phases of a flood event.

Moreover, the findings illustrate that different types of preparedness actions or responses may be appropriate for different types of people in different flood risk situations, for example between owners-occupiers and renters, rural and urban areas. Results also highlighted the need for various information methods which do not involve the use of the internet, to which a high proportion of the population still do not have access. Finally, there is a need to raise awareness of residual risk with regard to structural mitigation measures and to further raise awareness of non-structural measures and the policy of *Making Space for Water* and address the gap in knowledge between the scientific community on the one hand and local communities on the other.

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List of abbreviations

BRBM	British Market Research Bureau
FHRC	Flood Hazard Research Centre
FWD	Floodline Warnings Direct
HPA	Health Protection Agency
LRF	Local Resilience Forum
SFVI	Social Flood Vulnerability Index

Appendix 1: Appropriate actions list[25]

What is appropriate action in response to flooding?
Appropriate action is defined as those 'at risk' taking action from **Category 4, 5, 6 or 7** in response to flooding. These appropriate actions have been specified following research and are listed in the table below:

Category	Action
1 - Do nothing	Do nothing
2 - Form own assessment of flood risk	Watch water levels
	Listen/watch out for warnings
	Listen to local/national radio/TV stations for further information
	Check the Environment Agency website
3 - Get advice about what to do	Contact friends and family for help or advice
	Contact Emergency Services (Police/Local Council)
	Contact the Environment Agency for further information (i.e. Floodline)
4 - Help others	Warn your neighbours
	Help neighbourhood/community prepare for flood
5 - Protect personal property	Move valuable/personal belongings upstairs or to a safe place
	Move property out of reach of the flood (i.e. put furniture/appliances on bricks or empty bottom shelves).
	Move cars to a safe place
6 - Take steps to minimise water entering the property	Block doorways/airbricks with sandbags etc
	Put flood boards or flood gates in place
	Block toilet
7 - Prepare and mobilise people/animals to a safe place: prepare to evacuate	Prepare to move pets/livestock to a safe place
	Keep track of family members and pets
	Take warm clothing and/or food/water and and/or medication with you to a safe place
	Move yourself or others in the household to a safe place
	Be prepared to be evacuated
	Switch off gas and/or electricity
	Be prepared for a loss of power (e.g. take a torch)
	Lock/secure home

[25] Environment Agency, *Frequently Asked Questions FRM*, v5 August 2006.

Appendix 2: Main findings and recommendations from the Stockbridge Pathfinder (Wilkinson *et al.*, 2005)

Main findings

The broader implications of this study for the Environment Agency's social policy, including for some of the initial questions in the Introduction, are explored in a series of companion reports. There are six key findings from this study which are directly relevant to the social dimension of the Environment Agency's role in post-flood support and in longer term flood prevention and management:

1. *Quality of aftercare*. The enlightened response of the emergency planning team at Bradford MBC appears to have been critical, firstly to the effective psychological and social recovery of the flood-affected community in Stockbridge; and secondly, to the development of positive and ongoing relationships between the Stockbridge NDG and key agencies including the Environment Agency.

2. *Development of "catchment consciousness"*. Many stakeholders pointed to the need to understand the causes of flooding across the whole catchment rather than simply by focusing on their own locality. This included recognition of the need to understand the ways in which water finds its way into rivers, and of the increasing risks of flooding outside as well as within functional flood plains. This points to a growing "catchment consciousness" - both within flood-affected communities, and on the part of local authorities and other agencies and the many networks that connect these. Flooding is currently a growing priority for a number of local authorities along the Aire catchment as well as for the Yorkshire and Humberside regional assembly.

3. *The need for systemic solutions*. The growing awareness of the systemic *causes* of flooding needs to be matched by systemic *solutions*. Thinking in terms of a "flood risk hierarchy" of solutions highlights the need to design solutions which start upstream, and the key role of farming and land use within this. Systemic thinking also highlights the many linkages between factors affecting flooding and those affecting water quality. The Water Framework Directive provides an important opportunity to promote catchment consciousness and to tackle these issues in a joined up way.

4. *The need to build "bridging capital".* The flood-affected communities and agencies who took part in this research are keen to contribute to catchment-wide solutions addressing both flooding and water quality issues. At the moment, however, many of the networks between these communities, agencies and others are restricted to within local authority boundaries. There is a growing recognition that systemic, catchment-wide solutions at the natural and technical (engineering) levels will need to be matched by catchment-wide institutional approaches. This will require the further development and interconnection of the existing networks within local authority boundaries, with much more attention given to the development of "bridging social capital".

5. *The role of the Environment Agency*. Within all of this, the role of the Environment Agency is key. The Environment Agency is in the unique position of being able to take a whole-catchment perspective across the full range of water functions and uses. There are major drivers already pushing it in this direction, including climate change modelling, the development of more strategic catchment flood management plans, and the Water Framework Directive, with its emphasis on integrated planning at River Basin District level. The role of the Environment Agency should be one of leadership, working closely with stakeholders to develop catchment-wide solutions based on catchment-wide analysis. But to do this the Environment Agency will need to take the lead in developing the necessary "bridging social capital", thereby linking up existing and embryonic local stakeholder networks.

6. *Flooding and regeneration - finding the right focus.* The Environment Agency needs to find the right focus around which to link stakeholder networks. Regeneration and the amenity value of water and rivers could act as a positive incentive to bring stakeholders together. This would serve to frame the negatives of flooding and flood risk management in a much more positive way. This mirrors the argument for making the connections between water quantity and quality wherever possible.

Recommendations

1. The Environment Agency should do more to learn from the very successful story of post flooding co-operation between agencies and local people described in this study. At the moment this 'knowledge' is largely confined to those who were involved. The lack of institutional learning is probably as great, and more important, on the local authority side. The Environment Agency's role in the aftermath was greatly facilitated by the work of the local authority in this case. Nationally, the Environment Agency should work with the LGA to describe and learn from this and other positive examples. This could then lead to guidance on the process and socio-psychological dynamics involved in effective relief and recovery following flooding events.

2. The Environment Agency will publish its stakeholder engagement strategy for River Basin Planning (WFD) for consultation in autumn 2004 and is looking to complement this with a similar strategic framework for stakeholder engagement in shoreline and catchment flood management planning. To support the development of both these strategies the Environment Agency should invest further in this pathfinder. This would provide a valuable opportunity to learn more about how it might develop "bridging capital" between the existing stakeholder networks within local authority boundaries. The study has already established an embryonic network of partners who would be willing to support the Environment Agency in this initiative. As a next step the Environment Agency could take the lead in bringing these partners together through a catchment-wide 'whole systems' event.

3. In investing further in this pathfinder, the Environment Agency should also consider opportunities to learn more about how its water-based leadership can make a contribution to sustainable regeneration and the development of sustainable communities within the region. In this it should consider working in partnership with Yorkshire Forward, which already has ambitious plans for regional regeneration (the so-called "urban renaissance towns" initiative) and has sponsored development approaches which have included innovative processes of public involvement.

4. As in the WFD Ribble Basin pilot study, some of the learning from such an initiative is likely to be specific to the unique institutional, social, economic and environmental conditions of the Aire catchment. But the Environment Agency should also explore how the learning emerging from such an initiative could be used more broadly: on the one hand to help shape national policies and frameworks, and on the other hand be spread to the unique conditions of other catchments and River Basins through learning networks.

Appendix 3: Focus Group Guides

Carlisle residents focus groups

Welcome by moderator, introduction of researchers and brief background to the focus groups/project (**5 mins**)

Our study is part of a national research project, part of which is about people's adjustment and adaptation to flood risk, which is being funded by the Environment Agency. The overall purpose of the project is to improve the way in which flood emergencies are managed in England and Wales. Talking to people in Carlisle about their own experiences of the 2005 flood, their views on the recovery process to date, and steps taken to deal with possible future floods is a small but crucial part of the study.

The study is needed because more and more people throughout the country are at risk of flooding, as the events of this summer have clearly shown. By gaining a better understanding of what has happened in Carlisle, we will be able to make practical recommendations to the Environment Agency and other relevant organisations to inform their policy and strategy development in flood risk management.

Round table introductions by participants and affiliations e.g. to FAGs

Individual/household awareness and preparedness before 2005 flood (10 mins)

We would now like you to think about before the flood in January 2005 …

- How aware were you before the flood of the possibility of flooding in your area? [Might relate to how long they had lived in area] If aware then follow up with "Why were you aware"? [This should lead to stories of any previous flooding]

- Were you registered on the Environment Agency's Floodline Warnings Direct system? If not is there any particular reason why not?

- Had you taken any other actions or precautions against flooding before 2005? For example:

  - Did you have flood insurance [buildings and contents]?
  - Were you registered on the Environment Agency's Floodline Warnings Direct? If not is there any particular reason why not?
  - Had you made any attempts at "flood proofing" your home? If yes, what?
  - Had you sought information about flooding before the 2005 flood? If so, where from and in what form? Did you find it useful?

- Did you have a Family Flood Plan?

Responses during 2005 flood

Now we would like to focus on what happened during the 2005 flood …

- How were you first made aware of the risk of flooding?

  - Environment Agency warning
  - Warning from other organisation
  - Warning from friends, family, neighbours
  - Water entering property
  - Local radio

- What actions, if any, did you take when you first realised that you might be flooded? [Could prompt: sought confirmation of flood from other source (which?); rang Floodline; sought advice/help from elsewhere; moved people/cars/pets to safety; moved household possessions; tried to stop water entering property etc]

- Were these actions effective?

- Did you receive help from anyone outside your household? If so who and what? [Emergency services, local authorities, friends, neighbours, family outside household, voluntary organisations etc]

- Was this help useful? Which was the most useful and why/how? What was not so useful, why/how?

- Did you have to evacuate your home? If so, did you do this spontaneously or were you requested to leave by the police or emergency services? Who was the evacuation organised by and when did it happen?

- How soon were you able to return to your home?

- What were the main problems that you had to deal with?

Since the 2005 flood (30 mins)

Now we would like to focus on things that have happened since the flood …

Since the 2005 flood what, if any, actions have you and your household taken to prepare for any future flooding? [Examples: also prompt for more details]

- Sought more information about flooding and flood risk from EA or others
- Taken out insurance + see below
- Registered for flood warnings with Environment Agency or minicom service
- Made a Family Flood Plan or Evacuation Plan
- Keep an eye on river levels/weather forecasts
- Obtained sandbags
- Adapted property in some way e.g. flood boards, non-return valves, pump
- Water-resistant plaster, joists etc,
- Changed furnishings to more flood resilient or those easier to move
- Moved belongings permanently out of reach of floodwaters
- Formed Flood Action Group
- Joined Flood Action Group
- Become a community flood warden
- Attended flood fair
- Attended public meeting
- Other?

- Were any grants available for any of these measures and did you take up these offers?

- Insurance: have you or anyone had problems in obtaining insurance cover or had any restrictions placed on future policies?

- If you have not taken any actions to prepare for future flooding, why is this?

- If you have not yet taken any actions, are you planning to take any in the future? If so which?

- Who in your household/community do you think was the most affected by the flooding, e.g. elderly, disabled, women, children, minority groups, those on low income? How were they affected?

- [If not raised in previous question] What effect did the flood have on the children in your household (where appropriate)? What has their response been?

- What, if any, do you think the long-term effects of the flooding have been or will be on your household?

- What do you think the most important/serious impacts have been or will be?

- Are there any things related to the flooding and recovery that you would have liked to do but which you have not been able to do for any reason? (Finances, legal, time, etc)

- In what ways would you say that your household has recovered, or not, from the flooding?

- Can you think of anything which acted as a barrier to your household's recovery? Were there any particular problems that you had to deal with?

- Were there things that really helped your household after the flood? Were there any key people or organisations that really helped?

- How prepared do you feel generally for another flood?

- How would you say the City Council, Environment Agency and other institutions are supporting you and the local community in preparing for floods?

- How do you think the City Council, Environment Agency and other institutions could support you and the local community in preparing for floods?

Questions relating to community recovery and preparedness (20 mins)

We would now like to focus the discussion on the local community and how it has responded to the flooding …

- Has the *local community* taken any specific actions since the flooding to adapt or prepare for any future flooding? If so what are these and how successful do

you think they have been/will be? For example, does the community have a Flood Plan or Evacuation Plan now?

- How has *the city as a whole* gone about preparing for the possibility of a future flood? What preparations are you aware of, who has made them?

- Do you think these preparations or arrangements are likely to improve the resilience of the community to flooding? If yes, in what way, if no, why not?

- How prepared do you feel your community is for another flood?

- Has the flooding resulted in any changes to your local community – both to people and to the place itself, both positive and negative/good or bad? If so what have these been?

- What more do you feel could have been done (or still could be done) by the community or others to aid flood recovery or prepare for future flooding? Who could do this?

- What, if any, do you think the long-term effects of the flooding have been or will be on your local community?

- Would you say that the local community has “recovered”? What does that mean to you?

- How do people generally talk about what has happened since the flood? What kinds of things do they say and focus on?

- What if anything do you feel acted as barriers to your community recovering from the flooding?

- Also, what if anything was an aid to your community recovering from the flooding?

- Does the local community feel any different since the flood? If so explain how.

- In your opinion, has the flood brought the community together? In what ways?

- In your opinion, has the flood created divisions within the local community? Specify.

Flood protection/flood risk management (15 mins)

Finally, we would like to ask what you think about flood protection and managing flood risk generally …

- Who do you think is responsible for flood protection and why? National/local government, EA, individual households/businesses? Do you think that is about right? Or should there be more responsibility on certain bodies than others?

- What do you think the role of the government, EA, local authorities should be?

- Do you think that climate change will mean that we have to change the way we live in the future? If yes, in what ways? How do you think that will affect you and your household?

- Is there anything else that you would like to raise that we have not already discussed?

End of meeting – complete demographic questionnaires – pay participants.

Thank participants.

Carlisle business focus group

Welcome by moderator, introduction of researchers and brief background to the focus groups/project (**5 mins**)

Our study is part of a national research project, part of which is about people's adjustment and adaptation to flood risk, which is being funded by the Environment Agency. The overall purpose of the project is to improve the way in which flood emergencies are managed in England and Wales. Talking to people in Carlisle about their own experiences of the 2005 flood, their views on the recovery process to date, and steps taken to deal with possible future floods is a small but crucial part of the study.

The study is needed because more and more people throughout the country are at risk of flooding, as the events of this summer have clearly shown. By gaining a better understanding of what has happened in Carlisle, we will be able to make practical recommendations to the Environment Agency and other relevant organisations to inform their policy and strategy development in flood risk management.

Round table introductions by participants and affiliations

Awareness and preparedness before 2005 flood (10 mins)

We would now like you to think about before the flood in January 2005 …

How aware were you before the flood of the possibility of flooding in your area? [Might relate to how long they had lived/worked in area] If aware, then follow up with "Why were you aware?" [This should lead on to stories of any previous flooding]

- Had you taken any actions or precautions against flooding before 2005? For example:

    - Did you have flood insurance [buildings and contents]?
    - Were you registered on the Environment Agency's Floodline Warnings Direct? If not is there any particular reason why not?
    - Had you made any attempts at "flood proofing" your premises? If yes, what?
    - Had you sought any information about flooding before the 2005 flood? If so, where from and in what form? Did you find it useful?

- Did you have any general business contingency plan in place in case of emergencies, written or unwritten? If yes, were any specifically for flooding?

Responses during 2005 flood (20 mins)

Now we would like to focus on what happened during the 2005 flood …

- How were you first made aware of the risk of flooding?
    - Environment Agency warning
    - Warning from other organisation
    - Warning from other businesses
    - Water entering the building
    - Local radio
- What actions, if any, did you take when you first realised that you might be flooded? [Could prompt: sought confirmation of flood from other source (which?); rang Floodline; sought advice/help from elsewhere; moved staff/clients/cars to safety; moved stock or goods; tried to stop water entering property etc]

- Were these actions effective?

- Did you receive help from anyone outside your business? If so who and what? [Emergency services, local authorities, neighbouring businesses, etc]

- Was this help useful? Which was the most useful and why/how? What was not so useful, why/how?

- Did you have to evacuate the premises? If so, did you do this spontaneously or were you requested to evacuate by the police or emergency services? Who was the evacuation organised by? When did it happen?

- How soon was it before you were able to return to the premises?

- What were the main problems that you had to deal with and how did you deal with them? [Nowhere to move goods to, additional costs incurred as a result of the flooding (transportation or transferring equipment around, extra staff costs, repair and clean up costs, renting alternative premises, advertising return to trading, health impacts on staff), loss of goodwill etc]

Since the 2005 flood (30 mins)

Now we would like to focus on things that have happened since the flood …

Since the 2005 flood what, if any, actions have you and your company taken to prepare for any future flooding? [Examples: also prompt for more details]

- Sought more information about flooding and flood risk from EA or others
- Taken out further insurance + see below
- Registered for flood warnings with Environment Agency
- Made a Business Flood Plan or Evacuation Plan
- Keep an eye on river levels/weather forecasts
- Obtained sandbags
- Adapted property in some way e.g. flood boards, non-return valves, pump
- Water-resistant plaster, joists etc,
- Changed furnishings to more flood resilient or those easier to move

- Moved items permanently out of reach of floodwaters
- Formed Flood Action Group
- Joined Flood Action Group
- Attended flood fair
- Attended public meeting
- Other?

- Were any grants available for any of these measures and did you take up these offers?

- Insurance: have you or anyone had problems in obtaining insurance cover or had any restrictions placed on future policies?

- If you have not taken any actions to prepare for future flooding, why is this?

- If you have not yet taken any actions, are you planning to take any in the future? If so which?

- What, if any, do you think the long-term effects of the flooding have been or will be on your business?

- What do you think the most important/serious impacts have been or will be?

- Are there any things related to the flooding and recovery that you would have liked to do but have not been able to do for any reason? (Finances, legal, time)

- In what ways would you or would you not say that your businesses have recovered from the flooding?

- Can you think of anything which acted as a barrier to your businesses' recovery? Were there any particular problems that you had to deal with?

- Were there things that really helped your businesses' after the flood? Were there any key people or organisations that really helped?

- How prepared do you feel generally for another flood?

- How would you say the City Council, Environment Agency and other institutions are supporting you and local businesses in preparing for flooding?

- How do you think the City Council, Environment Agency and other institutions could support you and local businesses in preparing for flooding?

Questions relating to community recovery and preparedness (20 mins)

We would now like to focus the discussion on the local business community and how it has responded to the flooding …

- Has the local business community taken any specific actions since the flooding to adapt or prepare for any future flooding? If so what are these and how successful do you think they have been/will be? For example, does the community have a Community Flood Plan or Evacuation Plan now?

- How has the city as a whole gone about preparing for the possibility of a future flood? What preparations are you aware of, who has made them?

- Do you think these preparations or arrangements are likely to improve the resilience of this local business community to flooding? If yes, in what way, if no, why not?

- How prepared do you feel your local business community is for another flood?

- Has the flooding resulted in any changes to your local business community – both to people and to the place itself, both positive and negative/good or bad? If so what have these been?

- What more do you feel could have been done (or still could be done) by the local business community or others to aid flood recovery or prepare for future flooding? Who could do this?

- What, if any, do you think the long-term effects of the flooding have been or will be on your local business community?

- Would you say that the local business community has "recovered"? What does that mean to you?

- How do people generally talk about what has happened since the flood? What kinds of things do they say and focus on?

- What, if anything, do you feel acted as barriers to your local business community recovering from the flooding?

- Also, what, if anything, was an aid to your local business community recovering from the flooding?

- Does the local business community feel any different since the flood? If so explain how.

- In your opinion, has the flood brought the local business community together or created divisions within the local business community? In what ways?

Flood protection/flood risk management (15 mins)

Finally, we would like to ask what you think about flood protection and managing flood risk generally …

- Who do you think is responsible for flood protection and why? National/local government, EA, individual households/businesses? Do you think that is about right? Or should there be more responsibility on certain bodies than others?

- What do you think the role of the government, Environment Agency, local authorities should or could be?

- Do you think that climate change will mean that we have to change the way we live in the future? If yes, in what ways? How do you think that will affect your businesses?

- Is there anything else that you would like to raise that we have not already discussed?

End of meeting – complete demographic questionnaires – pay participants. Thank participants.

Appendix 4: Interview Guide

What has happened since the flood?

1. Emergency planner (City Council)
    - What has changed (e.g. their job, their approach etc) since the flood?
    - How have these changes been facilitated (e.g. EA)?
    - What relationships have been created (e.g. with EA)?
    - How are these relationships maintained? (e.g. flood exercises etc)?
    - How are they prepared for a possible future flood?
    - Was he/she around at the time of the last flood? If yes, what would happen differently now? Why?
    - Do they work with any community groups? Who are these groups?
    - Were these groups set up after the flood? Are they flood-specific?
    - Do they give any support to these groups?
    - How do they work with vulnerable people?
    - How do they know where they are?

2. Renaissance (Regeneration programme)
    - What has happened in Carlisle since the flood in terms of regeneration? (e.g. more/less jobs, business impacts, new build, funding)
    - Can any of the changes be attributed to the flooding/how did the flood impact on regeneration work/how did the flood facilitate regeneration? - *not sure about this one - I think you mentioned that the regeneration is happening on the back of a flood defence scheme so maybe no point*
    - Any impacts on house prices from the flood or the flood defence scheme? *(not sure about this one - a) maybe not relevant b) very difficult to attribute to the flood I guess*)

3. Community officer (City Council)
    - What was the role of the council in recovery?
    - Did they work with anyone? Who did they work with in recovery?
    - Would you say the affected communities have recovered from the flood?
    - What were the key things that helped/hindered recovery that happened after the flood?
    - What are the key changes to the community since the flood (e.g. people moving away, elderly people moving to homes, businesses closing down, new businesses)?
    - Are these changes mostly negative or have there been any positive changes?
    - What is the role of the council in helping people prepare for a future flood? Do they work with any community groups/do they support any groups?
    - How is the community prepared for a future flood?
    - How is the council prepared for a future flood?

4. United Utilities
    - How were key infrastructures (water and sewerage) affected in the flood?
    - Did they have any contingency/business continuity plans before the flood?
    - How did this work in practice?

- If no, do they have a flood plan now? How are they prepared for a future flood?
- Who did they work with on their flood plan?
- Have they made any other preparations for flooding? For example registering for FWD (if they weren't registered before), any flood proofing to their infrastructure etc.
- Did they have any role in recovery? (*surface and drainage flooding happened in Carlisle, not sure if they are responsible for drainage*)
- What was their role, who did they work with?
- Did they have any relationships with the Environment Agency before the flood? Do they have any relationships with the Environment Agency now (in relation to flooding)? Other relationships, such as the council, etc?

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