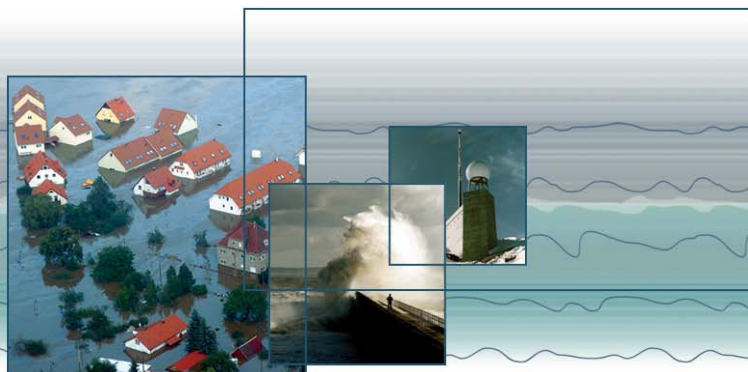




Vulnerability, resilience and social constructions of flood risks in exposed communities

A CROSS-COUNTRY COMPARISON OF CASE STUDIES IN GERMANY, ITALY AND THE UK

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SUMMARY

This report summarises, by way of a cross-country comparison, the main findings of three in-depth analyses at the regional level in the river catchments **Vereinigte Mulde** (Germany; Steinführer and Kuhlicke 2007), **Adige/Tagliamento** (Italy; De Marchi *et al.* 2007) and at the national level in England and Wales (UK; with a regional focus on the **Lower Thames**; Tunstall *et al.* 2007).

The purpose of the **sociological and geographical research** within the Integrated Project FLOODsite was to better understand the impact of floods on communities, the role of subjective and intersubjective perceptions and situational interpretations, pre- and post-disaster preparedness as well as the capability and capacity of communities to recover from a hazardous event. In the course of the project we became also increasingly aware of the significance of the social constructions of risk which both influence the application of mitigation measures and the assessment of public flood protection and management by residents at risk. All these issues – social vulnerability and resilience, how people behave and how they construct flood risks – crucially need to be understood in the context of flood risk management.

In our work, we mainly focus on a **bottom-up perspective**, i.e. from the residents of flood-prone and, in most cases, recently flood-affected areas. Their points of view in many respects differ from so-called experts' evaluations with regard to the way flood risk management should work on several scales. This, however, does not mean that we just replace one perspective by the other. Since we were in close cooperation with decision-makers from different authorities during the entire project, we also compare and confront their points of view with the judgements of the people at risk.

The **structure of the report** is as follows:

- Chapter 1 recapitulates the two main concepts of social vulnerability and social constructions of risk, on the one hand, and introduces the concept of resilience, on the other.
- Chapter 2 is dedicated to the methodological challenges of cross-cultural and cross-country comparisons which are increasingly becoming more frequent, but are only rarely reflected upon.
- Chapter 3 introduces the regional case studies from Germany, Italy and England and Wales, along with the respective flood events to be considered.
- Chapter 4 differentiates three levels of social vulnerability (individual/household, community and institutional vulnerability) and presents findings from the three country studies conducted.
- Chapter 5 pays attention to issues of preparedness as a (non-)result of flood awareness, expectations attached to structural flood defence and shifting responsibilities.
- Chapter 6 summarises the findings in terms of community resilience.
- Chapter 7 discusses cross-country commonalities and differences and formulates open research questions.

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1. Research background, main concepts and research questions

The purpose of the sociological and geographical research within the Integrated Project FLOODsite was to better understand the impact of floods on communities, the role of subjective and intersubjective perceptions and situational interpretations, pre- and post-disaster preparedness as well as the capability and capacity of communities to recover from a hazardous event. Thus, social vulnerability and resilience were the focus of our research from the very beginning. But in the course of the project we became also increasingly aware of the significance of the social constructions of risk and how this influences people's behaviour – e.g. with regard to whether and which mitigation measures are being applied by residents at risk and how public flood protection and management measures are assessed. These issues are important components for effective flood risk management, which is the main focus of FLOODsite, and were therefore also considered in our research.

This cross-country report is the second analytical step of our work. In the first one, we approached the above mentioned issues via regional in-depth analyses in Germany (river catchment Vereinigte Mulde; Steinführer and Kuhlicke 2007), Italy (Adige, Sarca and Tagliamento rivers; De Marchi *et al.* 2007) and in England and Wales (with a focus on the Thames; Tunstall *et al.* 2007). By way of comparison, in this report we want to summarise the main findings and come to some overall conclusions. In the first chapter, our chief concepts – vulnerability, resilience and risk construction – and the main research questions will be recapitulated.

From a wide range of disciplines and perspectives, **vulnerability** has become a buzzword in disaster research in recent years. Therefore, its application always requires a precise definition. To start with, three general connotations of vulnerability might be distinguished: as exposure to risks or hazards; as capacity of social response; and as vulnerability of places (Weichselgartner 2001, 87; with reference to Cutter 1996).

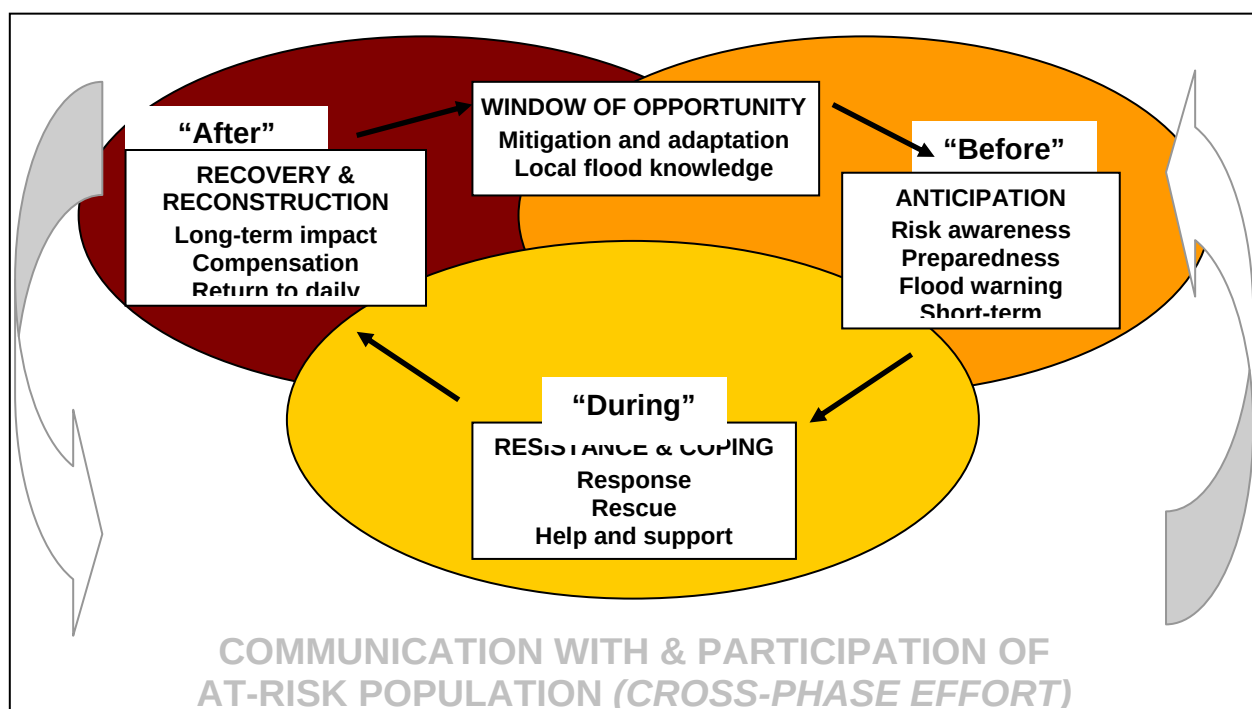
Official FLOODsite terminology refers to the first conceptualisation when defining vulnerability as the “characteristic of a system that describes its potential to be harmed. This can be considered as a combination of susceptibility and value” (Floodsite 2005, 27). With its focus on potential or actual damage due to a hazardous event, this describes a very common and widespread understanding of vulnerability from the point of view of natural scientists, engineers, disaster managers and economists (for the latter: Messner and Meyer 2006). The systemic perspective of this conceptualisation allows for applying vulnerability to different collective actors, including communities or organisations. Yet, from a social science perspective, this framing of vulnerability also has some severe shortcomings. First of all, it does not explicitly take into account people's behaviour, their assumptions, their knowledge and ignorance (Gross 2007; Kuhlicke 2007) as well as processes of sense-making. Secondly, the definition does not pay attention to the temporal dimension of a disaster and its emergence out of, and rootedness in, daily life. These latter aspects are in turn related to the political context and conditioned by policy choices (Sarewitz *et al.* 2003).

In our research, we defined **social vulnerability** as a specific form of social inequality in the context of a so-called disaster and applied the definition offered by Blaikie *et al.* (1994). They understand vulnerability as “the characteristics of a person or group in terms of their capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard” (*ibid.*, 9; similarly Wisner 2004). This approach considers both the social and temporal dimensions of a disaster which is its main strength from our point of view. Instead of emphasising the characteristics of the natural or technological hazard itself or the exposure of physical structures, it focuses on the question of how communities and social groups are able to deal with the impacts and/or threat of a natural hazard. Hence, it is not so much the susceptibility of entire communities or certain groups to a specific hazard that is of interest, but their coping capacity in the different, and partially overlapping, phases of an event. The phases can be characterised in the following way (Fig. 1.1):

- *Anticipation (first phase)* covers the entire time-span before the crisis itself. The situation stretches from a vague – or even no – idea of a potential flood (which is related to issues of risk awareness and preparedness) to the flood warning, call for evacuation and ad-hoc activities (e.g. taking documents and securing valuables). The disastrous event has not yet happened but behaviour is increasingly directed towards it. Uncertainty about how to interpret the situation predominates among all actors involved.
- *Resistance and coping* (the most important characteristics of the *second phase*) are necessary from the very moment when the water is inundating people's homes and their belongings and beyond. The disaster is now happening. Yet, uncertainty still rules with respect to flood damages and further impacts, the next steps to be taken and the time horizon. How the affected people deal with the immediate situation is what we mean by 'coping'.
- *Recovery and reconstruction (third phase)* relates to the post-flood situation, mainly the efforts to return to some form of 'normal' daily life and the long-term consequences with respect to physical and mental health. It also includes dealing with material and physical damages. In the research literature, the time-period immediately after an event is also called "window of opportunity" indicating – though not undisputed¹ – that this is the best moment for sensitising for the necessity of public and private mitigation measures.

As shown in Fig. 1, the crucial issue of mitigation and adaptation measures stretches between the post- and a new pre-flood situation which is due to their very nature as both reactions to past events and prevention of damages in the course of possible future events. Communication (such as warning or information on precautionary measures) and the involvement of the public in flood risk management are cross-phase issues and highlighted as such in Fig. 1.1.

Fig. 1.1: Subjects of Task 11 research arranged according to the different phases of a flood event



Source: authors' considerations

¹ See, for example, Felgentreff 2003.

It has to be underlined that we do not understand the phases as concrete and mutually exclusive entities. On the contrary, the phases overlap and blend into each other (Neal 1997 and Fig. 1.1).² Finally, although Fig. 1.1 indicates a circle of these phases recurring time and again, there are changes going on. Ideally, a new *anticipation phase* differs from the one described above, in a way that reflects learning and social change or, to put it differently: a new hazard cycle begins which is not a repetition of the one previously experienced.

While conceptualising social vulnerability in the way described, we did not forget about “non-social” aspects of vulnerability. Therefore, flood event characteristics (such as speed of onset), context-specific conditions (functioning of flood warning systems and evacuation measures, time of flood, location) as well as certain parameters which might gain importance in the course of a flood (e.g. tenure) were also taken into account. Fig. 1.1 displays some connotations and interrelations between main issues of our research as well as the temporal dimensions of vulnerability. Moreover, we will also distinguish between different levels of vulnerability, since not only individuals are vulnerable but also entire communities and organisations. This focus is useful not only to identify the main elements of vulnerability at different levels, but also to focus on its causes and dynamics. Due to their overlapping and interrelations, the different levels of vulnerability might enable or hinder each other to effectively prepare for, cope with and recover from a flood event (see below Chapter 4).

While the previously described connotations of the concept of vulnerability are rooted in geographical research and development policy, the concept of **resilience** originally stems from the field of ecology. It refers, in the first instance, to the ability of an ecosystem to recover from a disturbance, or the level of disturbance which can be absorbed before the system changes (Holling 1973 and 1978). Maintaining the ecosystem functions is key in this perspective (Adger 2000, 349-50; similarly Floodsite 2005, 24). Meanwhile, the concept has spread far beyond ecology and is, among others, also applied in the social sciences. In the course of this transfer to societal processes, it needed to be accepted that social systems at whatever scale will never return to the status quo prior to the event but would unavoidably modify. Thus, issues such as change, transformation, social learning and adaptive capacity – rather than the original notion of stability – came to the fore (Folke 2006).³

This understanding of resilience is mirrored by the definition applied in the framework of the FLOODsite project. In the “Language of risk” document, social resilience is defined as “[t]he capacity of a community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organising itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures” (Floodsite 2005, 25). A very important notion is pointed out by Adger (2000, 349, 351) when comparing ecological and social resilience: he conceptualises social resilience as a property of communities, rather than of individuals: “social resilience is defined as the ability of communities to withstand external shocks to their social infrastructure” (*ibid.*, 361). This is in line with the original ecological concept referring to a characteristic of a system, not of its parts (see also Twigg 2007). Moreover, Adger explicitly links resilience to social capital, i.e. the potential and actual personal relationships of an individual or a group of individuals and the resources which can be mobilised via this personal network (for more detail Chapter 4.2).

In the broad and ever enlarging body of literature on vulnerability and resilience, their **mutual relationship** is far from being clarified. The following conceptualisations are to be found:

² To assume that an “objective” phase reconstruction would be possible is misleading anyhow, since with only few exceptions (one case in Italy and one in the UK) our empirical research focused on residents which were recently affected by flooding. Partly, the respondents (e.g. in the German investigation) answered the questionnaire after a fairly long time interval.

³ Folke (2006) also provides a good overview of the different meanings of resilience in the course of its academic career in the different disciplines. See also the contributions in Gunderson *et al.* (1995) and Berkes *et al.* (2003).

- Firstly, in large parts of the literature resilience and vulnerability are regarded as inversely proportional: “Vulnerability comes from a loss of resilience” (Franklin and Downing 2004, 1; with reference to Holling 1995; similarly: Buckle *et al.* 2001; Gallopín 2006). Both for social and ecological systems, the authors state that “levels of vulnerability will increase in direct proportion to reduced levels of resilience” (Franklin and Downing 2004, 1). This understanding is based on the notion of vulnerability as “potential of a system to be harmed”.
- Secondly, in another approach vulnerability is used as an umbrella term referring to all phases of a disaster, yet with a focus on susceptibility to damage. In contrast, resilience is related to the very moment of the crisis (phase II; see Fig. 1.1) but in particular to the post-flood phase of recovery and reconstruction (phase III; see for example Buckle *et al.* 2001).
- Thirdly, resilience is understood as being affected by vulnerability, but can increase or decrease independently. For instance, having insurance against flooding will increase the resilience of a household; it will help its members to recover better from the (at least financial) effects of the flood. Moreover, these financial worries may also impact upon psychological health, therefore insurance can also help reduce anxiety. Insurance will not reduce the damages to the house or its contents but will ease the recovery, so it does not affect the vulnerability. Thus, one might be vulnerable to flooding but may have resilience to cope with and recover from it. Flood proofing measures or flood warnings, on the other hand, reduce vulnerability by potentially reducing damages to the household (example taken from Tunstall *et al.* 2007, 81).
- Finally, also cross-referring definitions are to be found. Klijn (quoted in Floodsite 2005), for example, defines vulnerability in the following way: it “refers to the resilience of a particular group, people, property and the environment, and their ability to respond to a hazardous condition” (*ibid.*, 12).

For structuring and interpreting our project results, however, we needed a clear understanding of both concepts. A tautological relationship – like in the first conceptualisation above, which regards vulnerability and resilience merely as inversely proportional – is meaningless since there is no added value of one concept or the other. The same holds for the final definition provided which, in our point of view, does not contribute to a clarification of either concept. In a first step, we accepted the distinct disciplinary traditions of the two concepts: the social science background of vulnerability justifies its predominant application to individuals and social groups, while resilience in the original (ecological) sense always referred to systems at different scales. This difference is meaningful for our objectives since it should enable us to come to new insights with regard to the capacities of local communities (Chapter 4). As the analysis started from the individual/household level we primarily will speak of vulnerability as defined previously. However, in a further step, we acknowledged that vulnerability and resilience are always normative concepts which can be, but are not necessarily, applied in an analytical way. Both approaches imply, particularly when related to a society, judgements about what is the “desired state, which it is sought to achieve or maintain” (Green 2004, 324). Especially resilience – similarly like related concepts (e.g. sustainability) – might be understood as a policy objective in the sense of “building” or “enhancing” resilience. Since our research is dedicated to improving flood risk management, we will also identify some research findings that explicitly refer to such a normative orientation (Chapter 6.2). Thus, the main body of the findings presented refers to vulnerability, while normative conclusions will be drawn also with regard to the resilience of communities.

Vulnerability in general and social vulnerability, more specifically, is nothing given or constant. Rather, it might be influenced by reducing damage potentials and increasing capacities to prepare for and cope with a hazard. In the context of flooding, precautionary measures are in particular regarded as crucial for reducing one’s vulnerability. However, personally taking any such measures implies that people are both aware of the risk of being flooded *and* that they attribute a certain significance to these measures. In other words, they regard the measure they take as meaningful, and at least hope that they will be effective. All of these perceptions and behaviours are related with people’s **social constructions of risk**. By using this concept we want to argue that risk is neither a process that is simply attributed to natural processes (e.g. hazard) nor an objectively given constant. Rather, risk is understood as being socially constructed in the sense that norms and values, as well as belief systems,

influence and possibly define it. Of central importance, therefore, is how the construction of risks is institutionalised.

Institutions are evolving when different actors are confronted with a recurring problem (such as flooding), and which is solved more or less routinely. The most obvious function of institutions is that they control and direct human life. Their controlling character may be guaranteed by explicitly set-up sanctions (e.g. the law). In Germany, for example, it is meanwhile hardly possible to construct new buildings in flood plains. In this sense institutions may define the distribution and exertion of power, the definition of responsibilities, and the disposition of resources (Mayntz and Scharpf 1995, 40). However, institutions also imply inherent mechanisms that are prior to or apart from sanctions specifically set up to support the continuity of an institution; they encompass less formalised regulatives such as norms, customs, habits and routines (cf. Berger and Luckmann 1967). This dimension may be described as legitimation that “‘explains’ the institutional order by ascribing cognitive validity to its objectivated meanings. Legitimation justifies the institutional order by giving a normative dignity to its practical imperatives” (*ibid.*, 93). Our analysis focuses above all on this dimension of institutions.

Understanding the social construction of risk in the outlined manner allows us to take into account subjective definitions of risk but also to focus on the institutionalised “perceptions” of risk (Chapter 5). This seems to us a fruitful design for a cross-cultural comparison in order not to remain at the level of superficial results and not to apply too rigid interpretations of social structures.

The theoretical and conceptual deliberations shortly presented in this chapter were transferred into the following **main research questions**:

1. Are residents of flood-prone areas aware of the risk they face? Do they feel prepared?
2. Which social groups are particularly vulnerable in the course of a major flood event?
3. Which resources (individual, household, community, organisations) are crucial for the processes of coping and recovery?
4. More specifically, what role does social capital play in coping with and recovering from a major flood event?
5. What significance do residents of flood-prone areas attach to private preparatory measures? Which ones are adopted and what influences these behaviours?
6. How do the at-risk residents evaluate public structural and non-structural flood protection measures?

As stated above, by way of the cross-country comparison, we will discuss and summarise the main findings of three regional analyses carried out between 2004 and 2007. The research questions will be addressed from a comparative perspective to highlight the similarities and the differences identified.

2. Cross-country comparison: general methodological issues

In this chapter, we will discuss the methodological challenges of cross-country comparisons, along with their added value and limitations.

With the ongoing internationalisation of research – in Europe strongly encouraged by the funding policy of the European Commission – questions of cross-cultural research methodologies are becoming increasingly important in different fields and disciplines. Also in the social sciences, the ‘Europeanisation’ of research is a matter of fact, mirrored in particular by the growing number of large-scale cross-country surveys, among them the European Social Survey (ESS), the International Social Survey Program (ISSP), the European Value Survey (EVS) or the Eurobarometer. Besides creating international data bases, these programmes in particular aim at cross-culturally harmonising indicators for a variety of topics (for more detail see the contributions in Harkness 1998 and 2006 and in Grözinger *et al.* 2007).

However, while comparative analyses are frequently demanded, they are even more often called into question. Indeed, there exist major challenges that international research projects are faced with, among them: the question of comparability, the decision at which spatial scale the investigation shall be carried out, the selection of the cases to be studied, the direction of the approach, i.e. whether the focus will be preliminarily on differences or on similarities, and the necessity to find (or to create) comparable data with respective indicators for the empirical testing of the scientific hypotheses.

In the course of Task 11, the research partners were faced with all these problems. The methodological design foresaw a two-step process: (i) investigations at the regional scale (case studies in Mulde, Adige/Sarca and Tagliamento river basins) and at the national scale in England and Wales (with a regional focus on the Lower Thames, and (ii) a cross-regional and, at the same time, cross-country comparison. Therefore, when selecting the case studies and finalising the research design for the first part of the project, we already had to pay attention to comparability. This applied, firstly, to the process of selecting the regional case studies which will be described in Chapter 3.1. Secondly, transferable and, if possible, cross-national indicators of the major topics of our research needed to be defined. For this rationale, a first research report (Tapsell *et al.* 2005) reviewed and discussed several existing indicators and indicator sets for operationalising and measuring social vulnerability and resilience. The report identified key hypothetical indicators of social vulnerability. Most of these were integrated into the empirical investigations in the three regional case studies (predominantly in the questionnaire surveys; see Table 2.1 and Chapter 3). Furthermore, this report also identified shortcomings of previous research. These shortcomings were related to a lack of (a) investigations concerning community vulnerability and (b) comparative studies in this field in general (*ibid.*, 2, 6). This finding therefore provided further arguments to lay one focus of Task 11 on communities and a cross-national comparison.

The following Table 2.1 displays key indicators of social vulnerability as they were identified before the empirical investigations. We also signalled which hypothetical influence a certain category of this indicator might have on vulnerability. This decision was based on the literature and personal earlier research in this field. Indicators without such information are ambiguous in this regard (for more detail: Tapsell *et al.* 2005; Steinführer and Kuhlicke 2007).

Table 2.1: Hypothetical indicators of social vulnerability and their use in the case studies

Hypothetical indicators of social vulnerability (+ = increases / - = decreases vulnerability)		Use of indicators in:		
		German case study	Italian case study	Case studies England/Wales
Location-/event-related indicators	Research location	✓	✓	
	Place of work/residence		✓	
	Risk index (high risk area +)		✓	
	Depth of flooding	✓		✓
	Serviced by flood warning system (yes -, no +)	(✓)		✓
	Length of evacuation	✓	✓	✓
	Flood impact	✓	✓	✓
Socio-demographic indicators	Age (children and very elderly +)	✓	✓	✓
	Gender (women +)	✓	✓	✓
	Employment (-), unemployment (+)	✓		✓
	Occupation (skilled +, unskilled -)	✓	✓	✓
	Education level (higher level +, low level -)	✓	✓	✓
	Family/household composition (large families +, single parents +, one-person households +)	✓	✓	✓
	Household income	✓	(✓)	✓
	Tenure (home owner -, renter +)	✓	✓	✓
	Long-term-illness or disability (+)	✓	✓	✓
	Length of residence (new migrants +)	✓	✓	✓
	Social networks' type	✓	✓	
Physical structures	Type of housing (single storey accommodation +, mobile housing +)			✓
	Number of rooms (low number +)			✓
	Rural/urban (high density urban +)	(✓)		
Community structures	Levels of risk awareness and preparedness (low +)	✓	✓	✓
	Previous flood experience (no experience +)		✓	✓
	Fire brigade/civil protection membership (yes -)	✓	✓	
	Community embedding		✓	
	Social networks' location	✓	✓	
	Support index (low +)	✓	✓	
	Trust in authorities (no +, yes -)	✓	✓	

Remark: the brackets for some of the ticks mean that these indicators were not measured directly.

Source: authors' compilation based on indicator set (Tapsell et al. 2005) and the country reports

The drafting of the standardised questionnaires for the German and Italian investigations represented the first major – and very time-consuming – milestone of the empirical work. Beside content and methodology, major linguistic and cross-cultural problems needed to be solved. First of all, we worked at three versions of the questionnaires simultaneously: the English one (as meta-version for mutual understanding and for cross-checking with previous studies by Flood Hazard Research Centre/FHRC, which, however never was applied in empirical praxis) as well as the German and the Italian ones. Moreover, the Italian colleagues not only had to provide a questionnaire in their mother tongue but also in German, since one of their research locations is situated in the bilingual area of the German speaking group close to the Austrian border. In this process, we needed to be aware of the fact that

pure (*verbatim*) translation in some cases would not solve but rather produce problems for the research to come. Thus, it could not be our aim to produce identical questionnaires but ones which captured the general meaning of the question and were therefore adequate for the task at hand. Adequacy of a certain translation refers to the degree to which it fulfils the objective of being both appropriate and understandable in the target language (Harkness and Schoua-Glusberg 1998, 94). This requirement can be justified in the following way: “Translation necessarily involves differences as well as similarity. Absolute absence of difference would amount to replication of the source text [...], absolute absence of similarity would force us to query the status of one text as a translation of the other” (*ibid.*, 93). Not only in linguistic terms had the questionnaires to be adequate but also with regard to content: they needed to retain a common theme across the studies whilst capturing individual locality and context-specific peculiarities. This problem was solved by defining a set of core indicators used in both the German and the Italian investigations, on the one hand, and context-specific indicators, on the other.

In spite of careful selection, the flood events, levels of hydro-geological risk, locations and community impacts we refer to are rather different.⁴ This is unavoidable in such a complex field of investigation. Therefore, in this report we will not conduct a naïve comparison of numbers (e.g. in the sense of: “in Italy X per cent of the people are aware of the risk of being flooded but in Germany it is only Y per cent”). Rather, we are interested in both an appropriate understanding and interpretation of individual flood events and their consequences on the one hand as well as on transferable findings and peculiarities in a cross-country comparison, on the other. In this report, in a first step empirical findings from the individual case studies will be juxtaposed and interpreted in their specific context, based on the existing country reports (Steinführer and Kuhlicke 2007; De Marchi *et al.* 2007; Tunstall *et al.* 2007). In a second step, conclusions with regard to both similar and different findings will be drawn.

While this report claims a certain transferability of results, we are also aware of its limitations. The case studies referred to were carried out in only three European member states. Therefore, the presented results themselves carry with them the notion of hypotheses to be tested in further projects. Moreover, in the final section questions for future research which evolved during the course of our research will also be formulated.

Our **research “lessons learnt”** from this kind of research are the following ones.

- Having adequate time for the research is an important factor as the researchers need to learn how to understand *each other*. As social scientists there was a general communality of understanding but the meaning of some terms had to be discussed and agreed during the course of the project, time and again.
- Moreover, it takes time to understand how different institutions in different cultural contexts operate, approach things and have different ways of working.
- English as a working language is a great thing, however, for our research we urgently need our mother tongue, too (and in the case of our Italian partners: even a third language!). Cross-translating time and again is very time-consuming and sometimes even frustrating.
- Finally, and related to the former “lesson learnt”, an Integrated Project like FLOODsite also needs time and money for, as well as a culture of, other languages, especially when it should be as practice-oriented as it is intended. Many local and regional stakeholders across Europe don’t read and speak (enough) English, hence papers – and recommendations! – in the new *lingua franca* turn around as inadequate.

Beside cross-cultural differences a final issue of research cooperation needs to be mentioned: in such a project it is impossible to agree on all issues and to always find a compromise. Hence, different theoretical conceptualisations, empirical interpretations and practical conclusions belong to such work.

⁴ Our research predominantly focussed on recent flood events. In order to test some hypotheses concerning awareness, preparedness, local knowledge and local risk cultures, we also integrated one case where for a long time no flood has happened (Vipiteno/Sterzing, Italy, see Chapter 3.2 below).

Thus, there are certainly contradictory descriptions and explanations in this report – but keep in mind that it was written by 6 different authors from 3 different countries (and many more differentiations, e.g. with respect to regional background, gender, age, disciplinary training etc., could be added).

3. Case studies in Germany, Italy and the UK: background information

3.1 Selection criteria

The case studies in Germany, Italy and the UK were selected according to common criteria (flood type, flood frequency, last major flood event, community size, and type of community) which the partners agreed upon after an intense debate and (as far as possible) personal inspections. Further FLOODsite partners were involved in this work (University of Padova, IÖR Dresden). Relevant administrative data were collected for the finally selected sites: four flash flood sites (Bocenago, Romagnano, Roveré della Luna, Vermiglio) in the province of Trento, one plain flood site (Vipiteno/Sterzing⁵) in the province of Bolzano/Bozen⁶, one flash flood site (Malborghetto-Valbruna) in the province of Udine as well as three plain flood sites in the Mulde catchment (Eilenburg, Erlln and Sermuth with the most recent flood event in 2002 also showing flash flood characteristics).

The locations chosen were situated in the so-called FLOODsite pilot sites:

- the **Mulde** as a tributary of the Elbe river, where a major flood occurred in August 2002,
- the **Adige/Sarca and Tagliamento river basins**, where flash floods are rather frequent (the most recent ones occurring between the year 1998 and 2003), and
- over 45 locations in England and Wales covering many river basins but with one study focusing on the lower river **Thames** which is characterised by both slow-rising plain floods and extreme rainfall events in urban areas.

Therefore, the aforementioned selection criteria needed to be adopted to empirical reality:

- **Flood type:** different types of floods were taken into consideration with a focus on flash floods and plain floods with a very fast onset.
- **Flood frequency and recent flood history:** both recently flooded locations and communities at risk where no major flood have been occurring for a long time were chosen (the latter only in Italy and in England/Wales).
- **Community size and type:** we carried out our research in both urban and rural locations of varying size.

Since in the UK, no primary investigation but rather secondary analyses of existing data were carried out, it was necessary to choose previous recent studies which included data that matched the above criteria as far as possible. With regard to flood type, the majority of river flooding in the UK is from plain floods, many with slow onset. However, some of these plain floods have been sudden onset and demonstrate the characteristics of flash flooding. Data was available for both recently flooded and those at risk, plus for some respondents who had experienced repeat flooding. Community size and type varied and examples were drawn from urban, semi-urban and rural locations of varying size within England and Wales. However, as the previous FHRC surveys had often been undertaken at the national level, drawing respondents from many different locations, with the exception of the Lower Thames study, there was no detailed data available on the individual locations and assumptions have been made during the analysis based on existing knowledge of some of these locations.

⁵ Vipiteno and Sterzing are the Italian and German names of the municipality, respectively.

⁶ Bolzano and Bozen are the Italian and German names of the Province, respectively.

3.2 Characteristics of the case studies and the flood events considered

German case study

The research locations of the German case study are based in the Saxon section of the river basin of the **Vereinigte Mulde**. In the southern part of the area considered the Mulde basin is hilly and the valleys are rather narrow. In contrast, in its northern parts lowlands prevail, resulting in a lower stream velocity. Although the Vereinigte Mulde is a plain flood example, the characteristics of the disastrous event in its upstream areas in 2002 were similar to that of a flash flood (almost no preparation time, rapid discharge etc.; see below).

According to the criteria mentioned above, the villages Sermuth and Erlbn and the small town Eilenburg were chosen for analysis. The village of **Sermuth** is located close to the confluence of the Zwickauer and the Freiburger Mulde. Behind Sermuth, the name of the river is Vereinigte Mulde. The empirical investigations were carried out in two out of three Sermuth districts (Kleinsermuth and Großsermuth) with approximately 400 inhabitants. The third area, Kötteritzsch, was left out since it was not affected by the flood. Both old farmyards and new buildings are to be found close to the river. Other parts of the village are situated in upper areas. Sermuth belongs to the municipality of Großbothen which in 2005 had a population of about 3,500. The second village under investigation, **Erlbn**, is located at the end of a single one-way road, just behind the Mulde dike. The village consists of 33 properties and has almost 100 inhabitants. Erlbn was completely inundated by the 2002 flood, the water level was 85 cm above the dike level. One million Euro are invested at present in order to renew (and raise) the old dike (by 95 cm) and to erect a second one. The village itself was reconstructed.

Eilenburg is a small town consisting of an urban, originally medieval core (in most parts destroyed during World War II), some 19th and 20th century neighbourhoods (among them Karl-Marx-Siedlung, which was heavily affected by the 2002 flood) as well as six rural districts, including the former village Hainichen, which was part of our empirical analysis. In 2005, about 17,500 inhabitants lived in Eilenburg. Approximately two thirds of all buildings in the town are detached and semi-detached buildings. The historic centre is located on an island surrounded by the Mühlgraben River and the Mulde River. Therefore large parts of the city are protected by dikes and flood defence walls, which were supposed to be renewed in the summer of 2002. However, at the very day the construction work was supposed to start, the dikes collapsed due to the rising river. Nevertheless, the pre-flood planning efforts gained new importance, since quickly after the 2002 flood the municipality was able to start rebuilding the dike constructions around the town. Today, Eilenburg not only has one of the most costly flood defence systems in the Free State of Saxony, but its reconstruction is also the most advanced in the region.

The **2002 Elbe flood** was triggered by a so-called Vb weather situation. This means that warm and humid air comes from the Mediterranean Sea, passes east of the Alps northwards and meets a body of cooler air. A stationary low pressure area is developing causing heavy precipitation, which was amplified in this case by orographic barriers such as the Sudeten and Ore Mountains (Erzgebirge) as well as the Bavarian/Bohemian Forest (Bayrischer Wald/Böhmerwald). As a consequence, large parts of the catchments of the Elbe River experienced heavy rainfalls between 6 and 13 August 2002. The situation was aggravated by heavy rainfalls in the Bohemian parts of the river basin (mainly tributary Vltava). In Saxony, within a few hours the situation along the tributaries of the Elbe (mainly the different streams of the Weißeritz river) was out of control, similarly along the Freiburger Mulde. Here the flood rose within a few hours. Therefore the villages of Erlbn and Sermuth, which are located in the hills (flood loam and loess sediments) close to the confluence of the Freiburger and the Zwickauer Mulde, were rapidly approached and inundated by the flood. In Erlbn, the dike broke at 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 dike was inundated. In both locations, the flooding of the buildings started in the very early morning of the 13 August 2002.

It is important to note – in order to understand the results presented – that 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. While Erlln was completely inundated, in Sermuth and particularly in Eilenburg only some neighbourhoods were flooded; however, the river inundated also in these communities large parts of the respective area. It is also worth noting that in Sermuth and Erlln the flood peak occurred in the very early morning hours of August 13, 2002 with no warning and evacuation in advance, whereas in Eilenburg the inhabitants were better prepared for the immediate event, i.e. both warned and, in large parts, evacuated in the morning hours of August 13, 2002. The flood wave actually reached the town in the afternoon of the same day. Finally, it needs to be pointed out that the last major floods in the area were already decades ago (in 1954 and 1974; for more detail see Steinführer and Kuhlicke 2007, 16–22).

Overall damage due to the 2002 flood is estimated at 9–11 billion Euro, with damage to public infrastructure amounting to about 3.5 billion Euro. 337,000 people were directly affected and 20 people died (DKKV 2003, 8; WWF Deutschland 2007, 5).

Italian case study

The six research locations for the Italian case study are in the upper Adige/Sarca river basin in the Trentino Alto Adige Region, and in the upper Tagliamento river basin in the Friuli Venezia Giulia Region. The main flooding processes in these areas include both torrential processes – with flash floods and debris flows – and fluvial processes with widespread river floods.

In the four sites located in the province of Trento (Bocenago, Roverè della Luna, Romagnano, and Vermiglio), flood events occurred all either in November 2000 and/or in November 2002. Precipitation during November 2000 was anomalously high: total precipitation varied between 200 and 500 mm across the region. This caused several landslides and debris flows. Even though each event was preceded by long lasting rainfalls, it is treated here as a flash flood, as it resulted in localised land sliding and debris flows. Similar phenomena occurred during the month of November 2002, with long lasting rains which brought the soils to saturation. Even minor rain events did cause land sliding, debris flows and flash floods.

Bocenago, a small village of 327 inhabitants⁷, suffered a landslide triggered by an intense precipitation. On 26 November 2002, the debris flow descended into the centre of the village and hit several houses. About 150 people were evacuated for a week. Damage here has been not so serious as in **Romagnano** (1,272 inhabitants) where on 19 November 2000, after three months of continuous rains, an intense precipitation event triggered a landslide and a debris flow on the Rio Prà dell'Acqua⁸ creek. The event occurred on Sunday at 7 p.m., and only for this reason there were no casualties. The church, the parish house, and the school building were invaded by mud, but in the meantime protected the rest of the village by acting as a dam and diverting the flow along the main village road. About 500 people were evacuated for a week.

In the same days, between 15 and 20 November 2000, a huge, slowly evolving landslide (about 100,000 m³) affected the lower watershed of Rio Molini, close to the uppermost portion of the village of **Roverè della Luna** (1,472 inhabitants). After two months of continuing rainfall, the landslide generated a sequence of debris (hyper-concentrated) flows (each characterised by a volume of around 1,500-2,000 m³), which exceed the sediment transport capability of Rio Molini. The decision to evacuate the entire village was taken mainly as a preventive measure and consented the removal of several obstructions from bridges.

The last site in the province of Trento, **Vermiglio** (1,856 inhabitants), exemplifies the case of a location hit by two consecutive debris flows, at a short time interval, in both 2000 and 2002. On 17 November 2000 a debris flow deposited over the parking lot of the village, damaging some buildings.

⁷ This number as well as all following ones refer to the Census 2001.

⁸ *Rio* means “stream” in Italian.

The Rio Cortina broke its banks three times, destroying three bridges and immediate interventions from the local fire brigade and civil protection units prevented more serious damage. About 100 people were evacuated for some days (maximum: one week). Two years later, on 14 November 2002, a new debris flow event occurred on the Rio Cortina, causing damages in the same area. A new check dam was built to mitigate the flood and debris flow risk, taking into account experience from the last event. Local residents showed some scepticism about the structural interventions designed to mitigate the risk after the first event and which proved useless in the second one.

The fifth community taken into consideration is the town of **Vipiteno/Sterzing** (5,785 inhabitants), in the province of Bolzano/Bozen, where the last severe event (a plain flood) occurred in July and August 1987. The local population includes a large German speaking group, to which belong three quarters of the inhabitants according to the official data. The location exemplifies the case of a high flood risk area. This was done with the specific purpose of testing whether differences on the basis of recent in contrast with long-past experience could be identified for individuals as well as communities. The last case included, **Malborghetto-Valbruna** (1,028 inhabitants), is a small municipality in the Friuli-Venezia Giulia Region, severely hit by a flash flood in the year 2003, which also caused two casualties and extensive material damage. The flood was the result of the combination of two extreme events: an extraordinary storm, during which 355 mm of rainfall fell within just three to six hours, and the anomalous condition of the soil, extremely dry at the end of a prolonged drought (Borga *et al.* 2006). Water transported sediments, stones, and shrubbery onto the village, causing damage to infrastructures and property, and forcing the evacuation of about 600 people for at least 2 weeks.

Case studies England and Wales

As stated above, the focus in the UK has been on re-analysing, or further secondary analysis of, data from earlier studies rather than the collection of new survey data. Thus, data in the existing data sets are very different from the case study data focused on particular localities and particular flood events analysed in the German and Italian case studies, although in a number of cases very similar questions have been used. Thus, only some limited comparison with data from the German and Italian studies was possible. The UK studies focused on individuals and households rather than upon communities. Moreover, there is very little data on flood risk constructions across the studies. However, the re-analysis provided a valuable opportunity to consider issues and relationships not considered in the original analysis.

The data sets comprised: the 'Intangibles' study (2002-2003) of 983 flooded and 527 at risk residents; the 'Warnings' study (2004-2005) of 408 flooded residents; and the 'Lower Thames' study (2005) of 206 at risk and recently flooded residents (see RPA/FHRC *et al.* 2004; Tunstall *et al.* 2005; McCarthy *et al.* 2006, respectively). The data sets provide quantitative survey data derived from structured questionnaires and some initial qualitative focus group and in depth interviews. The 'Intangibles' data set covers a range of locations (up to 30) and a number of different flood events in (key ones being the Easter 1998 floods and the very extensive autumn 2000 events). The bulk of the 'Warnings' respondents were involved in diverse events that occurred since September 2000, while the 'Lower Thames' data set focused on a particular location along the River Thames and the January 2003 flooding.

The Easter 1998 flooding in England and Wales was the most widespread for many years. Sustained heavy rainfall across central England and Wales caused rivers to flood over the Easter holiday weekend. Rainfall was exceptionally heavy and prolonged over three counties in central England resulting in severe flooding in these areas (return periods between 75 to 170 years) but with lesser events elsewhere (20-75 years). In many catchments the flooding was the most severe ever recorded, five people died directly or indirectly as a result of the floods.

The autumn of 2000 was the wettest on record across England and Wales for over 270 years. Recurrent heavy rainfall in October and November caused flood levels in many locations to be the highest on record, and in many places no previous record of flooding existed. The flooding was very

dispersed, with around 10,000 properties (homes and businesses) being flooded at over 700 locations. Many of these locations involved only a small number of properties. Since the Easter 1998 flooding, improvements had been made to flood warning systems and these appeared to have worked well. Around 11,000 people were requested to evacuate their homes, although not everyone complied (EA, 2001).

Severe flooding occurred along the River Thames in January 2003. This was caused by heavy rain falling on a saturated catchment with already swollen rivers. The flooding took place relatively soon after the June 2002 completion of the £110 m, Maidenhead, Windsor and Eton Flood Alleviation Scheme (a diversion channel named the Jubilee River), immediately upstream from the Lower Thames area. The flood alleviation scheme saved approximately 1,000 properties in these locations from being flooded but there was internal flooding affecting about 500 properties elsewhere including the downstream Lower Thames area. The extent of the River Thames flooding was the worst since 1947 (see Tunstall *et al.* 2007, 9-14, 32-33 for more details).

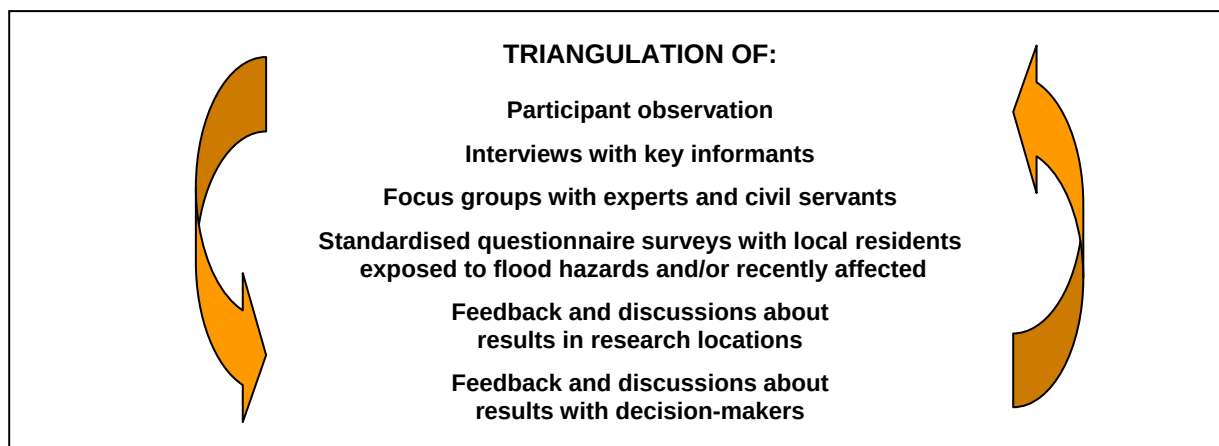
3.3 Methodological approaches

In all case studies we applied the methodological principle of triangulation of standard and non-standard (“quantitative” and “qualitative” methods) integrating different audiences. The main method of data gathering – standardised questionnaire surveys with residents at risk and recently affected by flooding, respectively – were prepared by interviewing decision-makers and (in the Italian case studies as well as in the previous investigations in England and Wales) focus groups. After having elaborated first research results, we presented and discussed them with members of the communities (German and Italian case studies) or with authorities in charge of flood defence and flood risk management (in England and Wales). The results of this process were used for refining our data interpretations (Fig. 3.1). Social scientists call this approach triangulation which means to investigate a certain problem (in our case: flood events and their impact on communities) from different perspectives in order to come as close as possible to an adequate interpretation (for more detail: Jick 1979; Flick 1992 and 2004; Erzberger and Prein 1997).

Thus, our research design combined and tried to integrate *emic* and *etic* perspectives (Pike 1967; Goodenough 1970; Harris 1980) so that one would shed light on the other. The term *etic* refers to the detached view of a researcher observing a system, the term *emic* to that of an insider familiar with and participating in the system.⁹ In such pursuit, we fully recognised that we, as researchers, were not just collecting data from an external, fixed reality, but were contributing to shape it through our framing of issues and our interactions with the local stakeholders. We wanted to understand how individuals belonging to certain communities and cultures frame the experience of their physical and social environment. Thus our purpose was not to come to share the *emic* perspective, but “to understand” it. Following Max Weber, we take “understanding” as encompassing both meanings of *Erklären und Verstehen* (roughly, explaining and empathising). We maintain that without such understanding, any *etic* view is at risk of being inadequate, if not totally distorted.

⁹ The terms are derived from phonetics and phonemics, respectively, which are used in linguistics.

Fig. 3.1: Methodological approach



Source: authors' considerations

The specific approaches slightly differed which was also due to the general Task design (primary investigations in Germany and Italy on the one hand, reanalyses of existing data for England and Wales, on the other). In the following section the individual methodologies are described.

German case study

Applying a mixed-method approach was one major effort in the course of the German case study. The following standard and non-standard methods were applied:

- documentary and secondary data analysis,
- semi-structured interviews with decision-makers (N=10),
- in-depth interviews with affected residents (N=20)¹⁰,
- standardised questionnaire surveys in Eilenburg (city centre, Karl-Marx-Siedlung, and Hainichen), Sermuth and Erlln (N=404) which were all heavily affected by the 2002 flood,
- presentation and discussion of research results with local decision-makers, agencies in charge of civil protection and the local population.

Our main focus was on the standardised questionnaire surveys. As described in Chapter 2, the process of finalising it in cooperation with the Italian and English project partners took several months. The questionnaire combined closed and open questions, the former serving “quantitative” and the latter “qualitative” (content) analyses. Thus, a mixed methodology was adopted even with respect to the questionnaire: closed questions imply pre-understanding on the part of the researcher; open questions allow for subjective interpretations and additional remarks by the respondents. Prior to the survey, the draft questionnaire was tested in a pilot study. Ten questionnaires were distributed among socially and demographically different test persons, mostly from the research locations, in order to check the comprehensibility and effectiveness of the questionnaire and its logic. Consequently, several questions needed to be revised. The final questionnaire contained 71 both closed and open-ended questions as well as two additional ones referring to the interest of the respondents to receive information about the results of the survey, and whether they want to add aspects that were not covered by the questionnaire.

In contrast with the two other case studies, we exclusively interviewed people who recently had direct flood experience since the 2002 flood event was so dominant in media discourses and still very present in the memories and daily lives of the people living in the areas. There we tried to reach all households affected by the 2002 flood, thus no sampling procedure was used. We applied a specific research design, well-tested in eastern Germany with its specific post-socialist transition history stretching to all

¹⁰ 9 semi-structured interviews with decision-makers (often with follow-up meetings) and 11 in-depth interviews with residents affected by the 2002 flood were recorded and transcribed.

parts of daily life in the past 15 years or so. The technique basically consists of a self-administered survey with some elements of face-to-face interviews and postal surveys. The questionnaires are distributed and collected by well-trained assistants and completed by the respondents themselves. After about one week the questionnaires are collected. Due to the interaction between the high quality of the survey preparation (several public announcements), the design and comprehensibility of the questionnaire and the fieldwork procedures itself, very high response rates of at least 70% are to be guaranteed (Steinführer *et al.* 2007). In the FLOODsite survey, we reached 73% in Eilenburg and 83% in Erlln. Moreover, this methodology is very time- and cost-efficient. The data were treated with SPSS (numerical data) and MAXQDA (a specific programme for analysing verbal data; for more detail: Steinführer and Kuhlicke 2007, 25–31 and Fig. 3.2).

Italian case study

The Italian research design also foresaw the triangulation of standard and non-standard methods. Data gathering included different complementary strategies and techniques:

- use and revision of existing data from secondary sources, such as census data and archives,
- focus groups with officers from provincial services and agencies in charge of civil protection, risk prevention, water resources, hydrology, demographic data collection and analysis in the provinces of Trento and Bolzano/Bozen, officers from municipal services in Vipiteno/Sterzing, and members of the voluntary fire brigade in Romagnano (N=4),
- semi-structured interviews with qualified informers (i.e. people who, due to their status, role or experience, have a deep knowledge of the subject under investigation and/or the relevant social context) including local authorities, civil servants, community leaders, politicians, scientific and technical experts, members of non-governmental organisations, etc. (N=32),
- pilot testing of the questionnaire with residents in the municipality of Malborghetto-Valbruna (N=22)
- standardised questionnaire surveys with local residents in the six research locations (N= 686; 100 in each site, except Vipiteno/Sterzing (N= 186),
- feedback and discussion about results with decision-makers (N=3) and
- feedback and discussion about results in research locations (N=6).

In drawing the research design, each stage was built as a basis for the following one, while in the fieldwork there was some overlapping so that the different parts would complement one another. In this way, we aimed at consolidating the theoretical foundations of the research and providing an integrated picture through the integration of different views and data (see Fig. 3.2).

In this perspective, focus groups, semi-structured interviews, and participant observation were planned both as preliminary and complementary to the quantitative surveys. The protocols were prepared in order to better define key research themes and were instrumental in establishing stable links with local stakeholders. Based also on these results, the questionnaire construction was a long-lasting process (see also Chapter 2). A first draft of the questionnaire was pre-tested in the municipality of Malborghetto-Valbruna and allowed the finalisation of the survey protocol which contains mostly pre-structured (or closed) questions, with the addition of some open-ended ones. Virtually the same version of the questionnaire was used in the four sites in the Trento area (Bocenago, Romagnano, Roverè della Luna, Vermiglio) and in Malborghetto-Valbruna. Slight variations were introduced, concerning site-specific or event-specific questions. A complete revision and adaptation were necessary for Vipiteno/Sterzing, where the most recent events did not have any significant consequences for the residents. As to sampling procedures, due to the geographical and administrative¹¹ characteristics of the territory and the events under investigation, drawing a random sample (even if population records and privacy restrictions allowed it) might result in the exclusion, or under-representation, of the very people we were interested in. Thus, we draw a quota sample, which

¹¹ In Italy, the lowest administrative unit is the municipality, whose political representatives are elected by the residents. There are as many as 8,102 municipalities in Italy.

replicated the distribution of three main demographic variables in the general population (gender, age, education), and risk exposure. We identified low, medium and high risk areas, on the basis of the indications of the municipality technical officers and of risk maps, when available. The questionnaire was submitted face-to-face by trained interviewers and each interview lasted from forty minutes to two and a half hours. In contrast with the German case study, the data collection technique resulted in a high quality of the data achieved, on the one hand, and a very time-consuming empirical phase going far beyond the original schedule, on the other.

Finally, quantitative data from the surveys were treated with SPSS¹². As to ‘qualitative’ answers (derived from open-ended questions or spontaneous additions to the pre-defined items of response), they were categorized and aggregated using EXCEL and, whenever appropriate, transformed into quantitative data amenable to treatment with SPSS (for more detail see De Marchi *et al.* 2007, 15–23).

Case studies England and Wales

As stated above, and in contrast with the German and the Italian case studies, in England and Wales secondary data analyses were carried out by FHRC since they have a long history of data collection with regard to flooding and flood hazards. The data were originally collected and analysed for other purposes, based on particular theoretical frameworks. This therefore allowed only limited comparison with data from the German and Italian case studies. However, for the purpose here they have been further analysed to augment our understanding of flood event experiences, preparedness and response to elaborate our understanding of social vulnerability by analysing the social and health impacts of flooding in the UK. The data sets provide quantitative survey data derived from structured questionnaires and are thus different from the data collected for the German and Italian case studies which includes substantial qualitative elements derived from qualitative interviewing, focus groups and observation. Yet, the FHRC surveys did involve some initial qualitative focus group and in-depth interview research which were also considered along with data from other relevant earlier qualitative studies (Tapsell *et al.* 1999; Tapsell and Tunstall 2001, Tapsell *et al.* 2003; see Tunstall *et al.* 2007, 9–17 and Fig. 3.2 for more details).

In total, the three data sets provided data from 2,124 respondents, both flooded and at risk. The UK case studies differ from those of Germany and Italy in several ways. Firstly, the FHRC studies focused on individuals and households rather than upon communities. Therefore, as stated above, except in a few situations, it has not been possible to take the details of the specific local contexts into account due to the large number of survey locations. Secondly, the issue of social capital was not addressed in these studies as in the German and Italian case studies, although questions on help and support were included and some inferences and observations can be made. Finally, the UK studies only included a few questions on how respondents construct flood risk, conclusions on this aspect are also limited.

¹² Bivariate and multivariate statistical techniques were used. Cross-tabulation was systematically employed with nominal and ordinal independent variables. Mean comparisons were used instead with scale dependent variables. In both cases tests of statistical significance were utilised: chi square for cross-tabulation and eta for mean comparisons. Factor analysis has been employed for the construction of indices.

Fig. 3.2: Main facts about the case studies

Case study Germany Research locations - 3 sites in the Land Sachsen (one small town and several rural districts and villages) Last major flood - in August 2002 (before in 1954) Prevailing type of flooding - plain flood (2002: with some flash flood characteristics, e.g. with respect to speed of onset) Empirical investigation => standardised questionnaire survey in: Eilenburg, Erlln and Sermuth (Saxony) in 2005: N=404 (affected) => semi-structured interviews with decision-makers => in-depth interviews with residents affected by the 2002 flood	Case study Italy Research locations - 6 sites in the regions Trentino-Alto Adige (provinces Trento and Bolzano/Bozen) and Friuli-Venezia Giulia (province Udine) Several severe floods - in 2000, 2002 and 2003 Prevailing type of flooding - flash floods and debris flows Empirical investigation => standardised questionnaire surveys in: - Bocenago, Romagnano, Roverè della Luna and Vermiglio (province Trento) in 2005/06: N=400 (affected) - Vipiteno/Sterzing (province Bolzano/Bozen) in 2006: N=186 (at risk) - Malborghetto Valbruna (province Udine) in 2006: N=100 (affected) => focus groups with local stakeholders => semi-structured interviews with informers => participant observation in the six sites => feed-back and discussion about results with decision-makers and in the research locations	Case studies England and Wales (UK) Research locations - over 45 sites in England and Wales (in some locations sample sizes were small) Several severe floods - between April 1998 and January 2003 Prevailing type of flooding - slow-rising and fast-onset plain floods, flash floods in steep catchments and very extreme rainfall events Empirical investigation - reanalysis of existing FHRC data (based on questionnaire surveys): => 'Intangibles' data set (2002/03): N=983 (affected), N=527 (at risk) => 'Warnings' data set (2004/05): N=408 (affected) => 'Lower Thames' data set (2005): N=206 (at risk/recently flooded)
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4. Social vulnerability to flooding

While starting from Blaikie *et al.*'s (1994, 9) definition of vulnerability ("the characteristics of a person or group in terms of their capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard") and specifying its social and temporal dimensions (Fig. 1.1), in a further step of analysis, we found it useful, for heuristic purposes, to distinguish between different levels of vulnerability:

- Vulnerability of individuals and households (micro-level),
- Vulnerability of local communities (meso-level),
- Vulnerability of institutions, organisations and authorities (meso- and macro-level).

In the national reports, these three levels of vulnerability were treated with different intensity, depending upon the specific methodological instruments. Most attention was paid to the micro-level of vulnerability, i.e. the individual and the household. It was also the main focus point of applying and refining the temporality of vulnerability. But since our work from the very beginning took the community as collective actor into account, we also investigated its vulnerability in different terms and at different moments of a disaster. Finally, we assumed that institutional settings also contribute to vulnerability and that the temporal dimension, once more, plays a crucial part, since disaster management and post-flood recovery, for example, need specific coordination efforts.

4.1 Individual and household vulnerability

The micro-level of vulnerability refers to the aspects which negatively influence a person's or a household's ability to prepare for and respond to an emergency. Such aspects, firstly, relate to standard conceptualisations of social inequality which regard certain characteristics of a person (e.g. age, household type, income, formal qualification, gender or race) and specific categories (the very old, one-person households, the very poor, the unskilled, women, ethnic minorities), respectively, as decisive for being (potentially more) vulnerable to flooding. The underlying hypothesis is that these social groups exhibit a higher vulnerability than people without this specific feature. Blaikie *et al.* (1994) put it very strikingly: "as a rule the poor suffer more from hazards than the rich" (*ibid.*, 9). With this conceptualisation, we are in line with mainstream social science research on vulnerability which tries to operationalise and measure vulnerability by means of social indicators and indices (Blaikie *et al.* 1994, 9, 13, 132–4; King and Mac Gregor 2000; Buckle *et al.* 2000; Tapsell *et al.* 2002; Cutter *et al.* 2003, 246–9, 252; for an overview: Tapsell *et al.* 2005, 11–7). However, as these taxonomic approaches often tend to overlook the situatedness of vulnerability (Wisner 2004, 184–8), we applied this view in a context- and phase-sensitive way.

In the German and Italian surveys we invited the respondents to focus on different temporal phases of the events suffered by their communities: prior to, during, and after their occurrence (see also Fig. 1.1.). For each phase, we asked them about their behaviours, attitudes, and expectations. The next step was to perform a cross-tabulation with a set of hypothetical indicators which we assumed to influence social vulnerability (see also Table 2.1).

As for the **German case study**, the empirical material revealed for the *anticipation phase* that the vast majority of the respondents felt by far not prepared for a flood like the 2002 event. None of the tested vulnerability variables explained any significant differences which were only minimal anyway (just 3% felt at least "a bit" prepared). However, with regard to precautionary measures as well as insurance some differences were to be observed. Particularly tenure played a decisive part, since owner-occupiers applied precautionary measures significantly more often than renters. Besides, but probably due to East German specifics (flooding used to be covered by normal household contents insurance until 1990), age mattered, since it was to a higher degree elderly people who were holding insurance

policies before the flood. Income also plays a role, since insurance was more often held by people of higher social classes. With regard to the period shortly before the flood, it is usually expected that *ad-hoc* activities are particularly important for reducing material vulnerability. However, the majority of people simply left their homes without taking any action. Similarly as above, tenure was of importance, since home-owners more often than renters tried to secure as many things as possible.

With the water flowing into the respondents' homes, the latent threat changed into an actual one. Thus, *resistance and coping* behaviour became important. First of all, we were interested in ad-hoc activities to reduce one's material vulnerability. Yet, in the case of the 2002 flood in spite of all activities before the water actually inundated the residents' homes, the individual efforts to reduce material vulnerability did not have any influence on the economic damage. Neither long-term precautionary nor ad-hoc activities nor receiving a warning led to a significant damage decrease, and in some cases losses were even more substantial than for people who did not apply any measure. Hence, the picture is rather contradictory making it very difficult to explain damage variance and, therefore, material vulnerability. The only explaining factor was once more tenure: as to be expected, renters (in our study almost exclusively situated in the city centre of Eilenburg) were significantly less affected than owner-occupiers (in all other research locations), both with respect to buildings and to contents. However, this phase is not only about damage but also about people. In this sense, information was crucial for coping with the immediate situation. The analysis showed that informal networks (family members and friends) were the most important resources people relied on. Additionally, there is empirical evidence that particularly the group of respondents older than 60 years as well as people with a low formal qualification seem to have received less support, thus that in our understanding in this phase they were more vulnerable.

With regard to the phase of *recovery and reconstruction*, the picture is again diverse. The perceived overall impact of the flood on the household was above all a matter of age and tenure: elderly people as well as home-owners perceived the impact as most severe. Additionally the elder cohorts (more than 60 years old) evaluated the consequences for physical and mental health as particularly bad. However, in this context the specifics of the reimbursement process after the 2002 flood in Germany have to be mentioned, since they were profoundly influencing the recovery and, thus, resilience (see also below, Chapter 6). Due to the extensive degree of monetary compensation, satisfaction with material compensation was extraordinarily high. With regard to a next possible flood the question of precautionary measures becomes virulent again. Although the level of awareness and also of preparedness increased, still the majority of the residents did not change anything in their homes in order to be more adequately prepared for a possibly new flood. This has its causes certainly also in the high level of post-flood compensation. As to be expected, the most important distinction was due to tenure: more residents living in their own house than renters applied precautionary measures after the 2002 flood. Also with regard to the types of post-flood mitigation measures, tenure is a crucial variable: while owner-occupiers were more inclined to pursue constructional changes at their buildings and to take up or improve their existing insurance policies, renters more often (but at large: relatively seldom) fitted the interior of their dwellings to a possible flood.

Taken together, there is broad evidence that a strict ex-ante assumption concerning social vulnerability *solely based on socio-economic variables* is *not meaningful* in the case of the 2002 flood. There is no single variable (e.g. age, income etc.) which would coherently and for all single phases explain social vulnerability. Neither is there one single social group (the very old, the very poor, those without social network etc.) which proved to be particularly vulnerable in all dimensions. Moreover, in many cases the relations between behaviour and underlying social structures turned out *not to be linear*, rather the *extreme groups* (such as the very young versus the very old, people without social networks and so forth) were striking. On the contrary, the analysis revealed a quite diverse picture emphasising the importance of applying a situational approach, which not only relies on demographic and/or taxonomic variables, but rather takes into account the different aspects of vulnerability as well as the peculiarities of a certain flood event. Moreover, also the phase-oriented approach provided valuable insights because at different points in time varying 'performances' of different social groups were to be observed.

As one of the most explanatory factors in a wide range of analyses tenure was singled out. Tenure, more precisely: owner-occupation, carries with it notions of a specific responsibility for property which is also mirrored in our data. However, the picture is ambiguous, since home-owners on the one hand applied more precautionary measures, but experienced greater material damage on the other. However, again the specifics of the 2002 flood event need to be taken into account which only rarely allowed effective counter-measures in the very same situation. A second strong explanatory variable – location – will be discussed in more detail in the frame of community vulnerability (Chapter 4.2).

In the *Italian case study*, findings for the *anticipation phase* revealed that most respondents were largely unprepared to face what happened and had not taken any previous precautionary measures. Previous experience with flood events somewhat increased the feeling of being prepared, but didn't necessarily stimulate action. Almost the totality of respondents didn't take any measures for protecting their households even after the flood events due to several reasons, including lack of knowledge of or confidence in individual initiatives, and/or (over)reliance on structural protection works.

The most vulnerable in the *anticipation phase* appeared to be women, housewives and students, those who received advice or help only by informal networks during the events (i.e. family, relatives, friends and co-workers), those who suffered a longer evacuation and a higher flood impact, those without a previous flood experience, and those with a higher level of trust in local authorities. The connection between the last variable and vulnerability deserves some comments. This finding is consistent with the hypothesis about the side effects' of services' effectiveness, which emerged from the interviews and the focus groups with flood risk professionals and managers. On the basis of this hypothesis, the residents' trust in services together with the agencies' good performance enhance social vulnerability. Services' effectiveness encourages, even if indirectly, the residents to rely completely on them: they rarely take action by themselves and refuse to take on the responsibility of any action pre and during the emergencies. This will also be discussed below (see Chapter 5.3.).

As to first response to the event, there was of course a great variety of behaviours, of varying degrees of appropriateness, influenced by the characteristics of the event itself and other contextual circumstances. "Go and see what's happening" was a great temptation, but some learnt from experience that it should be resisted. The need (and sometimes the curiosity) to know what was happening had been a powerful motor and a large proportion of respondents felt they had no access to information that they considered relevant for deciding what to do. In any case, the most useful behaviour indications came from official sources, alone or in combination with personal networks. Practical help instead came mainly from voluntary organisations, namely the local fire brigades and others, reflecting also the state of respondents as regards community embedding and social networks.

In the phase of *resistance and coping*, the most vulnerable residents appeared to be those with a low level of community embedding and with a low trust in local authorities. The latter finding was just the opposite of that commented above pertaining to the anticipation phase, which proves that the same group may be more vulnerable at certain points in time and less vulnerable in others. Again, this highlighted the importance of considering the temporal dimension, when dealing with social vulnerability (see Chapter 1).

When we look at the *recovery and reconstruction* phase, the picture again becomes varied. Overall, an extremely low number of respondents suffered physical damage, whereas the percentage increases of those reporting psychological problems, tension and stress within the family and, mostly, the village. Definitely the most serious impact was perceived in interpersonal relationships with fellow residents, which was reflected in the not so optimistic judgment about the level of solidarity existing among them. The most vulnerable residents were women, families with persons in need, residents in high risk areas, those who received advice only from formal networks, those who received more help during the event(s), those who suffered a higher flood impact. The same holds for those who had no previous flood experience, those who could rely only on kin or mixed networks (kin plus friends).

As it was expected, the few respondents who are members of the local fire brigades showed a low degree of vulnerability in all the phases.

In conclusion, some variables proved more suitable than others as vulnerability indicators (+ = increases / - = decreases vulnerability): research location (rural/mountain locations -), gender (women +), length of evacuation (longer evacuation +), flood impact (high +), previous flood experience (yes -), fire brigade membership (yes -).

Most of the focus of the *case studies in England and Wales* was on individual and household vulnerability, on health impacts as well as on the broad issue of warnings. Various characteristics of individuals or households were examined that may increase their vulnerability to the effects of a flood event. These characteristics include gender and age of respondents, social grade and household composition (i.e. presence of children, single parents, and those living alone), prior health and long-term illness or disability. Also in the UK case studies, no single social variable or index of social variables could be identified to explain all aspects of vulnerability, coping and resilience in flooding. Different factors come into play in the different phases of a flood event and, more particularly, affect specific behavioural responses and coping activities. However, the recognition of these different aspects of vulnerability is important and needs to be considered by flood risk managers and other agencies.

Re-analyses of existing data revealed that certain actions taken in response to flood risk can help mitigate vulnerability. Taking flood proofing measures or the receipt of flood warnings may reduce vulnerability by potentially reducing damages to the household. Flood warnings and a longer flood warning lead time, which are intended to reduce the health and stress effects of flooding, were significant factors predicting vulnerability. Other actions taken to reduce vulnerability *before flooding* varied from keeping alert for flood warnings during high risk months, moving personal property to safety and acquiring sand bags. Factors associated with the *aftermath of the flood event* may also increase the severity of the effects of the flood or help the recovery. These factors include: having to leave the home and length of evacuation and overall disruption, problems with builders and insurers, worry about future flooding, and level of resources. Some of these are discussed in more detail with regard to preparedness and resilience in Chapters 5 and 6.

However, one aspect of the flood events that was extensively explored in the UK studies was that of the *impacts on people's health and well-being* and the effects of this on individual and household vulnerability. Vulnerability and resilience to flooding was seen to depend on a series of factors: flood event characteristics, social and demographic characteristics, dwelling characteristics and post-flood factors or intervening factors. Three variables were analysed as 'vulnerability variables' (overall severity and stress of the event as subjectively measured by respondents and psychological health as measured by the General Health Questionnaire (GHQ-12), both for current health and that at the worst time of the flood.

The most highly rated impact on the life of households' – the disruption and all the problems of getting the home back to normal – was most closely associated with the stress of the flood event itself, which was also a highly rated impact. This suggests that the stress associated with flooding extends beyond the event itself into the recovery period. Having to leave home and worry about future flooding and health effects were also related to stress impacts. Moreover, there were striking and significant differences in the rating of the effects between men and women, with women giving a higher rating than men to almost all the effects.

The manner in which individuals and households may respond to flooding, and their capacity to recover, may also be affected by their *subjective severity* of the flood impacts. When the subjective stress of the flood event was considered as a measure of vulnerability, introducing the social dimension revealed the importance of social inequalities in vulnerability to flooding. Three flood characteristics were important predictors: contamination of flood waters, the extent and depth of flooding. Living in less affluent areas was a predictor of higher stress levels while being in social

grades AB (i.e. the groups with the highest social status)¹³ was a predictor of lower stress levels. Tenure was also a factor, with renters showing greater vulnerability than those who owned or were buying their property. Flood warning lead time had some contributory influence in reducing vulnerability in the short term.

Findings indicate that the impacts of flooding extend temporally and are experienced very differently over time by different individuals, reflecting in part the nature of the flood event that affected them and their own characteristics. The GHQ-12 results provide a guide as to when flooded respondents may be at their most vulnerable e.g. with older people being more vulnerable during the flood event and less so during the recovery period. Five social variables emerged as highly significant predictors of high worst time GHQ12 scores and therefore vulnerability; these again included gender but also living in vulnerable housing, prior health and being aged between 45 and 64. However, the relationship between age and vulnerability does not appear to be linear.

Yet all of these factors only help to explain a very limited amount of the variance in vulnerability and certain explanatory variables appear to be contrary to expectations. For example, we would expect those living alone and particularly those aged 65 and over living alone to be more vulnerable than others. In certain analyses these variables appeared as significant predictors of *lower* vulnerability. Thus, the revealed situations and responses of respondents are much more complex and diverse than the concept of social vulnerability appears to imply. However, the analysis does help us to further understand the diverse factors influencing vulnerability before, during and after flood events.

A key area that was addressed in the case studies in England and Wales studies was the issue of *flood warnings*. England and Wales have one of the most advanced flood warnings systems in Europe, if not the world. The Environment Agency took over lead responsibility for disseminating flood warnings to the public in September 1996, prior to the surveys and flood events analysed for this report. A key reason for this change was evidence of institutional vulnerability under the previous system where agency responsibilities for flood warning dissemination were shared or unclear. This resulted in failures in co-ordination, co-operation and communications between agencies and with the public. When the flooding occurred in Easter 1998, the Agency had only just begun to make improvements to the warning system and to establish its system for warning directly rather than through other agencies such as the police. Its failure to provide warnings to many of those affected by that event was severely criticised.

Since that time, the Agency has focused attention on enhancing its flood forecasting, and especially its warning systems. It has expanded its ability to deliver warning messages directly to the public: firstly through its Automatic Voice Messaging (AVM) system, and since early 2006 through Floodline Warnings Direct (FWD), a national automatic telephone warning system with greatly increased capacity to deliver warnings. FWD has now become the main method by which residents in England and Wales are warned about flooding from rivers. The Agency offers different levels of service to different areas according to the level of risk. Warnings are provided to known areas of risk but flooding can occur in areas where no flood warning dissemination service is provided. The nature of a flood event can make a difference to the possibility of forecasting and issuing timely warnings, however some events are regarded as extremely difficult to predict with current science and technology.

A key research finding is that despite investment in improvements to warning systems, it is still only a minority of residents (rarely more than 40%) who *receive a flood warning* of any kind. In the studies, respondents were left to define what constituted a warning and their responses cover warnings deriving directly from official sources, informal warnings and indeed their own experience and judgement. The receipt of a warning is also very area and event specific. However, the data show that family, friends and neighbours were important informal sources of warning. These warnings may serve to amplify, supplement or indeed compete with formal systems (Parker and Handmer, 1998).

¹³ For the social grade classification which is widely used in market research in the UK, but also in the last census (2001), see Tapsell *et al.* (2007, 20–1).

Despite the low take-up of the warnings system, results from the Warnings Survey show that being registered on the system was found to be the main factor associated with receiving a warning. All registered residents were twice as likely to have received a warning as those not registered. The data suggest that there has been an *improvement in flood warning dissemination over time*, which may be influenced by the ongoing Environment Agency campaigns to raise awareness of flood risk and by recent flood events. Awareness was a factor associated with warning receipt, as was longer residence in an area, prior flood experience, home ownership and depth of flooding.

As yet, the Environment Agency's formal warning systems generally are not able to differentiate and prioritise particularly vulnerable households, although this may be done in certain locations and circumstances, for example, where flood wardens or informal warnings systems and active neighbourhood networks operate. In the surveys, the only groups who appeared less likely to receive a warning were those in lower-skilled occupations and those with the lowest social grade (often likely to be one and the same). However, it is not possible to establish whether these differences were due to variations in service provision to different neighbourhoods and groups or to differences in the extent to which residents are proactive in accessing services.

The *type and level of information* communicated in the flood warning message and how comprehensible and believable recipients find the message can be important factors in addition to the effectiveness of the dissemination mechanisms. Messages need to be meaningful to recipients if they are to be acted upon (Handmer 2000). The colour coded warning messages used in the 1998 flood event were found to be poorly understood and the Environment Agency responded by producing new warning codes, symbols and warning message content. Recipients of these new warning messages in the Warnings survey generally responded favourably to them with almost three quarters regarding the warning information as 'very or fairly informative'. Around the same number of recipients believed that their property was at risk from flooding on the basis of the warning, indicating trust in the Environment Agency. This suggests that denial and disbelief, often identified in hazards research, were not major impediments to action in this study and those who considered their warnings 'very informative' saved more of their property than other warning recipients (Tunstall *et al.* 2005).

A further point can be made on possible *rural-urban differences* in dependence on official flood warnings. FHRC research on flood warning systems over the years has examined the issue of the extent to which those at risk from flooding rely upon official warning systems in making decisions at the time of flooding. Residents in rural settlements have often reported less need for an official warning than those in urban areas (Neal and Parker, 1989; Tunstall, 1992). Farmers and rural residents may be more used to coping with flooding and less reliant upon official warning systems than those in urban areas. Lack of experience of, and connection with, urban rivers, population mobility and thence lack of community memory (*local knowledge*) of flooding may contribute to the greater reliance on official warning systems in urban areas. However, these data are old and public expectations of warning services, as well as their provision, may have changed in the intervening period.

On the evidence of the surveys considered here, warning systems were not effective in that they successfully disseminated warnings to only a minority of those at risk (with the exception of the Lower Thames study where more than half were warned). However, where received, warnings were effective in *encouraging recipients to take action* to protect their property in various ways. There is also some evidence of the effectiveness of warnings and longer warning lead time in reducing the stress experienced in flood events. Remaining institutional weaknesses in the UK that need to be addressed relate to co-ordination of agency response during the recovery phase.

4.2 Community vulnerability

Community vulnerability refers to the elements influencing the capacity of a community to cope with and to absorb a negative event. Hypothetically, we assumed that factors like

- social capital (social networks at the local level as well as community trust and cohesiveness)

- local knowledge as well as
- local attachment and community embedding

are crucial aspects impacting on this meso-level of vulnerability. Before presenting some empirical findings, these concepts are recapitulated.

Social capital can be understood, firstly, as a resource of individuals. This notion is mainly connected with the name of Pierre Bourdieu (1986) and James S. Coleman (1990, 302). Bourdieu (1986, 248) defines social capital as the “aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalised relationships of mutual acquaintance and recognition”. These resources are based on a person’s affiliation to social groups. It is both the quality and quantity of these social relationships and the resources (further social, but also economic and cultural capital) which can be mobilised via this network which makes up the social capital of an individual. The second perspective is mainly connected to Putnam’s idea of (not) “bowling alone” (Putnam 1993 and 2000). Putnam conceptualises social capital as a collective good of a community which is based on trust and shared norms (for a critical appraisal: Portes 1998, 18–20).

Notwithstanding the differences, in both conceptualisations **social networks** play a crucial part. People establish and are themselves part of various social networks, which are of different character (informal vs. formal), frequency (rarely vs. often), quality (kin vs. friends, weak vs. strong ties) and geographical range (for network analysis see Burt and Minor 1983; Schenk 1983; Pfenning 1996). In the context of floods and other hazardous events, we assumed that social networks function as crucial resources for information, material compensation, emotional support and physical help. In principle social networks are a protecting factor. They enhance the feeling of personal and community preparedness and reduce vulnerability.

But in the context of a disaster, not only personal networks to kin, friends, associates and acquaintances play a part. Rather, at-risk and affected residents have also to come to terms with representatives of organisations, such as fire brigades, municipal authorities, the Red Cross, the police, the army etc. Therefore, when analysing trust (crucial, for example, with regard to receiving information announcing a disastrous flood about to come) and the like, also the distinction between **formal and informal networks** widespread in the social sciences is necessary. In this distinction, informal networks refer to personal social networks as defined above. Formal networks are, according to Matthiesen (2005; with a slightly different terminology) “strategic cooperation structures within formal-institutional structures and systemic functions, with clearly defined strategic goals, explicit benchmarking processes (milestones) and [...] with a defined end (death of network)” (*ibid.*, 10). Usually the presence of strong formal networks decreases vulnerability, but it may also increase it if people rely completely on them and do not take action by themselves, delegating responsibility and passively waiting for help and instructions.

Only recently, the concepts of social capital and social networks were also applied in hazard research (Dynes 2002; Nakagawa and Shaw 2004; Kirschenbaum 2004; Bohle 2005; Pelling and High 2006). It has to be noticed, however, that most researchers are predominantly interested in the role social capital plays in the recovery phase and in the effects the disastrous event has on social cohesion and community relations (Beggs *et al.* 1996; Sweet 1998; Nakagawa and Shaw 2004). Only a few authors deal with the role of social networks and social capital in earlier stages (Barton 1969; Hurlbert *et al.* 2001; Kirschenbaum 2004) which was one focuses of the case studies in Germany and Italy as well as partly also in the UK.

Local attachment and **community embedding** relate to the emotional bonds of an individual to a certain place (Fried 2000) and its population. Hence they are closely related to the idea of social capital as a collective resource available to all members of the community. These might be rather strong ties in the case of one’s hometown and place of birth, respectively, or fairly weak bonds, e.g. for a commuter in his/her secondary place of residence. Local attachment – also referred to as place identity (Proshansky *et al.* 1983) – develops in time, which is both historical (local, societal) and

individual (life-)time. At certain places with a characteristic built, social, and cultural environment, people experience public events (e.g. disastrous floods) and their very personal affairs (births, deaths etc.).¹⁴ Hence, such events are related to the specific place and will be (re)constructed by local narrations and become part of the local memory. But in the first instance, people-place relations are made up of or mediated by social and material bonds. The social dimension of local attachment comprises all kinds of informal personal networks as well as to “functional” persons, such as doctors, landlords or teachers. With material bonds, mainly property and real estate are meant which imply both possession and obligations. The distinction is, of course, an analytical one – social networks also transfer material goods (e.g. money), and material property is often related to the history of one’s family, hence it has a social dimension.

Local knowledge as a further potential resource of communities at risk and affected, respectively, is a form of knowledge, which was developed and tested in the local environment and which is therefore held as highly reliable and accepted (Schmuck-Widmann 2001, 36). Local knowledge concerns not only the territory (morphology, dangerous areas, etc.), but also its management (abandonment or exploitation, control and monitoring, etc.). Very often this knowledge is fundamental for the local residents not only to understand how to behave in emergencies, but also to foresee and mitigate dangerous occurrences. Thanks to local knowledge, many people are able to judge whether there is actually a danger, avoiding not only useless worries and alerts, but also no alerts at all. Moreover, in the discourse on natural disasters it is also agreed upon that this form of knowledge is a valuable resource for mitigating the impact of a hazard, since the local population develops specific strategies over time for coping with crises (Blaikie *et al.* 1994, 64–9).

In the *German case study* our data revealed that informal social networks (kin to a higher degree than friends) were the most important source of help during the phases of resistance and coping as well as in post-flood recovery (Fig. 1.1). As for warning and information in the situation just before the onset of the flood, it was both formal and informal networks which people relied on in order to receive, refine and validate uncertain or unexpected information. In this respect, formal networks (experts’ organisations like fire brigades, Technisches Hilfswerk THW/Federal Agency for Technical Relief and Red Cross) proved to be more trustworthy in the immediate hazardous situation than both weak and strong informal ties. With these organisations having left the affected areas in the phase of recovery and reconstruction, people once again successfully activated their strong informal ties (informal social networks) and received a variety of material, physical and mental support which often preceded the material compensations provided by public authorities.

As for the *spatial dimension of the informal networks* (close friends and kin), we found that there are good reasons to argue both against and in favour of local strong ties¹⁵ with respect to coping with a disaster. In the situation of the 2002 Mulde flood, locally based networks were on the one hand partially dysfunctional because literally everybody was affected. Thus, for example, they tended to provide no valuable (surplus) information in the anticipation phase since all members usually relied on literally the same sources of information. Hence, exclusively local networks could not fulfil their main function when the general situation was very uncertain. On the other hand, being faced with the same situation also contributed to feelings of collective destiny and solidarity. In this phase – but, not surprisingly also in the post-flood period – people with social networks exclusively located outside the region were relatively disadvantaged in comparison with people who could mobilise local or regional contacts.

¹⁴ To link environmental issues or natural hazards with local attachment is rather rare. Exceptions are Vorkinn and Riese (2001) and Cox and Holmes (2000).

¹⁵ The original “strength of weak ties”-hypothesis was developed by Granovetter (1973, revisited in 1983). It holds that heterogeneous social networks resting in various social and local contexts have more and in particular more diverse information about a certain topic (in its original application referring to labour markets and getting a job) than a dense network consisting of persons who are similar in various socio-economic and socio-demographic dimensions.

In many dimensions of social vulnerability, part of the variance found was due to *location* which beside tenure was one of our strongest ‘explaining’ variables. However, geographical characteristics per se do not explain anything. Rather, one has to distinguish two different aspects: it was, firstly, specific event characteristics (sudden versus slow onset, at night versus during the day) which account for the varying performance in and of the single research locations during the 2002 flood (e.g. with respect to taking ad-hoc activities and which ones). While the differences in warning and evacuation at first glance also appear to relate to local flood specifics, we think that a second argument – related to the very nature of the different communities – is worth considering: the structural differences between urban and rural locations. Although urban areas are more prone to high damage due to disasters (hence, in a traditional understanding, they are “more” vulnerable than other types of settlements) they also possess a higher capability, in quantitative and qualitative terms, of coping with and overcoming the impact of a disastrous event. Although this idea was originally developed with respect to megacities (in contrast with small towns; Cross 2001), we found evidence that it holds true also for small towns in contrast with villages (Eilenburg versus Sermuth, Erlln and also Hainichen).

With regard to *local knowledge*, a quite paradoxical situation is to be observed. The hypothesis for further in-depth research is that the ‘normal’ flood experience, which constitutes the intersubjective horizon of collective experience before 2002 of the residents, is defined, above all, by regularly and relatively-often-occurring minor floods. Before the 2002 flood, the events of 1954 and 1974 represented the most extreme flood imaginable within this horizon. However, the 2002 flood by far exceeded the previous floods and thus the collective horizon of experience. Therefore it was quite difficult for most residents to imagine a worse flood. As a result they often did not take the official demand to vacate the city seriously: most people adjusted their actions according to the 1954 and 1974 floods. With regard to such an event they had sound knowledge; yet this stable form of knowledge made it difficult to take into account its very limitation (e.g. a “bigger” flood). The 2002 flood, however, exposed the limits of comprehension and can therefore be understood as an event which revealed people’s ignorance; that is their borders of knowledge.

A further hypothesis – which derived out of the data interpretations – can be formulated: Eastern Germany and, in particular, small towns like Eilenburg were characterised by massive out-migration (mostly to the western parts of Germany) from 1990 onwards. It was mostly younger and well-trained persons who left their home towns thus, unintended, contributing to a homogenisation of the remaining population. Especially in Eilenburg we found a very homogeneous social milieu of former skilled workers or clerks, mostly already retired and living in traditional living arrangements (core families in empty-nest phase). Under such conditions there might be only a minority questioning traditionalised stocks of knowledge, e.g. with respect to disasters, and respective forms of behaviour. In contrast with the evidence from Italy presented below, not the loss of local knowledge but its prevalence might have contributed to community vulnerability.

In the **Italian case study**, *formal and informal networks* played a role especially during the anticipation and resistance/coping phases (Fig. 1.1). Before and during the events, the most useful behaviour indications for the residents came from formal/official sources, alone or in combination with informal networks. Most help was provided by family and relatives, followed by voluntary organisations, mainly the local fire brigade corps, which played a more important role than the municipality and civil protection service. Not surprisingly, local firemen were also considered the main ‘safety catalysts’. Local fire brigade corps have a very long tradition in the Italian research areas: their effectiveness is well known and is mostly based on local attachment, deep knowledge of the territory, training in facing emergencies, capacity of coordinating and managing crises and intervening in the short term. We also analysed the role played by other kinds of networks, without obtaining relevant findings. Indeed *social networks’ type* (kin, friend, mixed, no network), *location* (local, external, mixed, no networks), *advice* and *support networks* (in both cases formal, informal, mixed, not necessary) didn’t play any significant role in influencing respondents’ behaviours, attitudes, or expectations in almost all the phases of the events. *Community embedding* instead played a role, especially during the resistance/coping phase. The respondents with a low community embedding proved to be more vulnerable: they received less help during the events, showed a lower level of knowledge about hydro-

geological phenomena, considered their communities less prepared to face future events, and gave more negative judgements about changes in community life after the events (e.g. changes regarding solidarity between town-fellows, trust in local authorities, risk awareness).

Moreover some findings reveal a close link between the relevance attributed to informal networks/social capital and the level of trust in local authorities. In those communities where the level of trust in local authorities is weaker, social capital and informal networks weigh more in the residents' evaluations about community preparedness. Also informal networks are considered more positively as safety catalysts. This lead us to the conclusion that where trust in local authorities and expert systems is weaker, residents tend to rely more on their own resources (i.e. personal networks). This is probably not by chance as confidence in these networks has "replaced" the lack of trust in local authorities and expert systems.

Another element of community vulnerability that emerged from our qualitative work was the progressive *loss of local knowledge*. According to local stakeholders and qualified informers, people have lost their knowledge of the environment, the sources and types of danger, which enabled them to catch the environmental signals of danger and to adopt appropriate behaviours. Several hypotheses have been formulated about the causes of this situation. First, the traditional keepers of this knowledge are no longer present, due to progressive depopulation of the mountain areas (as the ones where the research locations are based). Second, the networks and the mechanisms within the community that granted the transmission of knowledge from generation to generation in recent decades, have weakened, in some cases blocked, in others they don't work any longer. Another (third) cause is the progressive loss of contact within the territory. The presence of people in the territory, which once was ensured by the different conditions and way of life, granted a higher control and monitoring of the risky areas.

Some interviewees (especially community leaders and members of the local fire brigade corps) highlighted that a better understanding of the causes of this progressive loss of local knowledge is needed. This implies a deeper understanding of why and how this knowledge is rendered inappropriate or inaccessible and of the ways in which people can be empowered to reclaim it and appreciate its usefulness (see also Wisner 2004).

In the survey, local knowledge emerged as a "predictor" of an higher level of respondents' risk awareness. Indeed the most concerned for hydro-geological phenomena referred in their explanations to the personal knowledge of the territory, mentioning the local sources of danger (e.g. rivers, streams, ...), the most dangerous areas, or the territory morphology. For example, many interviewees recalled the local dialect names of the sites most severely hit by the floods: "Prà dell'Acqua" in Romagnano ("water meadow"), "March" in Bocenago ("rotten soil"), and Slavini (literally "flash floods") in Roverè della Luna.

Although the *case studies in England and Wales* did not focus specifically on *communities* and *community vulnerability*, some observations can be made from the individual and household data regarding some of the issues raised above. Social capital as such was not examined in the studies but the issues of social support following flooding, length of residence, the receipt of flood warnings, and area house prices may be related factors in explaining community vulnerability. The findings confirm what our qualitative research has shown, that flood events do to some degree engender a community spirit and mutual help among those affected.

Levels of social support within the community can be demonstrated by the help received from neighbours and friends. Neighbourliness and community cohesion played a part in generating actions to prepare for flooding (*anticipation*) and to protect property, although there was no evidence that such help actually mitigated the effects of flooding. There were some significant differences in preparedness actions taken of those who did and did not receive outside help. In the Warnings Survey, the amount of help available *within* the household was not significant, but being given help from *outside* the home in protecting property and preparing for flooding was a significant factor. There were

also marked differences in the level of help received from outside the household *during* the floods, although somewhat different questions were asked in the different studies and may partially explain these variations. Neighbours and friends were revealed as the leading helpers but forms of help varied significantly in the different locations targeted. Both the social composition and social cohesiveness of the areas and the characteristics of the flood events may contribute to this variation.

Receiving help also varied according to certain social characteristics, such as social grade. Those in the lowest social grade groups were significantly less likely to be helped by neighbours than higher social groups. This was also true for those living in vulnerable housing, the elderly, those with poor prior health, households with ill or disabled persons, and single person households. Tenure was also significant, with renters less likely to be helped in this way. It appears therefore that there was no more, and in some cases less, help forthcoming for those who could be regarded as socially disadvantaged. It may be that many within these groups are less embedded into local support networks and therefore may get overlooked when it comes to neighbourly help. Households with children aged under ten were more likely to be helped by neighbours and friends than other households. It is possible that these families received help because of their greater local network connections.

People who have been living at the same address for a number of years should also, in theory, be more integrated within their local community. However, *length of residence* was only a significant factor for receiving help from neighbours and friends in the Warnings Survey. In that survey, flood experience (often linked with length of residence) was also significantly associated with getting help of all kinds, with those who had experienced previous flooding more likely to be helped in some way. Other factors such as the depth and extent of flooding were also significant in the help received, but those helped tended to have *higher* scores on the vulnerability variables, probably because those who attracted help from outside the home were more seriously affected by the flooding. Thus such help did not emerge as a mitigating factor in vulnerability.

The *presence or absence of a flood warning system* can be suggested to impact upon community vulnerability. A key UK finding was that despite investment in improvements to warning systems (see also Chapter 4.3), only a minority of residents surveyed received an official flood warning of any kind and the data indicates that the receipt of a warning is very area and event specific. Those with more main parts of their home affected were more likely to have received a flood warning, thus making an association between depth of flooding and receipt of a warning. Those owning their properties were also more likely to have received a warning than those in other tenure groups. Moreover, respondents drew on their own experience and judgement or on other informal sources such as neighbours to a large extent rather than on formal sources of information, thus indicating reliance on *local knowledge*. Further evidence from the Warnings survey suggests that longer warning lead time appeared to be taken up with trying to seek more information. Moreover, a longer warning lead time allows informal warning processes to be activated and for formal warnings to be amplified via such processes within the community. Those given more notice of possible flooding were also more active in moving valuables and personal possessions than those who had a shorter warning lead time.

One final factor explored in the research in the Intangibles study was *area house prices* and their differences in the 30 research locations. These house prices were used to capture variations in the *levels of community affluence* of the locations and, in part, reflect regional differences, although the prices are averages and neighbourhoods are not entirely homogenous. Areas with the higher house price ratings were predominantly in the south of England reflecting higher levels of affluence there, while there was also a strong correlation between area house price ratings and social class. Finally, area house price rating was also weakly correlated with stress and overall severity.

4.3 Institutional vulnerability

Institutional vulnerability identifies failures in integration, cooperation, communication and coordination within and between agencies, services and organisations in charge at different moments

of a disaster which impair the effectiveness of flood risk management. Scholars mainly focus on the rather short phase of immediate crisis management and the regular evidence for the crisis of the institutions which need to interact at this very moment but are not prepared for this. In most disasters (flood events) the lack of effective coordination of the different organisations is one of the main complaints from all actors involved and observers as well. It needs to be acknowledged that it is usually not the individual actor's inability or incapacity at the moment of the crisis but that institutional vulnerability is rooted in 'normalcy': firstly, disaster management requires effective interactions of organisations that seldom interact (Handmer 2000). Secondly, by definition these organisations possess different capacities and competences, involve different authorities and operate at different spatial scales. They have different missions and cultures, and socialise their members accordingly. This internal strength can become a collective weakness when differences are not recognised, acknowledged or acted upon. Finally, the people at risk and those affected need to make sense of the respective symbols, be it SMS warnings, TV news, weather forecasts, sirens or other sources of information and warnings. For such processes of sense-making local communities need to be prepared in times of non-crisis. Thus, also institutional vulnerability inherits a temporal dimension which needs to be considered.

The **German case study** reveals that the communication process shortly before the 2002 flood, namely the warning and the demand to leave home because of the approaching flood were on the one hand successful. Yet, on the other it also failed in some places. While in the Eilenburg by far the majority were demanded to leave their homes in time, in the small villages of Erlln and Sermuth only a minority were informed about the threatening flood. This is firstly explainable by the onset of the flood: Sermuth and Erlln are located upstream and, secondly, by the higher density of formal institutions in Eilenburg that were able to quickly plan, organise and conduct the evacuation of half of the population of the town, namely about 7,500 inhabitants. This is also mirrored in the finding that the formal networks played a crucial role in informing the residents at risk as the majority of the respondents received the evacuation demand by official organisations such as the police, fire brigades or the THW.

However, as the main objective of the evacuation was to vacate the town very rapidly, only very few citizens actually undertook activities that would have contributed to a reduction of the damage potential. Most people simply took important things like documents or medicine, packed clothes for a few days and left their homes immediately. There was also a large percentage of people that did not consider the officially announced scenario of a flood as realistic. This underlines that the information was hardly adaptable to previously established stocks of knowledge – it seemed not meaningful to the residents at risk. This results also from a missing mutual long-term communication process before the flood. Also during the flood, information is crucial for behaving and reacting, for coping with the immediate situation. Similarly as before, the results for Sermuth and Erlln show that there the inhabitants felt considerably less informed than those in Eilenburg and were therefore much more insecure during the flood. This result echoes the general trend described before, that the situation in Eilenburg was managed more appropriately (warning, evacuation etc.), which is explainable by the presence of more formal organisations – compared with the smaller villages – resulting in a lower institutional vulnerability.

In the **Italian case study**, there is a shared agreement among local stakeholders that problems of *coordination, competence overlapping, and cooperation* between the agencies and services involved in risk prevention, mitigation, and management are one main element of vulnerability. These problems are amplified under conditions of great uncertainty and regard mainly the relationships among services that operate at different administrative scales¹⁶, especially at the provincial and municipal ones. Many interviewees working in the provincial services complain that in the town councils the "safety culture" is either lacking or scarce. This causes major difficulties in the decision processes about several issues

¹⁶ In Italy, the lowest administrative scale is the municipality, whose political representatives are elected by the residents. The other administrative scales are the province, the region, and the state.

related to risk management (e.g. warnings, coordination and management of emergencies, planning of the territory). An often quoted example is the decision about the timing and the starting up procedures of the warnings. It is agreed that technically the warning system is well tested, but this is not the case for the organisational procedure in the moment of the crisis: cases of false alarms or, on the contrary, of delayed ones have been signalled, possibly deriving also from disagreement between provincial services and local authorities.

Another element of institutional vulnerability, as identified by local stakeholders, regards the *drawbacks of risk communication*. On the one side, the officers consider it important to discredit the idea that a zero-risk situation can be achieved through technical interventions and devices. On the other side, they fear that information about the disclosure of possible faults in protection works can cause undue alarm and anxiety among residents. This is a well-known paradox in risk communication literature, identified as the reassurance-arousal paradox (Otway and Wynne, 1989). It arises from unresolved conflicts and contradictions between incompatible messages (e.g. you are/are not at risk/safe). The reassurance-arousal paradox is valid also in the case of the *information about risky areas and risk maps*: people should be made aware of living in a risky area, but officers from provincial and municipal technical services fear that information about risk levels could accentuate residents' anxiety. The trade-offs between collective safety and urban/economic development objectives play indubitably a role in this case. When deciding upon urban constraints in risky areas, local authorities need to evaluate the relative importance of individual freedom and private property rights on the one hand, and public safety on the other (Beatley 1989; 1999).

Some experts and technicians remark that the number of areas at risk is becoming greater and greater, but of course the zoning takes into account both risk and protection factors, which is a concept not easy to convey to the general population. Moreover officers from provincial and municipal technical services are constantly subject to pressures to reduce the extension of areas designated as at high risk from the part of the economic actors. Residents are completely aware of this situation. In the survey, when it comes to judgments about risk exposure as a consequence of lack of (or failure to implement) restrictive building codes and land use norms, there exists a diffused preoccupation of possible trade-offs between personal selfish interests and collective safety, the former being perceived as consistent with a model of development, which privileges intensive land use and uncontrolled urbanisation.

Another element of vulnerability regards *risk assessment procedures*. Some municipal officers complain about the excessive rigour and the bureaucratic nature of the risk assessment applied by the provincial services, which, in their point of view, does not allow for taking into account the continuous changes of the territory caused by humans and/or natural processes. In any event, large margins of irreducible uncertainty will remain about the sources of danger. Notwithstanding the technical instruments presently available, the forecast of some events is still (and will likely remain) impossible.

In the **case studies** carried out **in England and Wales**, institutional vulnerability was not part of the surveys included here.

4.4 Summary

At first glance, the findings presented in this chapter are rather different. In all three countries, we found context to be very important and the importance of understanding this when analysing each flood event and its impacts on social groups and local communities to therefore be crucial. Therefore, we can – in a first step – summarise that people or communities are vulnerable in the context of particular situations or their '**risk environments**'. Every flood event is unique and the outcome of a combination of:

- the flood event characteristics;
- the characteristics and resources of the population affected (social vulnerability);
- dwelling characteristics; and
- the organisational and institutional responses to the particular event.

Moreover, each event may have different impacts on the households and communities affected, depending upon levels of preparedness and other factors. A similar flood event in terms of depth, duration, etc. can have very different effects on different people.

Yet, when having a closer look at the results presented, some common findings can be pointed out, although probably more on a meta-level, referring to the basic concept applied in this chapter: **social vulnerability**. As for research we could show by evidence that (a) a phase-sensitive approach towards vulnerability is more appropriate for the vulnerabilities of different social groups in the different moments of such a far-reaching crisis and (b) that distinguishing levels of vulnerability is meaningful since it is not only individuals and households whose characteristics account for vulnerability but that also communities and institutional arrangements contribute to or reduce vulnerability.

In a second step, we would therefore like to highlight the following points:

- vulnerability is context specific;
- there is no single variable which explains the vulnerability of specific groups coherently and for all the disaster phases;
- no specific group is *per se* highly (or little) vulnerable;
- the same group may be vulnerable in certain phases – anticipation, resistance and coping, recovery and reconstruction – and not vulnerable in others;
- the same group may be vulnerable in relation to certain aspects – e.g. preparedness, risk awareness, capacity to receive help during the event, flood impact – and not vulnerable in relation to others;
- some relations are not linear, it is rather extreme groups (e.g. the very young and the very old) which in certain respects turn out to be more vulnerable than the other groups “in-between”.

But, on the other hand, our research findings also indicate that **some social groups within communities are more likely to need specific targeting and support** (though not necessarily do under all conditions):

- those with no previous flood experience,
- those who have recently moved to an area,
- those with lower social status,
- those living alone without disposing of a social network outside their home,
- households with long term ill or disabled members,
- those living in vulnerable housing (like mobile homes or bungalows), and
- older people (in particular the oldest-old not living in homes for the aged).

Yet, it is important to stress again that this is **no universal catalogue** – it always needs to be checked with respect to the specific local/regional, socio-economic, demographic and cultural contexts. Thus, in the course of the work we developed a rather **critical understanding** of mainstream applications of the vulnerability context and question pure taxonomic approaches which do not take into account the contexts. It is thus necessary to point towards the limitations of the concept of vulnerability¹⁷. One has to bear in mind, time and again, that it was developed in geographical contexts, which are defined by a highly unequal distribution of resources in a general sense. Therefore “vulnerability” as an analytical concept emerged to uncover social inequality with regard to the ability to cope with stress and crisis under extreme conditions. In none of our case studies, such distinctive unequal distribution of resources and power exists. This is certainly due to the institutional framework of European welfare states with their efforts for at least balancing social inequalities to a lesser or higher degree.



Vulnerable housing (secondary home) during the 2002 Elbe flood
©André Künzelmann, UFZ

¹⁷ For critical perspectives on the concept of vulnerability see also Handmer (2003) and Furedi (2007).

From this, a great challenge arises for **flood risk management**: how to adequately approach those people actually in need? If literally everyone is vulnerable at least in the case of severe flooding, e.g. also the disabled just like all the others, does this mean that they don't need more support than others? This question is legitimate, however it is not an analytical but an ethical (or normative) question which is not to be decided theoretically but in a process of risk governance integrating all relevant stakeholders. For such a process, there are neither unique nor best strategies, techniques, and instruments for public involvement: they need to be developed in accordance to objectives, resources, context, circumstances and time frame. Initiating and perpetuating such a process of risk governance is one of the very tasks of flood risk management. There, the stakeholders will and have to refer to a normative understanding of vulnerability, which is an inherent notion in the concept itself, as outlined above in Chapter 1. With our analysis we did not want to suggest that this measure is not worthwhile, on the contrary: Value-based decisions are necessary and unavoidable in flood-risk management. Yet, it is decisive to distinguish between analytical and normative approaches. In our approach here, we applied an analytical approach and worked out both the strengths and weaknesses of the concept of vulnerability.

5. Social constructions of flood risk

As pointed out in Chapter 1, by using the concept “social construction of risk” we want to underline that risk is neither a process simply attributed to natural processes (e.g. hazard) nor an objectively given constant. Rather, risk is understood as being socially constructed in the sense that norms and values, as well as belief systems (institutions), influence and possibly define it. The main issues to be tackled in this section are:

- preparedness before and after,
- (perceptions of) responsibility (private versus public) and delegation of responsibility,
- attitudes towards structural and, to a lesser degree, non-structural measures.

5.1 Awareness and preparedness: imperfect links

Flood policy documents, also from the realm of flood risk management, often carry with them the implicit or explicit assumption that preparedness is a result of awareness (Best practices 2003). However, as social scientists we are rather critical about direct and linear relationships between mental constructs and action – the best (and well-researched) example is probably still the difference between (measured) environmental consciousness and ecologically correct behaviour.

In the **German case study**, the flood of 2002 constitutes a decisive event in most people's life. It is therefore only consequent that *awareness of the risk* of being flooded changed considerably in the course of the 2002 flood. Approximately three and a half years after the flood, when we conducted the survey, the risk of being flooded is taken much more seriously than before. This is not least mirrored by a higher (reported) feeling of personal preparedness—in contrast with the perceived collective preparedness of the local community which is regarded as very low. We could verify our hypothesis that if people regard another flood like the one in 2002 as likely they are more inclined to apply *private precautionary measures*. In contrast with the time before the flood, the proportion of respondents who applied such measures was considerably higher, but still the majority of the residents did not change anything in their home in order to be more adequately prepared for a possibly new flood. In the case that precautionary measures were applied, they were either related to taking out insurance (which, by the way, is also a kind of delegation of responsibility) or the efforts were directed towards an adaptation of the use of certain parts of the house (e.g. the basement) and the interior.

One major finding was that among the respondents almost nobody retrospectively regarded himself as *prepared* for a disastrous event like the 2002 flood. Although the proportion of people “being

prepared” (in their own perception) has significantly improved as of 2005 (from 3% to 20%), 40% of our respondents did not feel prepared for a possible new flood. Moreover, as a general pattern it turned out that in all research locations the respondents perceived the post-flood level of preparedness of the local community as much lower than their own one.

However, there was *no linear relationship* between “being affected”, “being aware” and “being prepared”. Although the level of applied precautionary measures increased in the aftermath of the 2002 flood, this should not be interpreted as a simple cause-reaction chain. While personal flood experience and flood risk awareness were to a certain extent related, this was not the case for preparedness. Rather, we could provide evidence that many respondents either doubt about the sensitivity, usefulness or meaning of private pre-flood measures or they don’t feel responsible for taking actions in this direction. The appraisal of local and regional structural measures, their efficiency and benefits is very high. The residents at risk don’t refuse non-structural measures like land use changes, at least as long as they are not affected by such measures themselves (like for example public flood drills and simulations) which can be interpreted as a sign of the NIMBY phenomenon (“not in my backyard”). However, the distinction between structural and non-structural measures which is regularly made by flood “experts” proved to be not meaningful for the respondents—but highly meaningful in their perceptions is the dividing line between public and private responsibility, a point we return to further below.

This offers a first hint for the institutionalised construction of risk among the affected population. Generally there is a strong belief that structural flood protection measures, which are provided and maintained by public authorities, are more meaningful for avoiding flood damages than non-structural and privately implemented measures and actions.

Findings from the **Italian case study** reveal that people in flood-prone areas seem to resist the idea that their own life may be at risk. Actually it is hard to live as if you were always in danger, fearing to lose your house and property. Indeed, when respondents evaluate *hydro-geological danger in relation to themselves*, as compared to the whole community, they are usually more optimistic. They rather consider hydro-geological phenomena more of a danger to their communities and houses. Feeling more or less endangered is also linked to the conceptual framing of the hazard. The least concerned concentrate mainly on the presence of protection works, whereas the most concerned focus on the unpredictability and exceptionality of the events, also based on personal knowledge of the territory and the local sources of danger.

The respondents’ sense of safety – differently from the feeling of danger – derives from a plurality of factors, including the presence of a local fire brigade, the efficiency of the civil protection, the (assumed) safe location of one’s house and/or place of work and the existence of a warning system. “Safety catalysts” can be grouped in two sub-sets: formal, i.e. civil protection services, voluntary organisations, protection works and warning systems, and informal, i.e. personal experience, fellow villagers, information available. Informal safety catalysts contribute more to the sense of safety where the experience of the event caused more severe consequences (as in the case of Malborghetto-Valbruna). This may be due to several reasons, such as a less influential role played by organisations in charge of flood risk and emergency management or the emergence of informal networks, community trust, solidarity, and cohesiveness after an event.

It is worth mentioning that in the Italian case study (as in the German ones), there is no significant relation neither between “feeling endangered” and “feeling prepared”, nor between “feeling endangered” and “applying private mitigation measures”. This suggests that there is no direct, immediate, and univocal link between perceptions, opinions, and attitudes on the one hand and actual actions and behaviours on the other. The self-assessment of *personal preparedness* before the event(s) afterwards somewhat varies, but less than it might be expected. Most respondents say they were largely unprepared to face what happened and feel a little more ready to face possible future events. However, there are quite a few who feel less prepared after having experienced an event, due to a new awareness of its unpredictability and the fear of a personal inadequate psychological reaction. In

Vipiteno/Sterzing (high flood risk area, yet not affected by recent flooding) the evaluation of personal preparedness is also very low, in this case mostly due to scarce awareness of risk and/or lack of interest for the whole risk issue.

As regards other aspects of personal preparedness, i.e. the *adoption of private precautionary measures*, most respondents took no steps to protect their dwellings either before or after the flood events mostly because they didn't know what to do or had little confidence in available measures. Other reasons are the belief of living in a safe area, (over) reliance on structural protection works, and delegation of responsibility to local authorities. Instead, respondents are much more positively oriented towards prospective investments in safety and private precautionary measures. In all the research locations more than half of the residents, show a precautionary orientation, mentioning either structural works or private voluntary insurance policies and, in some cases, both.

Finally, in all the research locations, the evaluation of *personal* and that of *community preparedness* show a direct and linear relation, the former being generally less positive than the latter. Optimistic judgments about community preparedness rely mainly on training (in particular drills and simulations held in the community) and logistic/organisational factors (in particular the presence of voluntary fire brigades).

Findings from the **case studies in England and Wales** also reflect those in Germany and Italy in that awareness of flood risk does not necessarily lead to preventative or protective actions by residents in at risk areas. The UK surveys show that *awareness* prior to actually experiencing flooding or on moving to the current address was low but this varied between the three studies, and different questions were asked in each. Prior flood experience, tenure and length of residence were the significant factors affecting awareness in two of the data sets. In all three studies there were significant and marked variations in prior awareness according to the specific location where the interviews took place. This suggests that constructions of flood risk may be influenced by a number of factors. The nature of the events, local flood history and possibly institutional factors such as awareness raising campaigns, social networks and community preparedness are more significant factors in flood risk awareness than individual characteristics. It appears that while residents acknowledge a level of risk, for most of those without flood experience, the level was not associated with an immediate risk to their homes.

In the Lower Thames Survey there were some significant differences in construction of risk according to whether or not respondents lived on the river bank. River bank residents tended to judge their property to be *less at risk in general terms* than non-residents. However, the opposite was the case when respondents were asked about the likelihood of flooding over *specific* future time periods. In this instance, river bank residents were *more* likely to view the risk of their property being flooded in the future as certain or very likely compared with non-river bank residents. Moreover, a very high percentage of people in the high risk area (where there has not been frequent flooding) were willing to live with the risk in exchange for other benefits associated with living in the area, such as amenities, environment, and social networks. This illustrates the strong attraction of living in the area balanced against the limited knowledge of flood risk and also limited experience and possible poor understanding of the impacts of flooding (McCarthy *et al* 2006).

Increasingly in England and Wales, property owners are being encouraged to take some responsibility for protecting their property in the event of flooding in order to increase their resistance and resilience (Defra 2004). However, these developments are fairly recent and their impact may not be fully reflected in the studies. Taking out insurance was a common form of *preparedness* measure by residents, although for many flood insurance may have come automatically as part of their general household cover. The key factors important in insurance take-up were social grade and tenure, with those in the lowest social groups, those living in 'vulnerable' housing and renters significantly less likely to have insurance cover. Other preparedness actions taken varied from keeping alert for flood warnings during high risk months, moving personal property to safety and acquiring sand bags. One important behavioural response in the Warnings study was to attempt to keep flood waters out of properties. Few people took the more effective action of putting up flood boards or gates, probably

because they did not have them. Those with *prior experience* of flooding inside their home were more active, and significantly more of those who had been flooded three or more times had taken more drastic preventative measures, such as building walls around their property. This indicates that previous experience is more significant in preparing for flooding rather than simply risk awareness.

In the Lower Thames study, for almost all, actions were taken before any recent flooding inside properties but with recent evidence (the 2003 flood) of the potential for flooding in the area. In this survey, it was possible to examine the way risk was constructed by residents and the actions taken. Only one difference emerged: those who considered flooding in their home likely in the next 50 years were significantly more likely to have undertaken at least one preparatory measure than those who thought flooding unlikely. Thus, viewing the flood risk to the home as more likely had a limited impact on preparatory action, mainly resulting in more attention to information about flood possibility.

Another key preparatory action that can be taken is to register with the Environment Agency's Floodline Warnings Direct system (see Chapter 5.3). Flood warnings were found to be a significant driver of behaviour before and during a flood event and age was a significant factor affecting respondents' ability to take actions. However, the low numbers nationally registered on the system was raised earlier. Again, those with prior experience of more than one flood event and prior awareness of flood risk were more likely to take this preparedness measure.

5.2 Trust in expert agencies (I): the symbolic power of structural devices

In the literature it is widely described how protection works can become danger sources and how “the flooding experience is damaging and dangerous particularly where defence systems are in place” (Bye and Horner 1998, 57). Some authors (e.g. Rosenthal *et al.* 2001) talk of the “vulnerability paradox” and stress how apparently adequate security measures can fail under the pressure of disturbance factors. There is a vast debate about the best approaches to risk reduction and risk protection. Some recognised authors argue that the more we try to control nature, the more damage we cause, whether we should “cooperate” with nature (Burby 1998). There are testimonies of a direct relation between the implementation of measures based on a “philosophy” of total control and the increase of damage potential (e.g. Enserink 2004; Biswas 2004; Burby 2006). Burby (2006) defines this relation as “safety development paradox”, making reference to what happened in New Orleans in 2005: “The paradox is that in trying to make the most hazardous parts of New Orleans safe for urban expansion, it had the unintended effect of contributing directly to the devastation of Hurricane Katrina” (*ibid.*, 176).

In the **German case study**, structural flood protection devices play a central role. In the aftermath of the 2002 flood, most efforts were laid on the improvement of the technical flood protection measures (WWF Deutschland 2007) – in spite of all contradictory intentions. For the respondents these devices are crucial; they make people feel safer. There is a high degree of unanimity in favour of the sense of security and damage reduction these structural devices provide. At the same time uncertainty is high specifically with regard to the actual efficiency of these measures: 30% don't feel able to judge whether the costs for their construction and maintenance are justified or not compared with the benefits. A closer look at certain social groups reveals that in particular formal qualification and age are crucial for interpreting these assessments: the better educated and the younger are much more sceptical with regard to the actual capabilities of public protection measures than people with lower degrees of formal education and, partly overlapping with the first group, the elderly. However, generally it is agreed that structural devices contribute to a feeling of safety among the respondents.

We also asked for an assessment of a variety of *flood measures*, both structural (like dikes) and non-structural (like land-use planning or warning systems) ones (for a detailed discussion of this distinction: Olfert and Schanze, 2007). However, the respondents did not share this distinction, they rather rated most proposed measures as very useful, irrespective of their “structural” or “non-structural” character. It was also striking that *measures based on individual actions* (like private mitigation measures and public disaster drills), were rated as least useful. Thus, the respondents drew a

clear line between “public and private” measures – and therefore of personal and public responsibilities for flood protection.

Findings from the **Italian case study** reveal that structural defences reinforce residents’ *sense of safety* and are powerful symbols around which people place their hopes for a secure future. Flood risk professionals constantly underline that this feeling of full safety is based on erroneous assumptions: indeed the protection works reduce but not eliminate the risk, as they are planned with the purpose of reducing the probability of occurrence of an event or, in case it happens, of reducing its damage. Thanks to the presence of dams, embankments, barriers etc. the residents don’t feel in danger and are confident of being fully protected in case an event happens. Overall respondents with higher levels of trust and preparedness are more optimistic about the role of structural protection measures in ensuring community safety. It is interesting to underline that (judged) personal preparedness and positive evaluation of protection works go together: recognition of the importance (both factual and psychological) of structural interventions does not imply a underestimation of one’s own role in assuring personal safety. Respondents with higher levels of risk awareness are instead less optimistic about the role of protection works as symbols of full safety. The residents’ positive attitude towards structural devices possibly derives from a combination of an actual long term positive experience concerning personal safety with a “need” to believe to be protected. As many researches have shown (e.g. Slovic *et al.* 1994; Slovic 2000), “risky places” and even “risk objects” which are familiar are not perceived as frightening or dangerous.

It’s worth noting that a-critical confidence in engineering solutions is challenged if defence systems fail (as in the case of Vermiglio), and if respondents feel more endangered due to hydro-geological phenomena and are less trustworthy in local authorities (as in Malborghetto-Valbruna). Confidence in engineering solutions is instead reinforced if decision makers choose to apply predominantly structural measures to solve the problem of flooding (as, for example, in Roverè della Luna).

Also in **England and Wales** residents, post flooding, usually demand structural flood defences and profess to feeling more secure when these are in place (e.g. Tapsell *et al.* 1999; Tapsell *et al.* 2003). However, the recent extensive flooding in the summer of 2007 may have helped to increase understanding of the limitations of these measures. Community based flood risk reduction options such as *temporary and demountable defences* are increasingly being proposed as a potential flood risk management approach half way between the provision of permanent structural defences at one extreme and reliance on individual measures, flood warning and emergency response at the other. These defences are useful for slow rising rivers where permanent defences cannot be justified and have been operated successfully on the slow rising River Severn. In the Lower Thames study (McCarthy *et al.* 2006), where flood defences such as walls and channels may not be practical because of lack of space or funding, the public response to such community based options was investigated. Substantial support was found in principle for this approach. However, when specific designs and their potential impact on amenity and access were presented a significant minority objected to their use. In terms of responsibility for paying for flood mitigation measures, the majority of responses in the Lower Thames were that the tax payer should be responsible for flood defence works but there was majority support for those who are at risk paying for all or most of the costs of individual measures, perhaps because householders liked to maintain control over alterations to their property. Very few residents had acquired any individual measures although three quarters claimed that they would do so in the future.

5.3 Trust in expert agencies (II): responsibility and blame

Both at the European and the national levels, institutional arrangements are coming into being which increasingly involve and require public participation in flood risk management. In this regard, the

European Floods Directive (adopted in November 2007)¹⁸ is particularly significant. It foresees as key tools for flood risk management preliminary risk assessment, risk maps and risk management plans. The Directive requires that all of these tools shall be made available to the public and that the member states shall ensure an active involvement of all interested parties in the production, review and updating of the flood risk management plans. Similar trends are also to be observed within the national policy of many member states (e.g. Germany, the UK, Italy and the Netherlands).

Beside the well-known demands for more stakeholder involvement ('traditional' participation), a new connotation of participation is also to be found in most of these documents, aimed, among others, at raising the public's awareness and preparedness. Residents at risk are explicitly expected to take active part in reducing the overall damage by applying preparatory measures. Hence, a shift of responsibility is obvious which we refer to as an increasing "individualisation of risk", meaning that flood protection is no longer a collective task, but is becoming increasingly an individual one. However, what is seldom reflected on with regard to the involvement of the public is the question of whether (and how) the public *wants* to get involved at all. It is usually implicitly assumed by the responsible institutions that the public is eager to participate in risk governance. However, a closer empirical look at our empirical findings allows the development of a more sophisticated picture.

In the **German case** the "individualisation of risk" with regard to the policy level is quite advanced and the demand on the individual has been considerable since the passage of new flood protection laws at the level of the *Länder* (*Hochwasserschutzgesetz* e.g. in Saxony) and the federal Water Management Law (*Wasserhaushaltsgesetz*, WHG) in 2005. According to this legislation, every citizen who is prone to flood hazards is obliged to implement private precautionary measures in accordance with his/her possibilities and abilities (WHG §31a; Köck 2005). However, according to our empirical results, many residents are first not even aware of this change in legislation; second, when asked directly about their perceptions concerning taking personal mitigation measures, most do not share the legal perspective. Rather, the majority of respondents understand these new legal regulations as an excessive demand (or overload) for the citizens living in the floodplains as well as in the mountain areas and valleys at risk. While overall people don't feel well informed about private mitigation measures, it is in particular the elderly as well as people with a low formal education and with low income who perceive themselves as badly informed.

These findings are a first hint that among the residents at risk traditional assumptions about flood protection – rather than of flood risk management as imagined by policy-makers and risk managers – predominate. This is also mirrored by the answers to the question for the reasons for the 2002 flood. While compensation was almost no issue for blaming, a clear 'scapegoat' is figured out with the regional *Landestalsperrenverwaltung* (State Reservoir Administration of Saxony). In the survey we asked people an open question about what they consider to be the *main causes for the flood*. Above all, in our research locations the 2002 flood is understood to be a failure of the Saxon retention basin authority. In order to understand this answer, some background information is necessary. The duty of the retention basin authority encompasses many different aspects such as supply with drinking water, flood protection and low water heightening as well as maintenance and extension of waters of so-called first order (*Gewässer erster Ordnung*). The authority is responsible for administering 115 retention basins and large dams with a water storage space of about 523 million m³; 3,000 km of flowing waters of first order as well as of 650 km of dikes (LTV Sachsen 2006). The "failure" is mostly attributed to the retention basins, since the authorities are blamed for not having emptied the basins in time to absorb the heavy rainfalls. This is understood until the present day as one of the main "causes" for the 2002 flood both in the public debate and among the residents of our sample. The basis of the argument is that the experts are in principle able by means of the basins to store water in the upper parts of the river whenever heavy rainfalls or a melting blanket of snow may lead to an increase

¹⁸ Its formal name is: Directive 2007/60/EC of the European Parliament and of the Council, published in the Official Journal of the European Union, L 288/27, 6 November 2007. For further information see http://ec.europa.eu/environment/water/flood_risk_index.htm (last access 5 January 2009).

of the water volume in the landscape. Many of the interviewed persons construct a causal link between the retention basins and the water level of the Mulde in Eilenburg.

Generally, most causes provided by the residents point to failure, either of existing structural protection measures and/or general mistakes made which were not further specified in the answers. Also, the heavy rainfalls during the days before the flood are seen as a major cause. Only a minority mention factors such as the non-existence of additional retention areas and/or the sealing of the soil surface. By way of conclusion, one has to point out that the causes are above all *attributed to an authority* and in a more general sense to *technical failure* (dikes, retention basins etc.) as well as to *nature* (rain and climate change). Other, more reflexive (in the sense of self-confronting) forms of reasoning are clearly less present.

Also exploring the respondents' opinions about the causes of events in the **Italian case study**, one discovers that the conception of floods as natural events does not go unquestioned. The respondents split between those who ascribe responsibility to nature alone and those who identify human induced causes, the latter connected either to inappropriate action (namely urban development in dangerous areas) or lack of appropriate action (e.g. poor maintenance of the territory, failure to implement protective measures, etc.). Interestingly enough, those who personally experienced damage are keener to indicate triggering factors of human origin. Moreover the Italian case study confirms the German and UK findings that among the residents at risk traditional assumptions about flood protection predominate. *Precautionary measures* and *flood defence* are first and foremost regarded as pertaining to public institutions. A large number of residents maintain that technocratic top-down approaches are dominant in flood management and judge that technicians are the most influential actors in decision processes. Most of those surveyed don't feel involved in the overall process of flood management and tend to delegate the responsibility for safety to agencies in charge of flood prevention and mitigation. In their own turn, the latter encourage the residents' dependence because of their perceived good performance and effectiveness. Paradoxically, as in a vicious circle, the agencies' good performance encourages residents' progressive disengagement with a culture of self-protection. Our research findings reveal also that most residents have lost (or have never developed) the capacity to anticipate and react to flood events in an adequate way. Very few adopt some private precautionary measures to protect their households and most respondents feel unprepared to face hazards and risks. The increased capacity of professional risk management has thus the perverse effect of increasing community vulnerability due to a lack of awareness and preparedness. This runs against the individualisation of risk favoured by risk managers.

As in the German study, in **England and Wales** Defra's recently introduced flood risk management policy of '*Making Space for Water*' encourages the "individualisation of risk". However, the shift from defending against all floods to managing the risk is not yet understood by the general public, particularly the implications for taking personal responsibility to protect properties. The case studies in England and Wales have also shown that people tend to think of flooding in causal rather than probabilistic terms (Green *et al.* 1991). They have provided numerous examples where flooding is attributed in part to mismanagement of a river system, particularly where flooding has not recently occurred. Respondents frequently cited failure to dredge rivers, poor maintenance of watercourses and defences, the opening of (or failure to open) control structures and developments in the flood plain, rather than weather conditions as the cause of the flooding.

The Lower Thames study exemplifies this tendency. There, a significant number of community group leaders and members of the public believed that their 2003 floods were caused by the design and operation of the new Jubilee River, a flood alleviation channel on the Thames immediately upstream from the Lower Thames area. The Environment Agency, who commissioned and operated the flood relief channel, was held responsible for the flood and an independent inquiry had to be set up to clarify the causes of the flooding (Onions 2004). The Environment Agency has had to work very hard since the event to regain trust in its competence from certain local group leaders and badly affected residents. Results from the qualitative research have also shown that trust in the authorities can be severely eroded by their perceived failure to act effectively in a flood event (Tapsell *et al.* 1999 and

2003; Tapsell and Tunstall 2001). However, this distrust was only partly reflected in the study, which focused on the areas and residents less badly affected by the 2003 flooding. About 80% of respondents considered that the Environment Agency and consulting engineers had the knowledge and skills required to reduce flood risk, and half trusted the Environment Agency to make the best decisions on this. However, only a third thought that the Agency fully understood the local flood issues as compared with two thirds for the local council and almost as many for residents groups. Only a quarter considered that the Environment Agency were open about how their decisions were made. Interestingly, earlier research identified similar patterns of trust for the Agency's predecessor organisations. Here there was confidence in the agencies' technical competence and expertise in designing and implementing flood defence schemes, but considerable scepticism about their taking into account the views of the public (Tunstall *et al.* 1994).

5.4 Summary

The paradigm of flood risk management, which the FLOODsite project is particularly dedicated to, carries with it a shift in responsibilities the consequences of which is rarely reflected upon. It expects the residents of the floodplains as well as in the mountain areas and valleys at risk to take active part in these efforts. Yet, our empirical findings underline that recent developments in the policy sector are not shared (or even understood) by the people at risk. While the demand that individuals should take responsibility and adopt private precautionary measures seems relatively well established within the scientific community and among flood-risk managers, at least at certain levels of decision-making, the results of our research show that among the residents at risk traditional assumptions about flood protection, both its structure (technical defence) and the responsible bodies (public authorities) dominate.

The empirical evidence highlights the importance of informal assumptions in risk management. While decision-makers and a number of researchers assume that the public needs and wants to be involved in risk management, large parts of the public are not aware of this demand and they regard the allocation of responsibility quite differently. Hence, while participation research and policy all too often start from the tacit assumption that 'the public' wants to get involved in risk governance, be it via preparedness measures, information and awareness campaigns or public hearings, our research findings indicate that residents don't feel involved in decision making processes concerning flood risk. Thus a gap of knowledge between the scientific community and the policy makers on the one hand, and the local population on the other, is apparent. Probably even more important, there exists also a gap in the attribution of meaning to private preparatory measures since the residents at risk have their own clear comprehension about responsibilities for flood protection which, in their point of view needs to be borne by public authorities (similarly for the UK: Brown and Damery, 2002, 423). These findings underline that flood risk management also requires new partnerships and synergies, otherwise placing greater responsibility on private shoulders is likely to be ineffective.

One further issue which arose during the course of our work was the question of what risk (and safety) actually mean. In our investigations, especially the Italian research findings suggest that risk and safety are not perceived by the interviewees as two faces of the same coin. The two terms 'risk' and 'safety' orient the respondents' thoughts in two different, almost opposed, directions. For our interviewees, discourses about danger and risk cover issues such as hydro-geological phenomena in general, the characteristics of the flood events (especially their unpredictability and uncontrollability), and structural devices, in particular the presence of protection works. Safety instead is mainly associated with "formal safety catalysts", i.e. civil protection services, voluntary fire brigades, as well as informal networks, local ties and mores. This finding is relevant for the design of communication policies: messages about safety should aim to build or strengthen formal and informal networks (i.e. social capital) and reinforce adaptive capacity not only at the individual, but also the community level. Moreover, there are important implications for policy, which will be developed in our final Deliverable ("Recommendations for flood risk management with the communities at risk"), which is underway.

6. Social resilience: local communities after flood events

The general purpose of this chapter is to summarise our findings with respect to the system's (community's ability) to recover from major flood event(s), to determine whether learning took place and in which sense, which (further) factors were most important for recovery and where we can identify shortcomings.

In the **German case study** the five locations investigated could be well compared since all were affected by the same event, the 2002 flood which after about 30 years was the first major flood of this severity in the region. There was indeed a low variance with regard to many vulnerability indicators. This was due to several reasons: (a) the disastrous 2002 event by far spread beyond the collective horizon of experience, thus, in the moment of the crisis not many behavioural options existed; (b) the affected population itself was relatively homogeneous due to the types of locations and the out-migration history of eastern Germany in the past two decades, and (c) high levels of post-flooding compensation equalized the levels of being affected by the 2002 flood. Thus the one standard phrase in the accompanying qualitative research was that such an event was not imaginable at all and many people simply behaved like in the case of other, but minor, floods.

One important conclusion we drew from the four rural locations and the urban settlement type represented by the city centre of Eilenburg were the structural differences due to types of settlement. In spite of the higher structural vulnerability of urban areas, they also possess a higher capability, in quantitative and qualitative terms, of coping with and overcoming the impact of a disastrous event, hence of resilience.

There was also some evidence that *local communities* with a strong and positive collective identity and *place attachment* – in our survey in particular Erlln and Eilenburg Karl-Marx-Siedlung – can cope better with such an event in the long run (as well as the other way round) and that already existing community trends are reinforced by such an event. Though not in all respects, the overall picture as drawn by the respondents is relatively negative in Hainichen. In particular, there was much criticism about local flood performance. At the same time, Hainichen is the place where certain dimensions of local capital were rather weak (perceived solidarity among residents, commitment in local associations) but, in contrast, also the place where, according to the residents, local “community feeling/solidarity” improved mostly after the flood. Hence, this case is very contradictory in itself, which might have to do with its hybrid structure as an official district of the small town Eilenburg, its originally rural character and the structural transformation it went through in the past years by new buildings and in-migrants.¹⁹ Also with regard to Eilenburg centre, we found some specific features, but most of them could be either attributed to the different kind of material attachment (predominantly renters) and the high social and, in particular, demographic homogeneity (most residents already retired) of this place.

Finally, a major and all-embracing intervening factor heavily contributing to the resilience of our research locations needs to be mentioned, an external one: *post-flood compensation*. After the 2002 flood, affected people were financially supported not only by insurance policies, but also by private donations, the Bund (Federation) and the Länder (federal states) as well as the European Union. Particularly the substantial support by public authorities (78% of all subsidies) is without example in German flood history.²⁰ A few weeks after the 2002 flood, the Federal Government adopted the *Sonderfonds Wiederaufbauhilfe* (Reconstruction Fund) regulating reimbursement payments for the people affected. If one sums up all the donations and reimbursement payments for the people affected by the 2002 flood, more than 100% of the damages were compensated. The reasons for this unknown

¹⁹ Also the very small sample (N=18) certainly accounts for the ambivalent results.

²⁰ After the Rhine Flood in 1993, in contrast, only 10% of the damages were compensated by public authorities (DKKV 2003).

wave of solidarity sweeping through Germany in the summer of 2002 were threefold: Firstly, during the flood the campaign for the parliamentary elections (to be carried out in September 2002) was taking up speed and the flood offered a welcome opportunity to demonstrate the solidarity with the flooded people regardless of party affiliations; secondly, the flood affected in particular the eastern part of Germany, which is, as outlined above, undergoing substantial economic and social transformation; thirdly, the flood was defined as an “extraordinary event”, letting it appear irresponsible to leave the burden on those hit most by the flood. In our case study, the high rate of reimbursement is mirrored by very high rates of satisfaction with material compensation. Moreover, also during our qualitative research (in-depth interviews with residents and semi-structured interviews with decision-makers) we were often told that they are “better off” than before, with a clear awareness of the ‘unmentionable’ of this fact.

The **Italian case study** confirms the German findings, for what concerns the fact that existing community trends are reinforced by an event. “Disasters disrupt the social order but they do not obliterate it, and while disasters may accelerate pre-disaster trends they rarely reverse them” (Tierney *et al.* 2001, 197). This “continuity principle” (Quarantelli and Dynes 1977; Quarantelli 1978; Quarantelli and Wenger 1987) is valid also in many Italian research locations. For example, the communities with a more widespread *self-protection culture* and greater autonomy in the management of emergencies (i.e. Bocenago and Vermiglio) reacted in a more adaptive manner to the events. Some communities turn out to be more resilient than others, i.e. more capable to recover after disturbance, absorb stress, and develop adaptive capacity (in the meaning attributed to the term by, among others, Holling 1973; Gunderson *et al.* 1995; Berkes *et al.* 2003; see also Chapter 1).

Two mountain communities, Bocenago and Vermiglio, showed a more widespread *self-protection culture* and more autonomy in the management of emergencies. In these peripheral and isolated locations, inhabitants are more prone to rely on personal resources, rather than expect/hope for external help, and are more aware of their environment and of the flood risk. They are also more willing to invest their own money in private protection measures for risk reduction (both protection works and insurance policies), praise more local knowledge about hydro-geological phenomena, are more prepared and precautionous. During the emergency they adopted less frequently wrong behaviours (i.e. go to see what’s happening next to danger sources as streams or rivers). They also evaluate their personal capacity of response more positively. Most of them say that, in the case of a future event, they would behave in a similar manner as in the past one(s), thus implying that they took appropriate action.

In other communities, i.e. Roverè della Luna and Vermiglio, where the *community embedding* is higher, the respondents say that they received more help during the events from family or relatives, neighbours or friends, and voluntary organisations. They also express more positive judgements about personal and community preparedness after the flash floods. The “positive experience” in terms of solidarity probably contributed to strengthen such embedding. We can argue that where the community embedding is high, people are not only more rooted in their social environment, but are also more aware of the available coping mechanisms. In particular they are familiar with the functioning of the community support networks and know whom to turn or not turn to for help.

Therefore our results show that samples selected with similar criteria in communities with similar characteristics and having experienced similar threats or events, produce fairly different pictures of each community as a whole, with respect to resilience (but also preparedness, vulnerability, and social capital).

The **case studies in England and Wales** had few questions on community recovery. However, several intervening factors were identified in the findings which are associated with the aftermath of the flood event, and which may impact upon community resilience. Three of these factors are highlighted here: evacuation and disruption, problems with building contractors and dealing with insurance companies.

Evacuation is one possible behavioural response to flooding which may impact upon community vulnerability and resilience. Evacuation measures are only normally taken during serious flood events when it would not be safe or practicable for people to remain in their properties, or for those living in vulnerable properties. Evacuation can largely increase the overall disruption resulting from flooding but the evacuation process is not complete until those who have left their homes are able to return. Although no mass evacuations were organised during the main flood events covered by the Intangibles survey, 65% of households had at least one member leave home because of the flooding and very few households managed to stay together in the home during and after the flood. Such disruptions can have a significant impact upon communities and community activities and can lengthen community recovery. In addition, findings suggest that the large numbers of empty properties provide opportunities for looting and burglaries and reduce the feelings of community security for those remaining. Having to leave home was also a highly significant factor in individual vulnerability as measured by the GHQ12 scores. Where either the respondent or someone in their household was reported as having to evacuate, respondents were significantly more likely to report their current and worst time GHQ12 scores to be high than where no one evacuated.

In the Intangibles Survey, problems with insurers and building contractors were significant factors that exacerbated the stress experienced by households during the recovery period. Although there is evidence that having insurance cover increases resilience to the effects of flooding, the way in which claims are processed can have a reverse effect. In the UK, there were significant correlations with the four vulnerability variables discussed in section 4.1 which indicate that problems with insurers and contractors were factors that exacerbated the impact of the flood event itself. Findings from the focus groups show that a key factor often affecting post-flood recovery is the varying levels of service which are offered by different insurance companies. This has led some flooded residents to state that the experience of dealing with these companies was actually worse than the experience of being flooded. Common complaints include slowness in dealing with claims, no up-front payments to cover immediate financial needs, and reluctance or refusal to pay for alternative temporary accommodation.

Bad and lengthy property repair work were other stressors affecting households during the recovery period, as well as financial exploitation within communities by builders when restoring buildings damaged by flooding. Although the British Damage Management Association accredits building contractors who specialise in flood restoration work, many people are not aware of this and often employ poorly qualified workers. Following flooding, only a minority of those affected appear to take the opportunity to make their properties more flood resistant and resilient by, for example, using flood resistant plaster or replacing kitchen units with more flood resistant ones. This in part can be said to be due to the fact that there have hitherto been no requirements on householders to refurbish their flooded properties in such a way as to make them more flood-resilient and resistant, although insurance companies do encourage this. However, it has also been noted that there is an institutional barrier to making such adaptations because insurance companies will only pay to restore properties back to their *prior condition* and not for adaptations that might improve future resistance and resilience.

A number of lessons can be learned from the findings of the three country case studies and more can be done to increase the resilience of communities to flooding. Increased awareness raising on the probabilities of flooding and specifically on flood impacts, might help to increase the number of people taking actions to prepare for flooding. Government assistance in the form of grants to pay for preventative measures are being discussed for England and are already available in Wales. Where evacuation is necessary, attempts should be made by authorities, insurers and contractors to limit the length of time involved and to reduce the length of disruption to households and communities. The methods, by which institutions within the community respond to and deal with flood events, and particularly with the post-event recovery, therefore need to be reviewed. For example, insurance companies could improve the ways in which they deal with insurance claims and offer a more consistent level of service to claimants. Similar levels of service should be encouraged regarding post-flood restoration of properties. Where respondents have experienced impaired mental health as a consequence of being flooded, support in the form of counselling should be made available by health authorities. Extensive compensation – as in the German case – contributes to a rapid recovery,

personal well-being and high satisfaction, however, the other side of the coin is that it is rather counterproductive with regard to personal preparedness.

7. Conclusion

7.1 Common findings and country-specific peculiarities

After having analysed the course and impacts of several major flood events across Europe from the perspective of those affected, we learnt to question many – apparently compelling – linear relationships, e.g. between “being affected” and “having a higher risk awareness” or “being affected” and “applying precautionary measures”. Unfortunately (from the viewpoint of such a naïve-technocratic understanding), empirical reality is much more diverse, contradictory and difficult to explain.

With respect to **social vulnerability** in distinct national, local and cultural contexts, we suggest that an adequate approach is required to be:

- **Context-sensitive:** Institutional arrangements, earlier flood-experience, regularity of floods, location, community size etc., do matter. They can be summarised under the umbrella-term “risk culture” which differs between and within regions.
- **Event-specific:** Each flood is singular in its timing, speed of onset, water velocity, duration, water pollutions, etc. Therefore, a careful reconstruction of the event from the perspective of the people affected is necessary to understand their behaviour.
- **Open-minded:** No individual, community or group is *per se* highly vulnerable. We found no evidence for “the” vulnerability of certain social groups across all phases of a flood event. Rather, we identified different groups with a lack of information and support at certain points in time before or during a disaster or with higher damages and more psychological stress in the aftermath of a major flood.

Some important conclusions with regard to **social resilience** can also be drawn from the cross-country comparison:

- **Awareness raising** concerning the possibility of being flooded and specifically the likely flood impacts are needed as a continuous effort. This might help to increase the number of people taking actions to prepare for flooding.
- Government **assistance** in the form of grants to pay for preventative measures might support individual behaviour. They are being discussed for England and are already available in Wales.
- Where evacuation is necessary, attempts should be made by authorities, insurers and contractors to **limit the length** of time involved and to reduce the length of disruption to households and communities. The methods by which institutions within the community respond to and deal with flood events, and particularly with the post-event recovery, therefore need to be reviewed. For example, insurance companies could improve the ways in which they deal with insurance claims and offer a more consistent level of service to claimants. Similar levels of service should be encouraged regarding post-flood restoration of properties. Where respondents have experienced impaired mental health as a consequence of being flooded, support in the form of counselling should be made available by health authorities.
- Extensive **compensation** – as in the German case – contributes to a rapid recovery, personal well-being and high satisfaction, however the other side of the coin is that it is rather counterproductive with regard to personal preparedness.

7.2 Questions for future research

In the course of our work and resulting from data interpretations, we identified the following questions open for future research:

- How to adequately address and explain urban-rural differences? Are there specific “urban risks” with higher damage potential on the one hand, but also more resources on the other? Are rural communities per se coming to terms better with such crises?
- Which impact will the far-reaching demographic changes (ageing, increasing/decreasing population densities in flood-prone areas, immigration, growing number of one-person households, increasing ethnic diversity in urban places) have on preparedness, coping and long-term recovery have?
- How can we improve our understanding of people’s perceptions, risk constructions and behaviour? How can we then work to change them?
- Which consequences does the increasing individualisation of risks (in the sense of Beck) have both with regard to vulnerability research and coping with flood risks?
- How can we make flood risk management a living paradigm, not just one of policy-makers, flood risk managers and (FLOODsite) researchers?

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