

R&D Technical Summary W5C-018/TS

Flood Warning for Vulnerable Groups

Background to R&D project

In 2001 researchers in the Department of Sociology and Centre for Environmental Strategy at the University of Surrey were commissioned by the Environment Agency to develop a detailed understanding of whether some groups within the population are particularly vulnerable to floods. The concept of vulnerability was addressed in three distinct ways: in terms of certain groups being more likely than others to be flooded; in terms of certain groups being less likely than others to be aware of flood risk and flood warnings and in terms of certain groups being less able than others to respond to flood warnings and cope in flood event.

Objectives of R&D project

The research objectives were to:

- document the social distribution of flood risk (are some social groups disproportionately likely to experience flooding?)
- document the variance of awareness of flood risk within the populations in flood risk areas
- document the variance in ability to respond to flood warnings and cope with flood event within the population in flood risk areas

Phase 1 of the project involved four tasks:

- A review of existing literature on vulnerability to flooding
- Secondary analysis of existing survey data on the social distribution of flood risk, the variance of awareness of flood risk and ability to respond of populations within at risk areas
- A review of the feasibility of mapping vulnerability to flooding
- Interviews with key informants in six areas affected by the floods of Autumn 2000

Phase 2 of the project involved one task:

- Carrying out focus groups with certain groups identified as vulnerable in five sites in order to develop a detailed understanding of their flood experiences and their reception and response to flood warnings.

The findings of the research are presented in four reports as follows:

1. **Literature review** – This report reviews and synthesises the existing literature on issues of social inequality in natural hazard research.
2. **Secondary Analysis of Flood Data** - This report provides a secondary analysis of the BMRB At Risk Survey and Post Event Survey for 2001.
3. **Exploring Flood-Related Vulnerability: a Qualitative Study** - This report provides an overview of findings from interviews with key informants and members of vulnerable groups.
4. **Measuring and Mapping Vulnerability to Flooding** – This Appendix provides a review of attempts to measure and map vulnerability to environmental hazards; a consideration of the potential for mapping vulnerability to flood risk in the UK and an illustration of the importance of selecting an appropriate areal unit of analysis.

This Technical Summary provides a brief synthesis of the findings and recommendations from each of these volumes.

Results of R&D project

Literature Review

The literature review explored definitions of vulnerability and reviewed existing research on categories of people particularly at risk in the face of natural hazard. Previous research suggests that the following socio-economic variables influence vulnerability to flood hazard:

- *Age* - Older people have a disproportionate vulnerability to the effect of disasters with frail or disabled older people being particularly at risk
- *Gender* – Women tend to recover more slowly than men from natural disasters and play a key role in the work of recovery after flood events. As primary care-givers women are more likely than men to have responsibility for dependants in the event of a flood and conversely are also more likely to be the sole adult householder (as lone parents or lone older people)
- *Race and ethnicity*- Language differences may obstruct reception of flood warnings and cultural differences may exacerbate the impact of floods
- *Socio-economic factors* – poorer people are less likely to be adequately insured for flood damage, more likely to live in homes at particular risk of flooding (i.e. caravans) and to have lower levels of education which may impede the reception of warnings
- *Disability and illness* – those with physical or mental disability or long term illness may have particular difficulties receiving warnings and being able to respond to them
- *Special needs populations* –residential care homes, hospitals, schools etc. may experience particular difficulty in evacuation.

Those authors who have previously reported to the Agency on the vulnerability of specific groups have all recommended that further research be done in order to generate a more complete understanding, highlighting a particular need to identify the most vulnerable sub-groups in these categories.

Secondary Analysis of Flood Data

Secondary analysis of the BMRB survey data available to the Agency was undertaken. Analysis focussed on factors affecting awareness of flood risk and actions taken in flood event. Key findings were:

- If lack of awareness of flood risk is treated as an indicator of vulnerability to flooding then the following groups are particularly vulnerable:
- those who have recently moved into a flood plain
- people renting
- people in socio-economic groups C2, D and E
- people aged below 35 and those aged over 55
- In flood events, households with more than two members took more action than those where individuals lived alone, and those resident in the area for more than one year took more action than newer residents

Exploring Flood-Related Vulnerability: A Qualitative Study

Six research sites where severe flooding had occurred in Autumn 2000 were chosen to provide examples of: a range of flood events; flood warning service availability; geographic range; varying types of location; a variety of properties; and areas of deprivation and social exclusion. The following sites were selected:

- *Skinningrove*, Cleveland. North East Region (Northumbria area), (Coastal site; Rural Village; Non-Main River)
- *Stockbridge*, near Keighley, West Yorkshire. North East Region (Ridings area) (Suburban; Main river)
- *Ruthin*, Denbighshire. Wales. (Rural Small Market Town; Main and Non-main river)
- *Bewdley*, Worcestershire Midlands Region (Semi-Rural Large Market Town; Main River)
- *Woking*, Surrey. Thames Region. (Urban; Main river)
- *Iford Bridge Park*, Bournemouth, Dorset, Southern Region. (Mobile Home Site; Suburban; Main River)

Key informant interviews were carried out in each site to determine which, if any, groups of people were particularly vulnerable in terms of flood warning and flood event; to gain insights into those aspects of flood-related vulnerability that might not have come to light from a reading of the published material; and to inform decisions regarding the second phase of this project, including appropriate recruitment strategies and suitable topics for focus group discussion.

The key informant interviews bore out the findings of the literature review that it is those people who are already vulnerable who are particularly at risk in terms of reacting appropriately to flood warnings and suffering adverse effects of flood event. Members of low income groups, frail older people, families with young children, those living in mobile homes, people with disabilities and members of minority ethnic groups were reported to have experienced particular difficulties. The study also concurred with conclusions from the review of survey data in finding that single householders were less likely to be able to take action than households with two or more adults, and that new residents were less likely to act promptly or take appropriate action on receipt of warning.

Research was then conducted in five of these sites to explore the awareness of flood risk, the ability to respond to flood warning and vulnerability to flood event of people in four vulnerable category groups:

- new residents (two focus groups – each met on two occasions)
- older people (three groups - each met on two occasions)
- parents of young children (four groups - each met on two occasions)
- disabled people (eight in-depth interviews)

This component of the project aimed to answer our research questions from the perspective of vulnerable flood victims and to provide practical recommendations for the improvement of flood warnings to members of these groups.

In terms of awareness of flood risk, overall levels were low before the 2000 floods. Findings show no clear evidence of systematic variation in awareness between particular vulnerable categories. Levels of awareness were found to vary according to knowledge of local flood history rather than category membership.

In terms of ability to respond appropriately to flood warning, findings support prior research on the existence of vulnerable categories; older people, disabled people and parents of young children faced particular difficulties. Overall, however, vulnerability in terms of warning response may be better explained by factors common across all groups. We found that appropriate response was often hindered by: disbelief; shock; fear; panic; lack of knowledge or information; the rapid onset of the flood event; and characteristics of property.

In terms of vulnerability with regard to flood event and its aftermath, we found evidence for particular vulnerabilities amongst older people, parents with young children, disabled people and mobile home dwellers, though no category can be classed as homogenous. In addition we found factors common to all participants (regardless of group category) that exacerbate vulnerability to flood event and its aftermath.

The focus groups and interviews reinforced the significance of prior experience of flood as a key determinant of flood related knowledge, awareness and preparedness. We found considerable evidence for post-event increase in: awareness of flood warning systems, codes and methods of dissemination; awareness of flood risk to local area and property; and levels of preparedness.

Measuring and Mapping Vulnerability to Flooding

This report provides a review of attempts to measure and map vulnerability to environmental hazards; a consideration of the potential for mapping vulnerability to flood risk in the UK and an illustration of the importance of selecting an appropriate areal unit of analysis.

- Section 1 provides an introduction to the report

- Section 2 discusses the measurement of vulnerability and reviews existing literature on the construction of vulnerability indices
 - Section 3 identifies available data which could be used to map vulnerability to flooding in England and Wales. When considering natural hazards and the effects they may have on the populations at risk, we need to consider two factors;
 - The nature and likelihood of exposure to the hazard: the vulnerability of place; the 'unsafe' place.
 - The characteristics of the affected populations and their ability to recover from such a hazard (i.e. the vulnerabilities of the population)
- With regard to vulnerability to flooding the indicative flood plain maps supplied by the Agency could be used to estimate the vulnerability of place component of the risk equation, and the following census derived variables for the vulnerability of the population:
- Census-derived variables: Area level deprivation indices, specifically the Jarman Index of Deprivation
 - Census derived variables: Area level classifications, specifically the GB Profiles
 - Census Area Statistics, specifically social class of head of household
- Section 4 provides an illustration of the importance of choosing an appropriate areal unit of analysis in any attempt to map vulnerability to flooding.

Two methods were used to identify 'at risk' populations:

- Area statistics of 'at risk' populations were aggregated to the UK Census enumeration districts (ED)
- Population grid models which aggregated data to 200m grid squares (Martin 1989).

The two methods were compared and found to provide very different estimates of the percentage of households within flood plains,

- The ED method found 30 % of households are in Enumeration Districts that either are within or intercept the flood plain
- The population grid model shows only 9% of households were within 200m grid squares which intercept the flood plain

In addition the two methods furnish entirely contradictory results about the relationship between social class and likelihood of exposure to flood risk. The grid method indicates that those in lower social classes face an increased likelihood of exposure to flood risk, whereas the ED method suggests the exact opposite.

- The analysis demonstrates the considerable effect that the choice of areal unit can have on statistics about the relationship between socio-economic status and exposure to environmental risks. We suggest that the grid method provides a more reliable method of assessing this relationship for three reasons:
 - The analysis is at a finer scale
 - The results produced by this method have 'face validity', that is they are supported by the body of existing research on the relationship between socio-economic status and exposure to environmental risk
 - The results produced by this method very closely match the Environment Agency's figures of the number of households at risk from flooding .

Recommendations

This broad-ranging research project culminates in recommendations for the Environment Agency in a number of areas.

- Additional socio-economic data should be collected within BMRB surveys in order to allow for more comprehensive analysis of factors influencing awareness of and ability to respond to flood warnings, as well as the social distribution of flood risk
- Given that the results of attempts to map the characteristics of the at flood risk population vary significantly depending on the areal unit of analysis selected, it is important that the Agency gives careful consideration to the most appropriate method for mapping vulnerability.
- Vulnerability to flooding should be understood not simply in terms of exposure but also in terms

of awareness of risk and ability to cope during and after the flood event. Our research confirms that older people, 'new' residents, those in lower socio-economic groups, parents with young children, disabled people and mobile home dwellers experience particular vulnerabilities. While it is essential to recognise that these groups are not homogenous, targeted campaigns for specific groups could play an important role in increasing risk awareness and preparedness.

- Decisions about how to target information and advice to vulnerable groups should be developed in collaboration with national and local agencies and organisations who have specialist knowledge of the particular groups and relevant local knowledge.
- Our research clearly indicates the need for flood communications and strategies to be informed by local issues. This should incorporate knowledge of specific local vulnerabilities and requires effective communication with local agencies, organisations and publics. We recommend that consideration is given to ways in which the collection and maintenance of such a body of local flood related knowledge in at risk areas could best be facilitated and utilised.

Interviewees expressed a strong desire for the provision of local flood wardens or equivalent to act as a central, locally knowledgeable and accessible point of advice and information. The Agency should consider how best to enable people to take on this kind of role, and learn from existing good practice in this area.

This R&D Technical Summary relates to R&D Project W5C-018 "***Flood Warning for Vulnerable Groups***" and the following R&D outputs, published May 2005:

- **R&D Technical Report TR1 - *Flood Warning for Vulnerable Groups – a Review of Literature***
- **R&D Technical Report TR2 - *Flood Warning for Vulnerable Groups – Secondary Analysis of Flood Data***
- **R&D Technical Report TR3 - *Flood Warning for Vulnerable Groups – a Qualitative Study***
- **R&D Technical Report TR4 - *Flood Warning for Vulnerable Groups – Measuring and Mapping Vulnerability***

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