CapHaz-Net

**Social Capacity Building
for Natural Hazards
Toward More Resilient
Societies**

Knowledge Inventory
State of the art of natural hazards research
in the social sciences and further research needs
for social capacity building

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Executive summary

Social capacity building for natural hazards is a major task of European societies which are increasingly challenged by the economic, social and environmental consequences of these hazards as just one impact of global change among others. At the same time, European societies have to cope with a new landscape of risk governance through changes in the distribution of responsibility between different state and non-state actors. Furthermore, a lack of social capacities to prepare for, cope with and recover from the negative impacts of natural hazards is being observed not only with respect to the population at risk but also within the wide range of organisations involved in risk management. CapHaz-Net argues hence that not only on the side of the public or on the side of communities at risk social capacities need to be enhanced and recovered, as it is implied in most capacity building efforts, but, rather, that capacity building also needs to take place among the organisations and authorities involved in risk and disaster management.

CapHaz-Net intends to create a dialogue around social capacity building for natural hazards in order to encourage the development of more resilient societies. After a broad literature review of defined relevant research areas, it was found that we are working within an emerging field of research which is even newer for Europe than for other parts of the world. While capacity building is a term increasingly used within global and also European frameworks and policies, it is yet to evolve in scientific discourses. At this stage of the project, the research completed has focused largely on existing scientific literature on selected topics, which are explore more in-depth in this 'Knowledge Inventory':

⟶   *Social capacity building* is considered as an overarching concept of participation: It concerns the effective involvement of residents at risk, organisations involved in risk and disaster management as well as larger communities and how they are able to contribute at various levels in defining and managing their own and other actors' vulnerabilities to natural hazards. This report outlines what this process entails and how it can be employed in practice. More information is provided in Chapter 2 as well as in Chapter 9.

⟶   The topic of *risk governance* is relevant in this context, as it indicates that a broad shift has been taking place in how societies are governed. Some characteristics of this transition – for example, a 'rolling-back' of the state, increased privatization and the entry of new forms of actors into the political decision-making process – can be seen all over Europe, though in different degrees. This report outlines some of its ambivalent implications, mainly in Chapter 3.

⟶   Findings from *risk perception* studies clearly underline that the awareness of a hazard does not necessarily translate into preparedness or concrete actions; they rather underline the relevance of the experience of hazardous events as well as the trust in authorities and measures as factors influencing risk perception. Background and evidence are discussed in Chapter 4.

⟶ The concept of *social vulnerability* is gaining increasing relevance on the policy level. Yet, the question of how to define vulnerability and how to measure it remain contested. Who are the vulnerable people one wants to refer to? Which is the target group that is to be researched, and which is the potential end-user group? These questions are referred to in Chapter 5.

⟶ Aspects of *risk communication* seem to gain increasing relevance in practice, as decision-making processes become more inclusive and as the increasing recognition and acknowledgement of uncertainties are requiring participatory approaches where scientists as well as involved authorities no longer have a uniquely privileged position. An overarching function of communication is to enable iterative evaluation, critical reflection and feedback on practices, and to store and pass memories and experiences. In this way, communication is a means to learn from practices and to adapt them. More information is provided in Chapter 6.

⟶ *Risk education* with respect to natural hazards is a genuine social capacity building effort which includes all age groups and goes well beyond mere dissemination of knowledge. It also includes capacity building on a motivational and procedural basis, as teaching always includes the notion of 'learning to learn'. To start with in this rather poorly developed research field, CapHaz-Net has a major focus on formal education, the curricula and materials used there. However, risk education is by far not restricted to formalised schooling, but rather includes a wide range of arenas, tools, actors and materials within the broad field of education for sustainability. This topic is dealt with in more detail in Chapter 7.

More detailed reports on single topics are made available on our website at www.caphaznet.org.

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Structure

1 Introduction

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> *»Not every windstorm, earth tremor, or rush of water is a catastrophe. A catastrophe is known by its work; that is to say, by the occurrence of disaster. So long as a ship rides out the storm, as long as the city resists the earth-shocks, so long as the levees hold, there is no disaster. It is the collapse of the cultural protection that constitutes the disaster proper.«* *(Carr 1932, 211)*

Despite long-lasting attempts to mitigate and reduce the damages due to natural hazards and a constant accumulation of scientific and practical knowledge, the human and economic losses caused by disasters are not decreasing (UN and WB 2010). Why is this – and what can research and societies do about it? To find explanations for this apparently paradoxical development CapHaz-Net is particularly concerned with people's capacities. By using the term *social* capacity building we want to emphasise that capacity building is a social process which involves different actors (private and public, individual and collective ones), includes different stages (that is, status quo, processes and outcomes) and is concerned with different forms of capacities. Having stated this, we regard the occurrence of a disaster as a result of people's, communities' and organisations' lacking capacities to anticipate, cope with and recover from the impact of a natural hazard. The term 'natural' disaster may hence be considered as misnomer, as it is social, political, economic and cultural conditions that transform a natural hazard in a social disaster. The central question CapHaz-Net is dealing with is therefore:

⟶ ***How can we enhance the capacities of European societies to prepare for, cope with and recover from the negative impacts of a 'natural' hazard?***

Obviously one cannot expect a simple answer to this question (otherwise it would have been provided in the past). However, the relevance of enhancing capacities was recently underlined by various policy documents. The Hyogo Framework for Action 2005–2015, for instance, contains several links to capacity building efforts. It identifies as one of its central priorities for actions the need to enhance "international and regional cooperation and assistance in the field of disaster risk reduction through, inter alia: The transfer of knowledge, technology and expertise to enhance capacity building for disaster risk reduction" (UN/ISDR 2006, 5). Resources should be invested for ensuring appropriate support for disaster risk reduction in general, but also for "awareness-raising initiatives and for capacity-development measures" (ibid.). A look at the "National Progress Report on the implementation of the Hyogo Framework for Action" of the German Committee for Disaster Reduction DKKV reveals that European countries are also concerned with capacity building (DKKV 2009). It identifies as one of its major strategic goals 'the "development and strengthening of institutions, mechanisms and capacities at all levels, in particular at the community level, that can systematically contribute to building resilience to hazards" (ibid., 4). Yet, surprisingly, the interrelations between social capacity building and natural disasters with respect to the whole risk cycle are not a major field of research in Europe so far.

1.1 Scope and approach

The aim of this report is to structure social capacity building research by taking into account established fields of scientific expertise. This detour is necessary as it was found that we are working within an emerging field of research which is even newer for Europe than for other parts of the world. While capacity building is a term increasingly used within global and also European frameworks and policies, it is yet to evolve in scientific discourses.

We call this report a "**Knowledge Inventory**" as it summarises the main findings of the literature reviews with regard to social capacity building, risk governance, risk perception, social vulnerability, risk communication and risk education in the broad field of natural hazards. These topics were, prior to the project, defined as major subjects of social science natural hazards research. Apparently the literature on each of these six concepts is diverse and situated in specific historical, intellectual and disciplinary contexts. Some of them strongly relate to each other and might to a certain degree also overlap (see Figure 1.1).
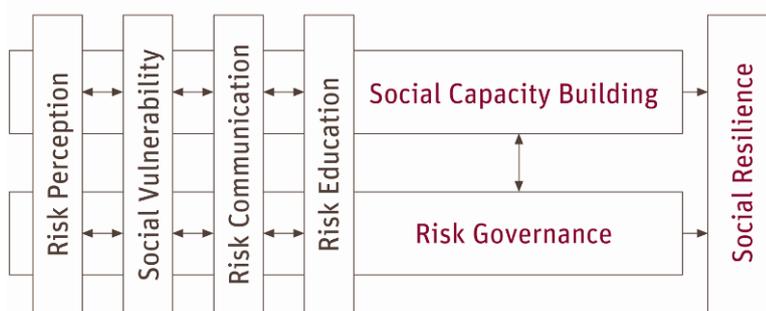
Figure 1.1: Main topics of CapHaz-Net
Source: authors' considerations; design: annalogie.de

The Work packages (WP) related to these six topics were completed within the first 18 months of CapHaz-Net. Each WP performed three main tasks:

(a) Based upon a broad literature review the *state of the research in Europe* (and partly beyond) was elaborated. This was done by the consortium members and in tandem with the respective WP leaders.

(b) The literature review was reviewed and expanded by means of three CapHaz-Net workshops in Lancaster, Haigerloch and Ljubljana (2009/2010) and the meeting with representatives of the French research community and NGOs in Paris (2010). These workshops were also a major source of information concerning *empirical evidence from all over Europe.* In total 126 scientists, practitioners and stakeholder from 17 European and Non-European countries participated actively in the three CapHaz-Net workshops considerably broadened our knowledge about existing studies far beyond the typical scope of English-written research. Of course, even with such assistance we will never fully cover all countries in equal measure and all research. Moreover, becoming aware of the research gaps, some WPs even carried out additional explorative studies (e.g. WP 5 and 6).

(c) Based upon both the WP reports and collective efforts of the consortium we subsequently defined major *research gaps* in the aforementioned themes (see Chapter 8).

In order to document the work done within CapHaz-Net so far, this Knowledge Inventory is structured around these six topics. The rationale is that we aim at taking into account relevant stocks of knowledge, expertise and experiences as well as good practices that have been published, communicated and discussed over the past 40 to 50 years or so and outline the implication of these insights with regard to social capacity building. This report hence acknowledges that CapHaz-Net stands as a 'dwarf on the shoulder of giants'. It wants to develop a scientifically sound and practically relevant understanding of social capacity building for natural hazards, before CapHaz-Net will deal in more detail with the concept of social resilience in the second part of the project.

This 'Knowledge Inventory' summarises the state-of-the art reviews which were produced in the first 18 months of the CapHaz-Net project. Moreover, it establishes links to the overall topic of social capacity building. After an introduction (Chapter 1) and an outline of our understanding of social capacity building (Chapter 2), the topics of risk governance, risk perception, social vulnerability, risk communication and risk education (Chapters 3–7) will be discussed. Each of them contains conceptual approaches and definitions of the topic under investigation, methodological challenges, empirical findings and implications for social capacity building. Chapter 8 summarizes the main research gaps found so far. Chapter 9 looks forward to the second half of CapHaz-Net.

1.2   Key concepts

This section shortly explicates a basic understanding of the main concepts used throughout this report. In the chapters that follow they will be taken up and more systematically elaborated by sharpening their basic notions, presenting different ways of defining them and providing empirical insights. Yet, the aim of the report is not present one 'valid' definition of a concept; it rather aims at unravelling the richness and diversity of the discourses and at identifying central themes and contributions which are relevant to reduce losses caused by 'natural' disasters.

Social capacity building

Social capacity in our understanding means the context-related ability of an individual, a social group, an organisation or a community to decide and to behave successfully in a certain situation in order to anticipate, respond to, cope with, recover from or adapt to the negative impacts of an external stressor (e.g. a hazardous event) as well as to employ the necessary resources. Social capacities include knowledge capacities, motivational capacities, network capacities and economic capacities as well as institutional and procedural capacities.

Social capacity building is a normative concept that describes the process of (re-)discovering, enhancing and developing the previously mentioned resources and abilities. It is not understood as a short-term linear process but rather as a long-term, iterative and mutual learning process which is based on the cooperation and interaction of a variety of actors including individuals, organizations and communities on different scales. This implies also that those considered as 'lacking' certain capacities should not only be involved in defining their own 'deficit' but also in defining the aims and purposes of the capacity building effort itself.

Risk governance

The concept of risk governance encompasses the formal and informal arrangements and procedures through which risks and hazards are managed in society. Governance can be defined as:

> *"the sum of the many ways individuals and institutions, public and private, manage their common affairs. It is a continuing process through which conflicting or diverse interests may be accommodated and co-operative action may be taken. It includes formal institutions and regimes empowered to enforce compliance, as well as informal arrangements that people and institutions either have agreed to or perceive to be in their interest." (Commission on Global Governance 1995, 2)*

We have adopted an open definition of risk governance in CapHaz-Net, but consider particular models advocating what 'good' risk governance should involve, whilst also recognising that there can be different perspectives on answering this question.

Social vulnerability

'Social vulnerability' stands for a concept that aims at identifying and understanding why certain groups of people, buildings, infrastructures and assets may be more exposed, more sensitive and/or less susceptible to the impacts of natural disasters than other groups. Although there exist many different views on how to define vulnerability, there seems to be a consensus that it is in a very general sense constituted by two different components. On the one hand, there is a rather static component which relates to people's exposure to natural hazards as well as to societal processes and structures they are not able to change. On the other hand, it includes a more dynamic and action oriented side relating to people's awareness of, as well as knowledge about, natural hazards, their motivation and attitude to act and take responsibility as well as their ability to access the kinds of financial and other resources needed to prepare for, cope with, recover from and adapt to the negative impacts of natural hazards.

Risk perception

The 'risk perception perspective' wants to improve our understanding about the factors that influence the thinking, beliefs and judgement of people about natural hazards. It involves the process of collecting, selecting and interpreting signals about uncertain impacts of events, activities or technologies. These signals can refer to direct observation (for example witnessing a rising flood wave) or information from others (for example becoming aware of a warning). Such perceptions may differ depending on the type of risk, the risk context, the personality of the individual, roles and profession as well as the social context.

Risk communication

Risk communication relates to the purposeful as well as non-purposeful exchange of information, knowledge and attitudes between decision makers, risk managers, public authorities, companies and the general public and focuses on concrete risk situations. Recently, there has been a tendency to understand risk communication as an interactive exchange rather than a one-way transfer of information, knowledge and opinions among/between those responsible for managing risks and those who may be affected by a hazard. Risk communication includes different actors, serves different purposes, modes and tools and conveys different messages. Related to social capacity building efforts, risk communication is one process among others through which social capacities to prepare for and cope with natural hazards can be developed.

Risk education

Risk education is understood as part of the wider sustainability and environmental education paradigm. In contrast with risk communication, risk education rather refers to the purposeful transfer of more generalised (thematic, organisational or technical) knowledge on hazards and risks from professionals in teaching institutions to usually (but not necessarily) younger persons within a formalised setting. Like every education activity it includes the learning of different skills beyond the gathering of knowledge. CapHaz-Net's focus is on the formal risk education of teenagers in schools. It has to be born in mind that the notion of knowledge transfer is not restricted to a one-way relationship from teachers to pupils. Rather, children are also regarded as transmitters of risk-related knowledge to their parents and to other people in their social network.

2   Social capacity building for natural hazards

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2.1   Social capacities

The Penguin Concise English Dictionary distinguishes four meanings of the word 'capacity', one of them being "ability or talent" and "power or potential" (Table 2.1). A broader search particularly in development and hazard research reveals that capacity is widely used as an umbrella term for referring to a broad set of resources (including abilities, skills, competences and social relations) of an individual or a social entity (such as a group, a community or a society). These resources are either actually or potentially available. Although the explicit term 'social capacity' is used only sparsely, all definitions provided in Table 2.1 basically refer to social capacities, that is, capacities of people, be them individual or collective actors.

Table 2.1: Definitions of (social) capacity

Definition	Source(s)	Relation to natural hazards
Capacity: "(a) ability or talent; (b) power or potential" (and three further meanings of the term)	Allen 2002, 121	No
Capacity: "that emergent combination of individual competencies, collective capabilities, assets and relationships that enables a human system to create value"	Baser and Morgan 2008, 3	No
Capacity: "Capacity is the ability of people, organizations and society as a whole to manage their affairs successfully."	OECD DAC 2006 (in Baser and Morgan 2008, 22)	No
Capacity: "The combination of all the strengths and resources available within a community, society or organization that can reduce the level of risk or the effects of a disaster. Capacity may include physical, institutional, social or collective attributes such as leadership or management. Capacity may also be described as capability."	UN/ISDR 2004 (in Thywissen 2006, 453)	Yes
Capacity: "The combination of all the strengths, attributes and resources available within a community, society or organization that can be used to achieve agreed goals. [...] Capacity may include infrastructure and physical means, institutions, societal coping abilities, as well as human knowledge, skills and collective attributes such as social relationships, leadership and management. Capacity may also be described as capability. Capacity assessment is a term for the process by which the capacity of a group is reviewed against desired goals, and the capacity gaps are identified for further action."	UN/ISDR 2009b, 5-6	Yes

Source: Kuhlicke and Steinführer 2010

When transferring this general meaning of (social) capacities to the context of natural hazards and disasters, 'social capacities' then refer to the context-related ability of an individual, a social group, an organisation or a community to make decisions and to behave successfully in a certain situation in order to anticipate, respond to, cope with, recover from and adapt to the negative impacts of an external stressor (e.g. a hazardous event) as well as to employ the necessary resources. Below this definition will be further specified after having clarified similar concepts and their relationship to social capacities.

2.2   Related concepts: Vulnerability, resilience, adaptive capacity and social capital

In the discourse on natural hazards and disasters the term 'capacity' was introduced most prominently by Anderson and Woodrow (1989) and subsequently developed further by Davis et al. (2004) in their "Vulnerability and Capacity Analysis" approach. Yet, also in other discourses, as for instance on ecosystems as well as climate change the term 'capacity' is used. This section gives a short outline about how the different concepts are used and how they interrelate.

Vulnerability and capacity

In many approaches, vulnerability and capacity are strongly linked. In an early approach, Peter Timmerman underlines the "two-faced nature of the concept of 'vulnerability': one is vulnerable to attack from, thereby exposing one's vulnerability to – the hazards out there are somehow parts of one's internal weaknesses" (Timmerman 1981, 18-19). A similar view was later developed by Robert Chambers who more specifically states: "Vulnerability has thus two sides: an external side of risks, shocks and stress to which an individual or household is subject; and an internal side which is defencelessness, meaning a lack of means to cope with damaging losses" (Chambers 1989, 38). These are the two phenomenological core components of most vulnerability frameworks (van Dillen 2002, 54).

   In a number of varying conceptualisations, social capacity – referred to as an existing or lacking capacity (i.e. preparedness, coping, response, recovery or adaptive capacity) – is considered to be a central component of (social) vulnerability. More specifically, it may be understood as the internal or 'soft' side of vulnerability referring to individuals or groups of individuals and taking into account their existent and non-existent capacities to come to terms with stressing, threatening or damaging events. The external side also refers to actors but concentrates on sources of threat or stress out of their reach, as, for example, people's exposure. In this vein, Greiving (2006, 214), for example, considers two components of vulnerability: hazard exposure and coping capacity (see also Figure 2.1). Together with the hazard potential these components then make up the specific risk. Similarly, Alexander et al. (2009) define exposure, susceptibility and response capacities as key components of vulnerability.

R = (wHH + wEE + wVV) – wCC

with
R = overall risk index
w = uniform weighting factor of (here) 0.33
H = score of hazard index
E = score of exposure index
V = score of vulnerability index
C = score of capacity and measures index

$$\text{Disaster} = \frac{\text{Hazard} \times \text{Vulnerability}}{\text{Capacity}}$$
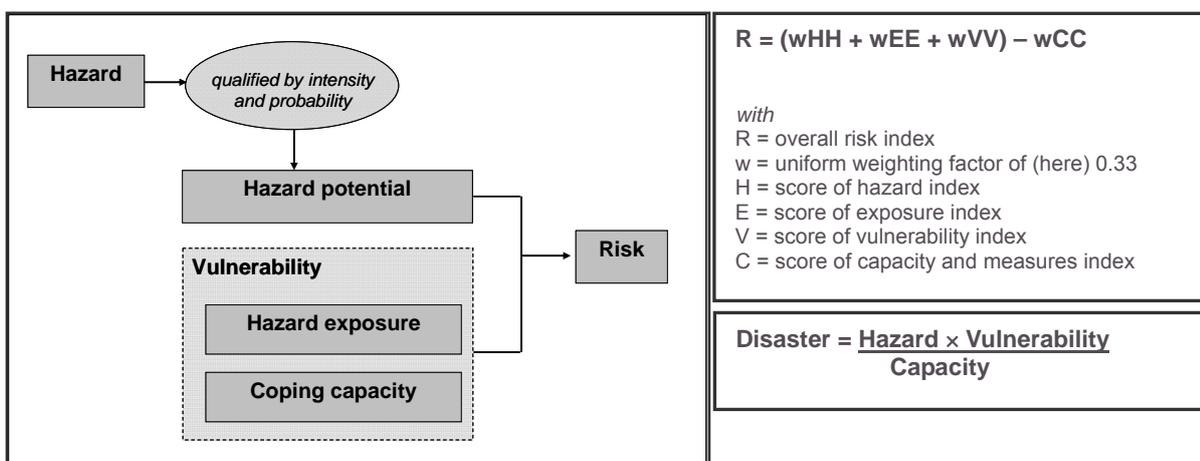
Figure 2.1: Examples of graphical and numerical representations of (social) capacity in natural hazards research
Sources: Greiving 2006 (left), Bollin and Hidajat 2006 (upper right), Davis 2004 (lower right)

In contrast with the previous approaches, vulnerability and capacity can also be understood as separate (analytical) entities. Bollin and Hidajat (2006, building upon Davidson 1997), create a 'community-based risk index' by summing (weighted) hazard, exposure and vulnerability scores on the one hand and relating them to existing capacities and measures. These comprise physical planning, social (or societal) capacity, economic capacity and management. Social (or societal) capacity is operationalised by indicators like public awareness programmes, school curricula, emergency response drills, public participation and local risk management/emergency groups (Bollin and Hidajat 2006, 274-7). Davis (2004, 131) extends the original equation "Disaster = Hazard $\times$ Vulnerability" by incorporating capacity, which is again taken as something separate from vulnerability (Figure 2.1).

Another line of argumentation leaves numerical equations behind and relates vulnerability and capacity in another way. Davis (2004) considers the two concepts to be in a mutual relationship: "... it was encouraging to note a positive development in the 1980s with the link between the negative and the positive or, in current terminology, with the link between vulnerability and capacity" (ibid., 131; our emphasis). He particularly refers to the "Capacities and Vulnerabilities Analysis Matrix" (Anderson and Woodrow 1989; see also Table 2.2) which was developed to aid risk and disaster management particularly in developing countries: "Users of this matrix were invited to fill in appropriate boxes to describe their situation, often finding that the same element might be repeated in both the 'vulnerability' as well as the 'capacity' box" (Davis 2004, 132). Vulnerability and capacity assessments (VCA) are a standard procedure of Red Cross/Red Crescent member organisations after disasters worldwide (IFRC 2006).

Table 2.2: Template of a 'Capacities and Vulnerabilities Analysis Matrix'

Definition	Capacities	Vulnerability
Physical/material What productive resources, skills and hazards exist?	e.g. flood-resistant buildings	e.g. residential homes in a floodplain
Social/organizational What are the relations and motivations among people?	e.g. strong mutual ties	e.g. excluded local minority
Motivational/attitudinal How does the community view its ability to create change?	e.g. community members are interested in initiating a risk communication process	e.g. community members stress problems other than those related to natural hazards (e.g. a recent disruption in the local economy)

Source: Anderson and Woodrow (1989, 12), supplemented by fictitious examples

Resilience and adaptive capacity

Like the discussion on vulnerability, the term 'resilience' also refers to some form of capacity (Timmerman 1981, Handmer and Dovers 1996, Adger 2000, Klein et al. 2003, Gallopin 2006, Berkes 2007). Berkes, for instance, understands resilience as the "capacity of a system to absorb recurrent disturbances, such as natural disasters, so as to retain essential structures, processes and feedbacks" (Berkes 2007, 239; cf. also Buckle 1998). Similarly the UN/ISDR defines resilience as the "capacity of a system, 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 this capacity for learning from past disasters for better future protection and to improve risk reduction measures" (UN/ISDR 2006, 4).

In many cases resilience is understood in relation to the concept of vulnerability, although the relationship between vulnerability and resilience continues to be contested, highlighting the complexities that lie beneath both concepts. Again a number of definitions could be provided for the concept of resilience. For Galderisi et al. (2010) vulnerability researchers pursue two distinct relationships between vulnerability and resilience. The two approaches either treat vulnerability and resilience as opposites, the 'flip-side' of one another or, on the other hand, there are some differences between them but the relationship is more complex.

→ The 'flip-side' approach, increasingly challenged by research, proposes that high levels of vulnerability imply low levels of resilience, and vice versa (Villagran 2006, Adger 2000). Resilience also appears to have emerged from a desire to emphasise the positive, for example one enhances resilience but reduces vulnerability (Klein et al. 2003). However, as it is also stated by Thywissen, most definitions show a large overlap "between coping capacity and resilience, which are often used as synonyms. These two dimensions of a harmful event are not easily separated from each other" (Thywissen 2006, 489). Therefore one may ask: what is the additional value of the concept of resilience if it is just considered as the opposite of vulnerability (Folke et al. 2002, 13)?

→ In the second approach resilience is viewed as an integral component of vulnerability, or vulnerability is considered a static component and resilience a dynamic propensity of a system (Galderisi et al. 2010, Turner II et al. 2003, Walker, B. et al. 2004). The dynamic nature of the relationship is a key component of this approach. The concept is linked more with the regenerative capacity of a system informed by attributes such as self-organisation, adaptation and learning capacity (Adger et al. 2005). But even within this group there are a range of approaches. If resilience is interpreted more as an outcome than a process then it is considered more incorporated within the concept of vulnerability (Manyena 2006). But if a stronger process orientation is adopted in research informed by adaptive and learning capacity, then vulnerability and resilience remain linked but still separate concepts. The concept of resilience hence puts a greater emphasis on self-organization of the system as well as the adaptive and learning capacities as important characteristics of the resilience of a system. Berkes, for instance, identifies four critical factors contributing to building resilience in socio-ecological systems confronted with natural hazards: (1) learning to live with change and uncertainties, (2) nurturing diversity in its various forms, (3) combining different types of knowledge for learning, and (4) creating opportunity for self-organization and cross-scale linkages (Berkes 2007, 287-288).

Recently, the notion of adaptive capacity gained relevance in the climate change discourse as well as in ecosystem research. Yet, this is not mandatory as it used to be linked to the sustainability discourse, too (Folke et al. 2002). Similarly as above, the interrelation of adaptive capacity with notions of vulnerability and resilience remains contested as does its distinctiveness from the terms response and coping capacity (Gallopin 2006).

Social capital

Theories of social capital are predominantly about the conditions, functioning and utility of network structures (Schnur 2003, 56) and thus on resource availability and use which is the major link to social capacity as defined below. Yet, when we scan the natural hazards literature, we have to conclude that this link is still "missing" (Nakagawa and Shaw 2004). Neither social capital nor network theories are of major importance in research on natural hazards and disasters. Some studies were carried out considering the recovery phase and the effects a disastrous event has on social cohesion and community relations (Beggs et al. 1996, Sweet 1998, Nakagawa and Shaw 2004), but only a few authors dealt with the relevance of social networks and social capital in earlier stages or phases of a disaster (Barton 1969, Hurlbert et al. 2000, Kirschenbaum 2004, De Marchi et al. 2007, Steinführer and Kuhlicke 2007). From the climate-change perspective, Pelling and High (2005) argue that "social capital offers a lens through which to study the co-evolution of social networks and norms in the production of adaptive capacity among collectives" and, thus, of learning and of social change (ibid., 308). Considering a variety of social capital approaches in their applicability and use for geographical vulnerability research, Bohle (2005) particularly highlights those approaches "that seek to promote opportunities, those that facilitate empowerment, and those that enhance security" to be worthwhile in development research (ibid. 65).

By way of summary, we have to consider that the notion of 'capacity' is nothing new to the discourses on natural hazards and disasters, be it in the academic sphere or in development policies. However, its relation to other concepts (vulnerability, resilience, social capital) remains contested. Moreover, it becomes also obvious that in these framings, capacity is rarely defined and even more rarely operationalised. We will take this question up in Chapter 2.4 after having explored key notions of capacity building.

2.3   Capacity building

While the previous section put an emphasis on the term 'social capacity' this section focuses on the process of (re-)discovering, enhancing, developing and/or building capacities. To trace the origins of the term 'capacity building' is not an easy task and there are surely many different ways of framing and defining capacity building. Some argue that scholars and practitioners alike have been writing on "capacity issues for decades, albeit using different concepts, terms and contexts" (Baser and Morgan 2008, 13). Others underline that capacity building as a term and concept was introduced as "part of a political fashion" but is in practice hardly to be distinguished from other concepts (Craig 2007, 335).

According to Eade (2005) today's thinking about capacity building has its origins in "earlier ideas concerning participation, empowerment, civil society, and social movement" and these have been influenced and shaped by the work of Paulo Freire and the impact of Liberation Theology in Southern America in the 1970s and 1980s[1] (ibid., 10). 'Capacity building' then has risen

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[1] During this time Freire developed his "awareness-creation approach to adult literacy" (Eade 2005, 10) in a context which was characterised by political and military repression in large parts of Latin America. Some of Freire's ideas directly relate to capacity building. In a general sense, he argues that being able to read is a political act: "our reading of the word is shaped by our reading of the world" (ibid.). Instead of understanding the process of learning as a one-way dialogue (a superior person hands down its knowledge to a student), Freire emphasised the importance of developing skills and competences to solve problems in a dialogical manner. More specifically, he argues that "learners and their own experience and knowledge are of crucial importance; second, that awareness, learning, self-esteem, and the capacity for political action are mutually reinforcing. And third, that poor and marginalised people have

to worldwide prominence during the mid-1990s in the context of the sustainable development/ Local Agenda 21 debate as it was initiated by the United Nations Environment and Development Programme (UNDP) and the UN Commission on Sustainable Development following the Rio Conference in 1992. At its beginning the term 'capacity building' had a reflexive component in the sense that, for instance, the UNDP definition focused on the role of the UN itself in supporting capacity building. The aim was to build capacity "for the formulation of plans and strategies in support of sustainable development" (McGinty 2003, 5). This understanding assumed a necessary intervention by an external organization that would initiate or promote an endogenous process by concentrating on specific aspects such as human resource development, organizational, institutional as well as legal development (Craig 2007, 341; see also IPCC 2007).

Only later definitions of capacity building, particularly within the development context, expanded the focus and contained a stronger community component. The relationship between external interventions and local endogenous potentials shifted towards empowering the latter. It was intended to stimulate a process that would be consistent with the goals of the "self-help approach to community development" (Christenson and Robinson 1980) aiming at an increased autonomy and agency of individuals and communities (Pavey et al. 2007, 92).

This altered understanding of capacity building was also stimulated by some critique: Capacity building efforts often prescribe a greater individual responsibility (Fudge 2009, 59-60) as such programmes look primarily at facilitating the agency response, helping individuals to see opportunities where previously they may have seen barriers. However, such approaches need to be embedded, as Taylor (cited in Fudge 2009, 61) argues, in the basic political, economic and social rights of modern citizenship. Importantly, she asserts that the structural causes of social exclusion need to be addressed, particularly in any programme that seeks to build capacity and empower individuals and communities. This points to a second argument: Glendinning et al. (2002) hold that most often there exists a major difference between the organizations involved in capacity building. In particular, non-governmental organizations and community groups, which are often represented on an unpaid volunteer basis, are considerably worse equipped (e.g. financially, managerially, technically etc.) in comparison with representatives of larger, more powerful and better resourced partners. As a result there might be a tendency for building the "capacity of the powerful (and their organizations) and not the weak, or for building the capacity of the weak only insofar as it accords with the interests of the powerful" (Craig 2007, 348 referring to Banks and Shenton 2001). This, then, undermines the very idea of capacity building: "Perforce, there is a relationship of unequals. And inequality never built capacity" (Manji 1997, quoted in Eade 1997, 8).

Another line of criticism focuses on the analyses of the status quo and the inherent difficulty of which actors have the legitimacy to define that a 'deficit' exists which needs to be dealt with by means of capacity building (see also De Marchi 2003). Particularly, people 'working on the ground' question the motives of those promoting capacity building from the top (e.g. FCDL 2004, 3). As Tedmanson (2003) noted, by referring to experiences of the Aborigines in Australia the capacity building jargon "signifies an entrenchment of notions of what constitutes capacity, who defines capacity and what constitutes the relationship between the dominant culture of capacity-builders and those identified as capacity deficient" (ibid., 15). Capacity building is quite often

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the right, and the capacity, to organise and challenge authority in order to create a society that is not based on exploitation and oppression" (ibid., 11). Particularly in development thinking and practice his ideas of empowerment and participation became relevant.

applied "by donors to recipients" (Nunn 2007, 470) whereas the need for capacity building is defined by external actors.[2] More intriguingly, cultural differences are in this perspective quite often viewed as a "weakness and not as a strength, a capacity deficit to be rebuilt or a problem to be 'solved'" (Tedmanson 2003, 15). According to Beazley et al. (2004) the weakness of the 'deficit model' is that it pays no attention to the capacity of institutions to overcome inherent barriers to engagement. In a nutshell: the problem often lies not with communities but with the institutions, structures and processes that affect them. Additionally, quite often community capacity building approaches would define the 'deficit' but would not define the endpoint or the expected outcome of a capacity building effort: "What is the capacity being built towards or is it an end in itself?" (Beazley et al. 2004, 6).

Another strand of criticism, which is mostly concerned with organizational capacity building, argues that many approaches to capacity building do not sufficiently acknowledge the dynamic learning processes that underlie any attempt to build capacity. Although some kind of education, training and/or transfer of knowledge and experience is inherent in all capacity building efforts, this dimension only gains prominence in more recent writings. In this sense, capacity building always implies the integration of "old and new knowledges and being able to apply learning in new ways and to new situations" (Johnson and Thomas 2007, 40). Quite often the actors involved discover a surprising mismatch between "expected and actual results of action" (Argyris and Schön 1996, 16). The discovery of such surprises may cause feedback loops consisting of single-, double- and triple-loop learning processes (cf. Argyris and Schön 1978, Ramalingam 2008. Johnson and Thomas 2007):

→ Single-loop learning departs from the mismatch of expectations and actual results and tries to detect and correct deviations and variances from established and more or less taken-for-granted practices, policies and norms by changing actions;

→ Double-loop learning processes involve reflections on the underlying practices, norms and policies. They thus address the basic self-conception of an organization and might result in re-addressing and rearranging them;

→ Triple-loop learning questions the entire rational of a social entity and may result in radical transformation with regard to practices, norms, structures and cultures of the entity itself as well as its external context.

[2] See also the impressive example given by Singh (2009) on the outcomes of international aid in the post-tsunami Nicobar Islands which actually destroyed local social capacities by establishing a new material culture and completely transformed socio-ecological conditions under the heading of vulnerability reduction.

2.4 Towards a conceptualisation of social capacity building for natural hazards

This section will specify some of the implications of the previous discussion for any attempts to define and to build social capacities.

⟶ *Interrelation to other concepts and terms*: It was previously shown that, first, the term 'capacity' is common both in the discourse on vulnerability and resilience and that, second, it emphasizes important abilities and resources that people, organisations and communities have developed to come to terms with harmful, threatening and stressful events. Introducing the notion of 'capacity' is an attempt to reduce the tendency of previous vulnerability researchers to overestimate the weakness of actors implying a lack of agency on the side of the potentially vulnerable persons. More specifically, in the discourse on vulnerability, capacity is most often complementing or opposing the notion of 'exposure' which includes the interrelation of social actors or systems with some kind of perturbation or stress (i.e. with the hazard) (cf. also Gallopin 2006). The specification of the interrelation of capacity, exposure and vulnerability will be taken up again in Chapter 5.

⟶ *Different types of capacity*: 'Capacity' is not considered as something uniform or one-dimensional, there are many different types of capacity distinguished in discussions on both vulnerability and resilience (as, for example, preparedness, response, coping and recovery capacity (Blaikie et al. 1994; Table 2.3).

Table 2.3: Different types of capacities in vulnerability and resilience research

Different types of capacity (some examples)	Author
Capacity to prepare, cope with and recover from the impact of a disaster	Blaikie et al. 1994
Physical planning, social capacity, economic capacity, management	Bollin and Hidajat 2006
Physical/material, social/organisational, motivational/attitudinal capacity	Anderson and Woodrow 1989
Capacity of a system to absorb recurrent disturbances	Berkes 2007
Capacity to adapt and learn	Berkes 2007

Yet, even in cases where there is a direct reference to natural hazards and/or disasters, the concept of capacity remains blurred. Based on internal project discussions (see CapHaz-Net WP 1 and WP 5 reports; Kuhlicke and Steinführer 2010, Höppner et al. 2010) and taking into account other strands of literature (particularly Fichter et al. 2004, Powell and Colin 2009, Gupta et al. 2010) we distinguish *six different types of social capacities: knowledge, motivational, network, economic, institutional and procedural capacities*. In Table 2.4 they are described in detail.

Table 2.4: CapHaz-Net's typology of social capacities

Types of social capacities	Specification/description
1. Knowledge capacities	▪ knowledge about the hazard and the risk ▪ knowledge about how to prepare for, cope with and recover from the negative impact of a hazard ▪ knowledge about other actors involved in the handling of hazards and disasters ▪ knowledge about formal institutions such as legal frameworks and specific laws ▪ knowledge about underlying informal values, norms and beliefs of different actors
2. Motivational capacities	▪ the motivation to prepare for, cope with and recover from the negative impact of a hazard ▪ the building of a sense of responsibility for one's own actions but also for those of other actors
3. Network capacities	▪ the possession and exploitation of social capital, that is, 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" (Bourdieu 1986, 248). ▪ the possession or development of the ability to establish and stabilise trustful relationships among and between different organisational, local and individual actors
4. Economic capacities	▪ Availability of financial resources to prepare for, cope with and recover from the negative impact of a hazard
5. Institutional capacities	▪ Consideration of principles of fair governance (legitimacy, equity, responsiveness, accountability) ▪ Consideration of a variety of problem frames, multi-actor, multi-level, multi-sector, diversity of solutions, redundancy) (Gupta et al. 2010)
6. Procedural capacities	▪ Having an understanding of how to elicit and apply the aforementioned capacities, skills and knowledge stocks.

Source: authors' considerations

These different types of capacities go well beyond the level of the individual actor or the community at risk as they try to consider also institutional dimensions of social capacity building and the knowledge of how to employ certain resources and skills. Beside knowledge and motivation we furthermore acknowledge the role of financial capital as well as of social capital.

⟶ *Social capacity building as intervention and participation*: Interventionist approaches put a focus is on the public sector, particularly on the policy dimension as well as legal and regulatory systems and aim at stimulating and supporting capacity building in specific sectors, localities or regions by providing measures, strategies and entire policy frameworks intervening in a given locality or region. Participatory approaches focus on in the private sector, particularly on individual actors and different kinds of communities. They aim at empowering actors by increasing their autonomy and agency to "develop their own self-confidence and skills to challenge prevailing local and wider structures of domination" (Pelling 2007, 375). Here the focus is on locally driven and locally owned capacity development processes.

⟶ *The dynamic nature of social capacity building*: To simplify, there are three elements involved in social capacity building: a status quo, which is defined by a lack of capacity, a process attempting to improve the situation and an expected outcome or a defined objective characterised by more capacities. While the outcome of social capacity building attempts should result in an improved situation compared to the status quo, e.g. the coping capacities of citizens living in a flood exposed community has increased, the process is concerned with the dynamics, strategies and specific measures by which this result is intended to be reached (Harley et al. 2008).

Figure 2.2: Elements involved in social capacity building for natural hazards according to CapHaz-Net

Source: authors' considerations; design: annalogie.de

However, Figure 2.2 is a simplification as social capacity building is not a simple linear process; it is dynamic in time and is influenced, for instance, by the concrete experience of a disaster, by locally specific risk environments but also by broader societal changes and processes. At the same time the successful building of social capacities in a specific setting might itself influence the experience of a disaster as well as the immediate physical and social environment and possibly also contribute to the transformation of the broader context. It is also dynamic with time itself. Different organisations' time horizons may be in conflict or even clashing with those of the affected communities, which themselves are internally differentiated. In short, time is not given and progressing. The process of social capacity building is hence not a linear one, but rather a dynamic process taking places on different scales be influenced by different time horizons and ideally based on iterative and mutual exchange and learning among people, communities and organisations involved in risk and disaster management.

⟶ *The normative dimension of social capacity building and the relevance of power relations*: Social capacity building has a strong normative dimension. This report is well aware of the insight that building capacity often entails a paternalistic stance, in the sense that an actor or a group of actors is considered by an outsider as lacking a certain skill, a resource or a capacity. This judgment is mostly made from a position of superiority. This implies that the interrelations of 'capacity builders' and those 'deficient' of a certain capacity need to be carefully taken into account. Therefore we outlined some of the questions in Figure 2.3 as very relevant.

Figure 2.3: Elements involved in social capacity building for natural hazards according to CapHaz-Net – reconsidered

Source: authors' considerations; design: annalogie.de

Ideally those considered as lacking a certain capacity should be involved in the definition process: do they agree or do they have distinct perceptions and definitions of their own 'deficits'? At the same time, the processes by which a certain aim is to be reached should also be made transparent and become part of a collective negotiation process. Finally, the outcome of any social capacity building should be made transparent and agreed upon, again by taking into account the views of the different actors (more generally on these issues in a risk context: De Marchi 2003). By way of summary, the following definition of social capacity building has been developed within CapHaz-Net.

A definition of social capacity building

Very generally, capacity refers to a context-related ability of an individual, a social group, an organisation or a community to decide and to behave successfully in a certain situation in order to anticipate, respond to, cope with, recover from and adapt to the negative impacts of an external stressor (e.g. a hazardous event) as well as to employ the necessary resources. Social capacities include knowledge capacities, motivational capacities, network capacities, economic capacities as well as institutional and procedural capacities. 'Social capacity building' is a normative concept that describes the process of (re-)discovering, enhancing and developing the previously mentioned resources and abilities. Ideally, it is understood not as a linear process but rather as a long-term effort including a variety of actors including individuals, organizations, communities and institutions. It is designed and set up as an iterative and mutual learning process which is based on the cooperation and interaction of these different actors. This implies also that those considered as 'lacking' a certain capacity should not only be involved (and have the capacities) in defining their own 'deficit' but also in defining the aims and purposes of the capacity building effort.

3 Risk governance of natural hazards

Rebecca Whittle, Gordon Walker

The term 'risk governance' was only recently introduced to the discourse on natural hazards and disasters. There are two interconnected rationales for considering the relevance and application of governance and risk governance ideas to natural hazards in general and to social capacity building more specifically:

Societal change: wider changes in society and in ways of conceiving, organising and structuring the coordination of societal objectives inevitably shape the manner in which natural hazards are dealt with. A broad shift has been taking place in how societies are governed and this is also relevant to the handling of natural hazards and disasters. The nature of the shift is unclear and contrasting accounts and explanations have been offered. However, some characteristics of this transition – for example, a 'rolling-back' of the state, increased privatization and the entry of new forms of actors (private companies, partnerships, non-governmental organizations (NGOs) etc.) into the political decision-making process – can be seen all over Europe, though in different degrees. A risk governance perspective aims to understand the nature of these changes and how they impact on established ways of carrying out risk or hazard 'management' in its various forms. Legislations, programmes and/or agencies operating at the national and European levels are encouraging or even requiring private companies, voluntary organizations and individuals to take more responsibility for their actions. This process of "responsibilization" (Garland 1996) includes, among others, attempts to define individuals, households and companies as agents that need to actively take decisions and choices with regard to the prevention and mitigation of hazards. This "privatisation of risk" (Steinführer et al. 2008), meaning that there is a tendency to place greater responsibility on the people at risk (e.g. to apply private prevention measures etc.), strongly relates to the idea of social capacity building: Have people, organizations and communities knowledge about the hazard? Do they consider themselves as being responsible for reducing the impact of a flood, for instance? Have different actors the resources to build up networks and establish trustful relationships among and between each other? How fair is this shift of responsibility onto individuals? What is the role of government and the private sector in such a context?

New risk challenges: risk or threats to safety, health and well-being and our understanding of these are changing, for example because of climate change and through our experience of high profile disaster events such as the Asian Tsunami, Hurricane Katrina, European heat waves and droughts, or UK summer floods. The challenges these risks pose are shifting because of evolving patterns of vulnerability and the demonstrated limitations of existing approaches to mitigating or reducing risks. Furthermore, our understanding of risk itself appears to be changing with greater appreciation of the limitations of science and predictive models and acknowledgement of the intrinsic uncertainties of knowledge. Risks are perceived to be more uncertain than previously thought and modern society appears to be increasingly intolerant towards the impacts of hazards and our apparent inability to cope with risks of various forms. Established models and ways of thinking and acting over natural hazards may thus not be 'fit for purpose' and better frameworks are needed. Moving from established approaches of risk mitigation, risk prevention or risk management towards ideas of 'risk governance' is one shift in which answers to the challenges

of contemporary and future risks may be found. This new perspective also places a greater importance on non-structural adaptation and mitigation measures and brings increasing numbers of non-governmental actors into the sphere of risk and disaster management. Merz et al. (2010) state with regard to flood risk management: "The increasingly prominent role of non-structural measures requires a much larger involvement of the public, and a functioning dialogue on the flood risk and mitigation options is an essential element of an integrated flood risk management" (ibid., 522). In this way, new actors, including individual citizens and those from the private and public sectors, can be seen to be joining those with more established hazard management roles in the risk governance process. However, this change is not taking place evenly or simultaneously across Europe. Instead, a multiplicity of pathways and development stages is observable (see also WP 2 report, Walker, G. et al. 2010). However, because of this profound transformation in how risk management is understood, social capacity building at different levels (for example, individual, organizational, community and region) becomes more important as the following sections will argue.

3.1   Approaching the governance of natural hazards

A first challenge relates to the definition of governance, as governance is a complex concept that is subject to varying definitions. However, it is useful to reflect on the kinds of ideas that are encompassed within our understanding of the concept. Throughout this document we conceive of governance as encompassing a diversity of formal and informal arrangements and procedures, which change over time. In short:

"Governance is the sum of the many ways individuals and institutions, public and private, manage their common affairs. It is a continuing process through which conflicting or diverse interests may be accommodated and co-operative action may be taken. It includes formal institutions and regimes empowered to enforce compliance, as well as informal arrangements that people and institutions either have agreed to or perceive to be in their interest." (Commission on Global Governance 1995, 2)

In this understanding the concept of governance has a dual orientation: in the sense of 'good governance' it is concerned with a set of definable qualities which enable problematic risks to be effectively handled in society. It is therefore used as something to be advocated, sought after and applied – a *normative* rather than only a descriptive or analytical term. However, in the sense of a more general understanding, risk governance is about broader transformations taking place across Europe and elsewhere, pointing to the involvement of multiple actors and stakeholders; the many ways in which knowledge is produced and authority is exercised; and the importance of situating governance in a multidimensional societal context. Understood in this way, governance is a *descriptive-analytical* term. In the following the usage of the term 'new governance' points towards its descriptive dimension, while the term 'risk governance' points towards the more normative understanding of the concept.

A 'new' governing of natural hazards?

For the majority of theorists, an important change in governance practices took place in many countries during the 1980s and 1990s (Bevir and Rohdes 2003, Rhodes 1997). These changes are described in different ways. However, there are certain common core elements to this 'new governance' that can be identified.

A key characteristic is that the new ways of governing involve a diverse yet interdependent set of actors. For example, Rhodes (1997) describes a situation where there are no longer single (state) authorities, but rather a "multiplicity of actors specific to each policy area" (ibid., 51). These actors may have shared goals and they come from different sectors (i.e. private, public and voluntary), resulting in new forms of action, intervention and control. As Bevir and Trentmann (2007) highlight, one of the defining features of the new governance is the fact that the state is perceived to be increasingly dependent on other actors "*to secure its intentions, to deliver its policies, and to establish a pattern of rule*" (ibid., 2). Consequently, it takes on a new role which is less about service delivery and more about making policy decisions. Such a change reflects Osborne and Gaebler's famous distinction between the 'rowing' (service delivery) and 'steering' (decision-making) functions of government (1992).

Most significantly the management of natural hazards has always involved the activities of multiple actors beyond the public sector. This is particularly obvious in emergency and disaster response activities where coordination between multiple public services, voluntary and community organizations is typically involved. In most of Europe the private insurance industry has similarly always been a key part of the management of disaster risk (through risk transfer), but notably with quite different arrangements between the state and the insurance industry arrived at across EU member states (OECD 2002, 2006).

However, the hazards literature has noted a recent shift towards a *greater diversity of actors* being involved and the development of new roles and stronger forms of collaboration and partnership working. For example Christoplos et al. (2001) identify the shifting roles for various actors commenting that "there are no longer set piece roles for states, NGOs, the private sector and local institutions in dealing with disasters" (ibid., 189). They also comment that "institutional pluralism and public-private partnerships are key" (ibid., 188) echoing calls across various organizations for more inclusion and better collaboration between actors. As a specific example in the UK the development of local and regional 'resilience forums' has actively included such a diversity of public, private, and non-governmental actors. Medd and Marvin (2005) interpret this as a shift to a 'governance of preparedness' in which key players are brought together into 'new configurations' of institutional actors.

A second prominent theme is the development of new forms of authority and control. This increased emphasis on 'steering' necessitates new forms of authority and control based more upon negotiation and management, as opposed to more traditional techniques of coercion and enforcement. For Rosenau (2004) the new governance is still about the exercise of authority, but through employing a broad range of strategies including shaping people's shared norms and habits, informal agreements, negotiations, etc.

In the literature on natural hazards these shifts are also partially reported. Shifts of responsibility have been associated to some degree with a shift from a stance based upon mitigation to

one focused upon resilience and adaptation, where flood management is a good case (Rogers-Wright 2009). Here, recent years have seen signs of a shift from an approach based upon flood prevention via structural approaches and the provision of large-scale flood defences to an emphasis on resilience and adaptation where the goal is to help people live with the impacts of floods. For example, within the UK, such approaches are enshrined in the government's strategy of 'Making Space for Water' (Defra 2005), as well as in recent policy initiatives which attempt to encourage householders and businesses to make changes to the fabric of their buildings in order to make them more resistant and/or resilient to floodwaters (Defra 2008). This has been seen as evidence of a split between the rowing and steering elements of governance – with government continuing to set flood policy but at the same time seeking to shift responsibility for costs and actions to other segments of society (Watson et al. 2009).

Similar changes are also taking place across Europe in relation to the problem of water scarcity. Structural solutions such as the construction of new reservoirs and desalination plants have been and are still being used to try and make more water available to more households, particularly at times of water stress. However, contemporary approaches are increasingly emphasizing the role of learning to live with water scarcity via demand management and the adoption of drought-sensitive farming methods (Chappells and Medd 2007, Ali Memon and Butler 2006). In these ways those at risk – householders, businesses, farms, infrastructure managers, etc. – are becoming managers of that risk and part of the multi-scale risk governance network.

A third theme is the multi-level nature of governance processes as well as issues of scale. Theorists often speak of 'multi-level governance' and the 'hollowing out of the state', which refers to "the loss of functions upwards to the European Union, downwards to special-purpose bodies and outwards to agencies" (Rhodes 1997). In the past, the different tiers of government – from the local to the national and international – were seen as fitting neatly inside one another like Russian dolls (Hajer and Versteg 2005). Today, however, this linear chain of command has given way to a more complex structure based on networks, as subnational organizations such as local government and the voluntary sector can communicate directly with supranational organizations such as the European Union, and vice versa.

Such changes do not mean that nation states have no role to play, merely that they are no longer the main players in the system. This may represent more of a departure for some countries than for others – in the UK, where the national government has traditionally been strong and regional government very weak (Rhodes 1997), the movement of power outwards and upwards is readily visible. However, for countries like Germany, Switzerland and Italy, where the regional and local levels of government respectively have been very important, the shift to new governance practices may not appear as immediately apparent or distinct. In Eastern and Central Europe the fundamental transition from very strongly state-centric communist government, to various forms of democracy have represented a major shift in the locus of power and practice of government, but even so traditions of centralized, hierarchical, state-led government can still be in place. As a result of such diversity, scholarly opinion is divided over how 'new' these features of the new governance really are and how much it is possible to talk of a widespread cross-national shift or trend.

For natural hazards the relationships between levels of governance have also become increasingly important. This can be seen in for example the international scale joint frameworks and cooperation strategies – e.g. the Global Disaster Information Network and the EU-

Mediterranean Disaster Information Network. The Hyogo framework (2005) identifies 'good governance' and 'international and regional cooperation' as particularly important to support actions at local levels, with major disasters seen as often beyond the capacities of nation states to manage on their own. The EU has become more directly involved in the governance of natural hazards, through, for example, setting down pan-European provisions in the Water Framework Directive and Floods Directive and establishing cooperation and funding mechanisms for large scale emergency responses. New ways of working between local, regional and national actors have also been focused on in the literature. For example May et al. (1996) draw on empirical examples in New Zealand and Australia to analyse the significance of what they call 'intergovernmental approaches' to hazards that involve moving from coercive to cooperative approaches between national, regional and local actors.

Diversity in governance and hazards across Europe

Whilst such examples of the emergence of new forms of governance can be found, we need to guard against over-generalisation. As noted earlier the extent and significance of these changes can be quite different across the member states of the EU (and other European countries) and counter-cases can be found in which the key characteristics are not evident or are manifest in quite different ways.[3]

A clear example of diversity across Europe relates to the insurance arrangements provided within different countries for disaster risk. Here, we can see a long standing involvement of the private insurance industry as an actor in the management of risk, but there has been no movement to unify the governance of insurance upwards to the European level. Insurance arrangements and the relationship between market and public measures are determined at a national level and, as a consequence, a great diversity exists across member states. For example in the UK in line with the 'shift of responsibility' thesis, there has been an ever increasing trend towards individualization of flood risk, segmentation of the market and differentiation between insurance premiums depending on degrees of assessed risk at a particular location. However, in other parts of Europe exactly the opposite trend has been seen. For example in France compulsory cover for disaster risk is shared since 1982 amongst all policy holders with an identical additional percentage premium paid on top of the assessed premium for fire insurance (French Disaster Reduction Platform 2007). This approach (which is similar to those in Belgium, Spain and Norway) is guided by a principle of solidarity and mutuality, which contrasts directly with the individualizing, market driven logic of the UK. In both cases public-private partnerships have been central. But importantly the outcomes of these public-private partnerships remain quite divergent and ideologically distinct. This example clearly demonstrates the need for any understanding of the needs and challenges in social capacity building to develop an appropriately differentiated and contextualized view of how governance operates in practice across Europe.

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[3] To assist in thinking about some of these differences across Europe, Annex 1 in the WP2 report (Walker, G. et al. 2010) gives some examples of the various governance arrangements applied to natural hazards within different European countries.

Issues and critiques

Whilst taking these points on board, it is important to recognise the critiques that the new governance arrangements have stimulated in the natural hazards field. For example, the disaster recovery literature has highlighted the problems that can follow from a retreat from state responsibilities towards sharing these with other actors, particularly those in the private sector. Recent arguments, such as those presented by Klein (2007) and Gunewardena (2008), mount a harsh critique of neo-liberal disaster reconstruction policies which, they claim, enable the private sector to benefit from disasters at the expense of local people. According to such accounts, neo-liberal policies encourage disaster response initiatives that are led by big corporate interests – such as rebuilding and redevelopment programmes fronted by engineering consultancies and private developers. Such actions are said to perpetuate, rather than resolve, the socio-economic inequalities which led to local people becoming vulnerable to hazards in the first place, thus leaving communities more vulnerable to the effects of disasters in the future. Gunewardena (2008) argues that this shift from 'assistance' to 'investments' amounts to "a predatory form of capitalism that triggers a secondary set of disempowering consequences for affected communities" (ibid., 4).

Critiques have also centred on the issue of partnerships and participation. Pelling (2003) argues that partnerships, where local people can be involved alongside non-governmental organizations and state actors, are an important tool of governance, but also emphasizes that partnerships must be treated with caution if they are not to fall into the trap of allowing the interests of the more powerful actors (including formal government) to dominate the decision-making process:

"Collaboration between actors – particularly when grassroots actors are involved – can provide opportunities for learning how to access resources and build self-esteem with which to claim rights to resources for local risk reduction. But neither partnerships nor grassroots actors should be viewed romantically. Power lies in relationships, and when partnerships are built on unequal relations of power development outcomes are open to bias. This is as true for relationships between local organizations and non-governmental or state actors as it is for relations between men and women, the young and old, or different ethnic or religious groups at the local level." (Pelling 2003, 90)

Such concerns are paralleled in work on participation figures within governance frameworks for hazards and related environmental management practices within Europe. For example, Petersen et al. (2009) critique the 'new environmental governance' of the Water Framework Directive arguing that this has become a way of extending state power rather than introducing a new form of more democratic politics into environmental decision-making.

3.2 Risk governance of natural hazards

Following our general definition of governance we can define risk governance as encompassing a diversity of formal and informal arrangements and procedures through which risks and hazards are managed in society. Renn (2008) has put forward a specific model of risk governance, seeing it as a wide-ranging and inherently multidisciplinary activity that:

"requires consideration of the legal, institutional, social and economic contexts in which a risk is evaluated, and involvement of the actors and stakeholders who represent them. Risk governance looks at the complex web of actors, rules, conventions, processes and mechanisms concerned with how relevant risk information is collected, analysed and communicated, and how management decisions are taken." (Renn 2008, 9)

In this definition we can clearly see links with wider notions of the 'new' governance – the involvement of multiple actors and stakeholders; the range of ways in which knowledge is produced and authority is exercised; and the importance of situating governance in a multidimensional societal context. Whilst we can think about risk governance in this way as a description of what is relevant to understanding how risk governance operates, there are also more prescriptive definitions. For the International Risk Governance Council (IRGC), risk governance is defined as something normative and desirable, specifically: "the application of the principles of good governance to the identification, assessment, management and communication of risk" (IRGC 2009). However, in the literature, the concept of risk governance, including the model proposed by Renn, is more often applied to technological risks, such as those arising from nuclear power or GMOs. A key question for CapHaz-Net is therefore how well can the Renn and IRGC risk governance framework be applied to the management of natural hazards?

Some differences and commonalities between risk governance and the discussion on natural hazards

In terms of the specification of component parts and elements, risk governance (as advocated by Renn and the IRGC) does not bring anything distinctly new to the natural hazards field. Existing models of 'risk management' applied to natural hazards at first sight appear to have the same or similar component parts[4]. For example, in the model of flood risk management presented by Schanze (2007), sequential stages of risk analysis, risk assessment and risk reduction are specified with the managing entity consisting of a "*multi-actor constellation representing several sectors (e.g. water and spatial planning authorities), adjacent areas (e.g. multiple municipalities) and different levels (e.g. local regional)*" (ibid., 3). However, some important distinctions can be made:

⟶ First is the extent to which the risk governance framework recognizes the challenges of *knowledge* about risks, foregrounding issues of *complexity* (in particular systemic risks), *uncertainty* and *ambiguity* and advocating the design of strategies which explicitly recognise these knowledge challenges from the very beginning (IRGC 2008). Conventional approaches to risk management in contrast tend to be less explicit about such challenges, if not seeking to hide them from view.

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[4] Terminology is confusing here as 'risk management' is sometimes used as an overarching concept, encompassing such activities as appraisal, assessment and evaluation, rather than as in Renn's framework as a stage of action or intervention.

→ Second is the distinction between the *degree* to which risk governance necessarily involves multiple actors, extended actor networks and collaborative processes, and the more limited notions of participant involvement usually represented in models of risk management. Even though models of risk management may acknowledge the importance of stakeholder involvement and the like, government and expert bodies may still in reality be the primary if not sole actors involved in most of the core elements listed above. As a corollary this means that expert knowledge (and its scientific epistemology) still very much dominates, and local or lay knowledge remain peripheral and are given little real credence or significance. Risk governance potentially may go further towards equalizing knowledge claims and giving recognition to a greater diversity of voices. Following this line of argument Greiving and Glade (2008), in a rare and brief discussion of risk governance and natural hazards, focus on the greater degree of trust and 'acceptance' that the risk governance framework might engender, concluding that it does constitute a 'new principle' in the field.

→ In this light and leading to the third point: Where the risk governance framework is *most* distinctive is in the centrality it gives to *risk communication* across and between all stages. The main emphasis of the framework is to see hazard assessment and risk management as acts of communication rather than a series of behavioural actions. Communication is understood to encompass many forms and purposes of flow of information between the different actors involved in risk governance and to include different modes of interaction, participation and partnership rather than only flows of 'expert to non-expert' information (see also Chapter 6 below). Such themes are becoming increasingly evident in the natural hazards field, but are not as central or applied to all aspects (e.g. White et al. 2001 for a general discussion, see Faulkner et al. 2007 on the development of a 'translational' discourse on flood risk uncertainty, Green and Penning-Rowsell 2007 on different perspectives of engineers, emergency planners, the public and researchers). The need for more effective participatory processes has also become a more significant theme in natural hazard discourse. For example, an influential statement of key principles of sustainable hazard mitigation (Mileti 1999) includes the importance of participatory processes and the involvement of more than those with scientific or technical expertise. Schneider (2002) stresses the need to integrate emergency management into processes of community planning and development and argues for the need to see disasters as "*community-based problems requiring community based solutions*" (ibid., 143). Pearce (2003) similarly stresses the importance of public participation. Tompkins et al. (2008) associate good governance of disasters with stakeholder participation in decision making, democratic access to knowledge and transparency and accountability in relation to policy decisions.

What additional factors should risk governance consider?

Despite the preceding discussion, there are also some important dimensions of handling natural hazards and of the associated research literature that do not appear to be captured as effectively by the risk governance framework.

→ The first is the substantial work in the natural hazards field focusing on vulnerability and understanding the 'social forces' that lead to and produce disasters (White et al. 2001). Risk is understood in the IRGC definition as a combination of hazard (energy, material, information) and hazard absorbing systems (structures, human beings), with risk being proportional to the strength of the hazard and the vulnerability of the hazard absorbing system. The place of vulnerability is therefore recognised and vulnerability assessment is included as part of the 'risk appraisal' stage of the governance framework (Birkmann 2006). Whilst important this does though tend to limit the notion of vulnerability to a technical element of knowledge generation. Other understandings of vulnerability would see it not only as something to be measured, but rather as at the foundation of what *creates* or produces disasters (Pelling 2003; see also below Chapter 5). Here the focus shifts away from the hazard itself towards differences between social groups in capacities to anticipate, cope with, resist and recover from the impact of a natural hazard and the social forces and processes that produce these differences. How governance should address these goes far beyond the risk focus of the risk governance framework (Tompkins et al. 2008). We can though note that potentially at least the underlying vulnerabilities and inequalities that contribute to disasters may be better exposed and addressed by opening up assessment and decision making processes to include more voices, in particular those who are normally excluded and marginalized from expert and governmental processes.

→ In a related way the risk governance framework is less obviously effective in encompassing the governance of disaster and the ensuing processes of recovery (although a recent IRGC report has briefly considered the governance failures of the response to Hurricane Katrina; IRGC 2009). This in part reflects its origins and predominant application in cases of technological risk, where large scale disaster events may not be applicable at all, or if they are they are much less familiar and recurrent. The management of natural hazards is often characterized in terms of a cycle of phases of 'pre-event', 'event' and 'post-event' activity. Such a conceptualization does not though map readily on to the risk governance framework, which arguably is largely concerned with pre-event activity (although recognizing the feedback of risk experience into other elements). However the shift towards new governance processes is highly relevant to disaster management and recovery, and as noted, this has both critical and more positive dimensions. According to Gunewardena (2008), disaster recovery involves more than just a 'search and rescue mission'. "*It should be grounded, rather, in an interrogation of the complex intertwinement of power, rights and justice with the objective of ensuring human security beyond mere survival*" (ibid., 8). In short, post-disaster governance practices should address – or at the very least not worsen – the existing socio-economic inequalities that make people vulnerable to the effects of natural hazards. At the heart of their recommendations is a focus on giving power back to local communities and a commitment to reducing the kinds of structural inequalities that

perpetuate vulnerability – the latter a theme largely missing from accounts of risk governance that do not address underlying mechanisms and structures.

Whilst such perspectives on disasters are largely focused on the developing world, the lessons offered – in terms of the role that governance can play in disaster mitigation and response – can still be applied to the European context where vulnerabilities may be less immediately apparent and where policy making tends to be more focused upon hazard control and prediction than disaster response and recovery. They also highlight the fact that the temporal dynamics of risk governance might not be best represented in a simple circular manner, implying somehow that there is a recurrent return to the first step. Representation of the progress of governance as a 'helix' of continual change in which there is never a return to starting conditions may be more appropriate.[5] Bringing a number of these points together it is instructive to consider a well-known model for representing the processes and dynamics of natural hazards and disasters. Figure 3.1 shows the 'access model' of Wisner et al. (2004) which has at its centre dimensions of household livelihood, social forces, social relations and structures of domination and which emphasizes the iterative, circulating dynamism of multiple time phases and events. Future work might seek to grapple with how this powerful model might be productively interfaced or integrated with concepts and processes of risk governance, for example shaping the degree to which social protection operates effectively (particularly for the most vulnerable social groups) and social and institutional learning is able to break out of the loop of continually repeating disaster experiences.
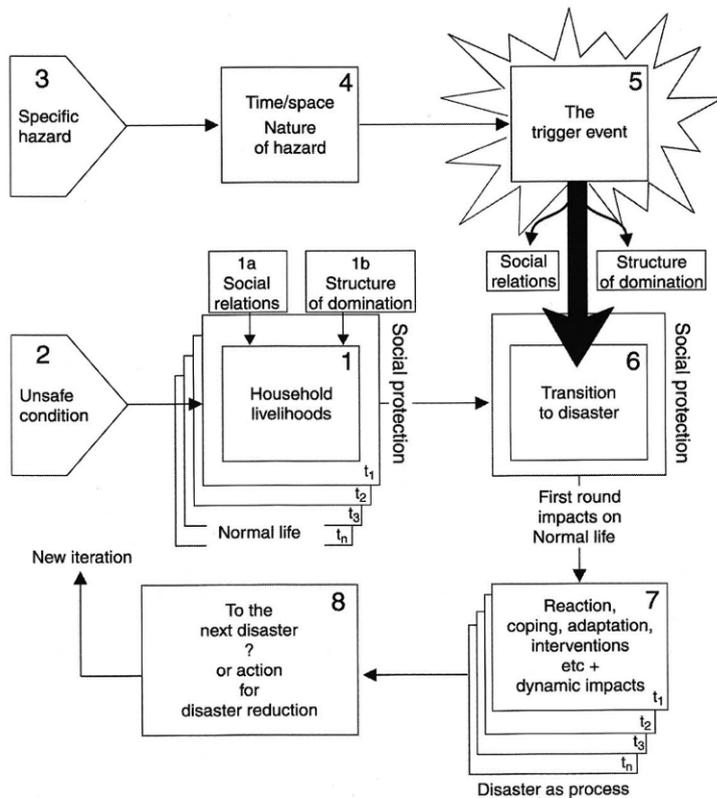
Figure 3.1: The access model of hazards and disasters

Source: Wisner et al. (2004)

3.3 Implications for social capacity building: New forms of governance and multiplicity of actors from different sectors[6]

The consequences of the 'new governance' as well as 'risk governance' as proposed by the IRGC/Renn are manifold and can hardly be summarized here; all the more as the implications of some of the findings previously outlined are not entirely understood let alone well described. However, the following points highlight some of the main links between risk governance and social capacity building as discussed within CapHaz-Net:

⟶ *The ambivalent implications of shifts of governance*: Table 3.1 attempts to draw together the discussion up to this point by identifying some of the key features of 'new' governance and then commenting on the possible positive and negative ways in which these may materialize in the governance of natural hazards.

Table 3.1: The implications of shifts to governance for the governance of natural hazards

New forms of governance	Governance of natural hazards	Potential positive implications	Potential negative implications
Networks of multiple actors beyond the state	Government agencies, private sector utilities, businesses, community groups, householders	Different voices are heard; different skills, knowledge and capabilities are drawn on; better communication and coordination	Unclear accountability; illusion of involvement; tokenistic inclusion; slow decisions and compromise solutions
Multi-level governance networks	International agreements; cooperation between nations; regional and local networks	Greater flexibility, sharing of skills and resources; more cooperative solutions between levels	Unclear distribution of responsibilities; conflicts between scales; disaster capitalism
Diverse forms of control	Communication and persuasion; use of market mechanisms; regulation of private companies	More effective and efficient ways of achieving policy objectives	Reliance on market mechanisms disadvantages those with fewer resources; fragmentation and ineffective regulation
Distributed responsibility	Sharing of responsibilities with private sector, NGOs and individuals	Empowerment; more effective action; local decision making; more resources	Unclear responsibilities; fragmentation of policy making and policy implementation; under resourced and marginalized groups may become more vulnerable

Source: authors' considerations

⟶ *The involvement of multiple actors in social capacity building*: There is a great consensus in the scientific literature that natural hazards need to be dealt with by multiple actors and at multiple scales. While national or even European policies set the general frames for how hazards and disasters should be managed, local and/or regional authorities and administrations are mostly responsible for taking care of the immediate impacts and consequences of natural disasters (Corfee-Morlot et al. 2009, 13). People living in endangered areas may have developed special knowledge and resources to adapt to and cope with the impact of natural hazards. To allow for a more systematic understanding of the different ac-

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[6] Section written by Christian Kuhlicke, Annett Steinführer, Gordon Walker and Rebecca Whittle.

tors and their roles, the following overview (Table 3.2) specifies two major types of actors that are and/or need to be involved or considered in social capacity building efforts, that is, private and professional actors both as individuals and in organizations.

Table 3.2: Actors involved in social capacity building and their relevance

Actors in the private sector

Description	▪ This includes individuals or a collective body of individuals (e.g. households, school classes or communities etc). The defining characteristic of this level is that actors are not formally organised with respect to hazard and risk management efforts. ▪ Individual and collective actors might overlap to a lesser or higher degree (see also below, Figure 3.2) but it is important to principally accept that perceptions, intentions and behaviours of individuals might be distinct from those of the collective (be it a school class or a community).
Relevance	▪ Many individuals and local communities are exposed to natural hazards across Europe. Therefore their capacities to anticipate, respond to, cope with and recover from the impacts of a natural hazard are central for reducing the overall consequences of natural hazards and disasters. ▪ These capacities are unevenly distributed. ▪ The population also has to deal with ongoing alterations of the governance approaches demanding individuals and/or local communities to take over new tasks and responsibilities.

Actors in the professional sector

Description	▪ The defining characteristic of this type of actors is that they belong to some kind of "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)" (Matthiesen 2005, 10). ▪ Such formal organizations exist in the public, the private and the voluntary sectors. ▪ Also for this sector it is necessary to principally make a distinction between individual and collective actors. However, their interests, intentions and behaviours more strongly overlap (than in the case of private actors) as individuals are in charge of conducting specific organizational tasks.
Relevance	▪ Organizations from the *public sector*, which are directly or indirectly involved in disaster and risk management include governments, ministries, administrations, planning agencies, local authorities, public services, fire brigades, etc. These are attempting to reduce disaster losses and damages. Furthermore, they may be confronted with new tasks, demands and functions as, for instance, the increasingly prominent role of non-structural measures may require a larger involvement of the public, and a functioning dialogue on the flood risk and mitigation options (Merz et al. 2010, 522). ▪ Companies in the *private sector* may be insurance companies but also other companies formally or informally involved in risk and disaster management e.g. privately owned utility, infrastructure companies or consultants. ▪ Non-governmental organizations from the civil society (*voluntary sector*) are directly or indirectly involved in disaster and risk management. These include NGOs, foundations, community groups, activist groups, union and other interest groups. NGOs have long been working to reduce vulnerabilities, raise awareness and secure action not only in the field of disaster and risk management but also in the wider arena of sustainable development and humanitarian aid policies.

Source: authors' considerations

A major 'actor' which is widely referred to in risk management research and practice (as well as in the fields of sustainable development, humanitarian aid, development cooperation or neighbourhood development) is *'community'*. However, there is a neither a shared understanding of what 'community' means, nor whether this term refers to communities in a social, local or behavioural way, to mention but a few. Usually, though often only implicitly, research and practice refer to local communities (or 'geographical communities'; CCS 2009). But 'communities of circumstance' (which emerge by chance or due to structural features, such as school curricula) or 'communities of interest' (which come into being due to a stated interest or legitimate stake in a

certain issue)[7] are equally important. Moreover, neither community type is not one single actor, as their members are neither homogeneous nor have a clearly defined stake in risk management. Rather, local and other communities are characterised by a number of diverse interests and internal social differentiation. Issues like social conflicts, social inequity and social exclusion need to be equally taken into account (cf. also Pelling 2007). Generally, there is a broad consensus that the local level and/or the level of communities is the most appropriate setting for realising social capacity building efforts, for the following reasons:

⟶ Each natural disaster is singular in its physical characteristics and local impact due to its coincidence with context-specific risk cultures, risk governance structures and institutional performance. Due to the physical vicinity of others in the same risk situation, risk-related social networks can be established at this level.

⟶ Simple 'top-down' approaches are mostly misleading. Capacity building attempts will always need to take into account existing local management practices and local memories. And, indeed, the local level is already an important scale of actual risk management. It is here that the tendency toward an increasing 'privatization of risk' is materialising and, in some countries (e.g. UK), it is also the level at which local flood risk assessments are conducted and at which risk education and communication efforts focus in order to raise awareness and change behaviour.

Figure 3.2 displays the different actors involved in social capacity building. It principally distinguishes between private and professional actors (be them individual or collective) but also suggests that there is a certain overlapping and permeability between these two sector (e.g. a fire fighter volunteer might be a professional and a person at risk at the same time). Individual actors in the private sectors are more or less strongly integrated in social groups, such as families or school classes, as well as in overarching contexts, such as local communities or communities of circumstance (as described above). Individuals in organisation usually have to fulfil certain roles prescribed by the organisation and, thus, only restricted leeway when deciding for or against certain measures. Therefore their intentions more strongly overlap with that of the collective actor than in the private sectors.

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[7] We are grateful to Laura Gibb from the UK Civil Contingencies Secretariat who introduced this typology during the Lancaster workshop in November 2009 (cf. also CCS 2008).
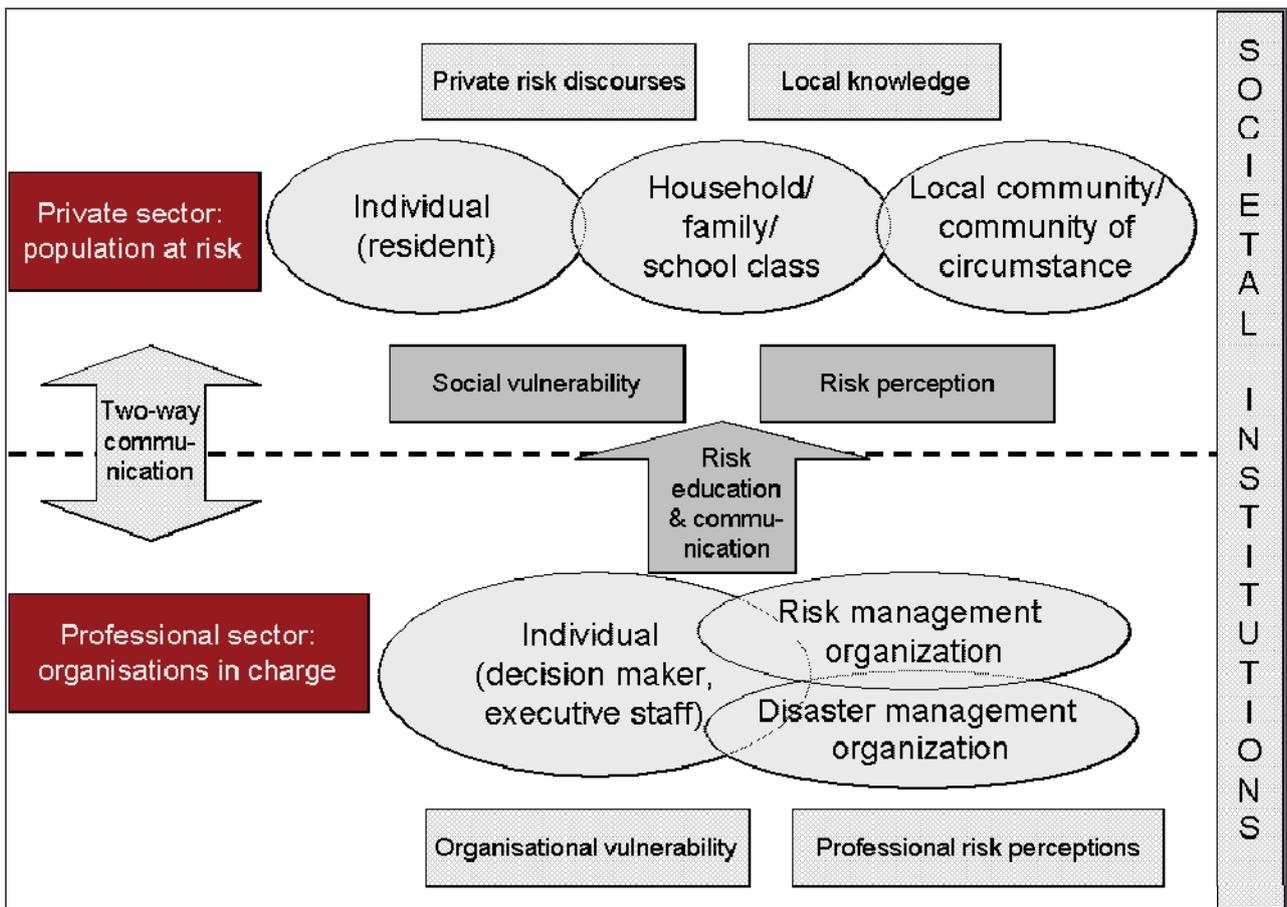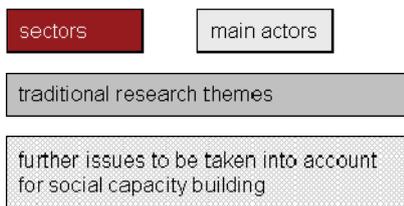
Figure 3.2: Sectors and actors of social capacity building and their relation to major topics of natural hazards research

Source: authors' considerations

It is important to note that the several types of social capacities as introduced above in Chapter 2.6 are not restricted to individual or private actors but are also relevant for organisations – just like social capacity building is an effort targeting at the public as well as at organizations of different types.

What is more, Figure 3.2 also introduces a certain imbalance in the relationship of private actors (at risk), on the one hand, and professional actors, on the other: traditionally it is the latter to educate 'lay' people, to communicate risk to those who are vulnerable and have a certain (often regarded as 'false') risk perception. However, our approach to social capacity building suggests that

- also professionals (individuals and organisations) are at risk and vulnerable and
- these also convey certain understandings and assessments of risk which might depart from that of the actors in the private sector.
- On the other hand it is suggested that

- risk communication and education – traditionally regarded as a transfer of information and knowledge of those more experienced/skilled to those with less knowledge and information – also occur in rather informal settings at the family or local scale (as private risk discourses or the intergenerational passing of local knowledge) and
- more two-way communication is required between these two sector: as highlighted above, the risk governance framework attributes a central role to risk communication across and between all stages. Communication is understood to encompass many forms and purposes of the flow of information between the different actors involved in risk governance and to include different modes of interaction, participation and partnership rather than only flows of 'expert to non-expert' information (see also Chapter 6).

Finally, Figure 3.2 stresses the importance of institutions for both types of actors. Institutions include overarching societal processes, cultural patterns, shared norms and values, beliefs and attitudes which are among individuals, organizations as well as communities. Although of central relevance of any capacity building effort they are most often neglected in the analysis and/or only loosely defined (Gupta et al. 2010). Institutions may be formally expressed and include legal and regulatory frameworks or may be simply taken for granted and implicitly shared values, norms and beliefs. An understanding of *existing institutions* is crucial both for understanding the current situation as well as the respective governance setting, but also for elaborating communication and education strategies, which are adaptable and implementable in different institutional settings. The *institutional design* not only considers the existing institutional setting but also how it enables social capacity building (cf. also Gualini 2002). Hence, the institutional design includes rules and norms "structuring the interaction" of people and creating the "power to achieve purposes that would be unreachable in their absence" (Scharpf 1989, 152, quoted in Gualini 2002, 36).

This systematic of actors is developed in a rather generic way in order to enable the categorisation of different actors and levels across a variety of socio-institutional contexts and risk governance practices across Europe and to specify what kinds of capacities possibly need to be developed and enhanced with regard to which actors in subsequent stages of the project.

4   Risk perception

Gisela Wachinger, Ortwin Renn

The contribution of risk perception studies to this field of research and practice has been to introduce a view that incorporates how residents at risk and those handling the risks perceive certain risks, by unravelling subjective perspectives. However, as this section will show, risk perception studies have also questioned the entire idea that risk calculation, done by scholars and experts, is less important for the perceived severity of a risk (often even unimportant) in relation to the personal factors influencing the view of the risk. The question of how people perceive risk arising from natural hazards is not only a question of theoretical relevance; it also has relevant practical implications for both long-term risk prevention and short-term crisis management (Bostrom et al. 2008). How people decide and act, whether they consider themselves as being exposed to risks from natural hazards or whether they see themselves in the position to cope with, adapt to and recover from hazards and disasters are all issues of risk perception (Plapp 2004, 2). In this sense, a heightened awareness may be regarded as a first step for preventing the occurrence, or at least reducing the impact of a natural disaster and hence a quite important capacity of people. In this context further cross-cutting topics emerge: How should risks arising from natural hazards be communicated if risk awareness is low? Which information do residents need in order to take preventive steps and which information and actors do people trust? The following section will introduce the reader to the most important findings of European risk perception studies in relation to natural hazards.

4.1   Different approaches to risk perception

The perception of risks involves the process of collecting, selecting and interpreting signals about the uncertain impacts of events (or activities or technologies). These signals can refer to direct observation (for example witnessing a flood) or information from others (for example reading about a flood in the newspaper). Perceptions may differ depending on the type of risk, the risk context, the personality of the individual, and the social context. Knowledge, experience, values and affects all influence the thinking and judgement of people about the seriousness and acceptability of risks.

Broadly speaking, there are two main perspectives in the study of risk perception (Plapp and Werner 2006, 102, Plapp 2001, 3): the concept of *cultural theory* (Douglas and Wildavsky 1983, Thomson 1990) and the *psychometric paradigm* (Slovic 2000, 226-227). The concept of cultural theory examines the cultural prototypes which act as the basis of the individuals' construction of their cognitive categories (García 2005, 15), whilst the psychometric paradigm goes beyond the individual's social context, paying attention to those elements that are shared across cultures and social groups. The following section discusses differences in the perception of natural and non-natural hazards from within both of these perspectives.

Psychometric methods provide an empirically driven explanation of why individuals do not base their risk judgements on subjectively expected utilities. The concept of perceived risk was mostly developed by a group of psychologists at Oregon University, USA, in the mid-1970s. These authors, of whom Paul Slovic is the main representative, proposed a cognitive model that employs multivariate statistical techniques to understand people's risk attitudes and perceptions (Slovic 1987). Key elements in the model are represented by aversion or indifference to specific hazards, as well as by the potential gap between lay people and experts' opinions about, and

reactions to risks. Methodologically, such studies ask people to rate the current and desired levels of risk of diverse hazards (e.g., car driving, skiing, atomic energy etc.), and the desired level of intervention from risk management institutions for the regulation of such hazards. Responses are then related to other factors such as: (1) the qualitative characteristics of hazards that are believed to account for risk perceptions (e.g., voluntariness, dread, knowledge, controllability); (2) the cost-benefit balance and the consequences of specific hazards, also at a community or societal level (Slovic 1987, Sjöberg 2000).

The research revealed several contextual characteristics that individual decision-makers use when assessing and evaluating risks (Fischhoff et al. 1978, Slovic 1987, Rohrmann and Renn 2000; Renn et al. 2007). Table 4.1 gives an overview of the most important risk characteristics that have been found to affect people's judgements about risks.

Table 4.1: List of important qualitative risk characteristics

Qualitative characteristics	Direction of influence
▪ Personal control	▪ Increases risk tolerance
▪ Institutional control	▪ Depends upon confidence in institutional performance
▪ Voluntariness	▪ Increases risk tolerance
▪ Familiarity	▪ Increases risk tolerance
▪ Dread	▪ Decreases risk tolerance
▪ Inequitable distribution of risks and benefits	▪ Depends upon individual utility; strong social incentive for rejecting risks
▪ Artificiality of risk source	▪ Amplifies attention to risk; often decreases risk tolerance
▪ Blame	▪ Increases quest for social and political responses

Source: Renn 2008, 109

Another way of understanding risk perception has been introduced by Mary Douglas, an anthropologist, and Aaron Wildawsky, a political scientist (Douglas and Wildawsky 1982). This perspective emphasizes different cultural perspectives of constructing risks in a certain way and how the risk perception is being defined by norms, value systems and cultural idiosyncrasies of groups. As a result, this so called cultural theory assumes that there is no objective way of approaching or perceiving risks, since there is no neutral standpoint from which risk can be objectively defined: every person (including scientists) has a specific bias towards risks. As a result, a simple juxtaposition of individual/subjective and scientific/objective risk perceptions is no longer possible in this vain, since every group is biased by specific assumptions, norms, values and beliefs (Douglas and Wildawsky 1982, Thompson et al. 1990). It is hence a truly sociological or cultural way of understanding risks, since the occurrence of a hazard – be it natural or technical – is understood as a social phenomenon which needs to be explained by societal processes and structures. The foundation of cultural theory was laid by Mary Douglas by developing the so called 'grid-group model' (Douglas 1970) which led to the identification of four different types of environmental views: fatalists, hierarchists, individualists and egalitarians.

Opinions on the validity of the cultural theory of risk differ widely. Slovic et al. (2000) regard this approach as useful in explaining some of the differences in risk perception; Sjöberg (2001) and Sjöberg et al. (2000) found the variance explained by cultural prototypes to be so low that

they rejected the whole concept. Rohrmann (2000) also expressed a sceptical view, mainly because of methodological considerations about the empirical validity of the claims. All authors agree, however, that specific culture-based preferences and biases are, indeed, important factors in risk perception. The disagreement is about the relevance of the postulated four or five prototypes within the realm of cultural factors.

4.2   A structured framework for risk perception

In the past the psychological, social and cultural factors that influence risk perceptions have been investigated within the disciplines in which they reside. However, these different factors are all interconnected and reinforce or attenuate each other. Taking these interactions into account Renn and Rohrmann (2000) developed a structured framework that provides an integrative and systematic perspective on risk perception. Figure 4.1 illustrates this perspective by suggesting four distinct context levels (originally presented by Renn and Rohrmann 2000, 221; inspired by the generic model in Breakwell 1994).
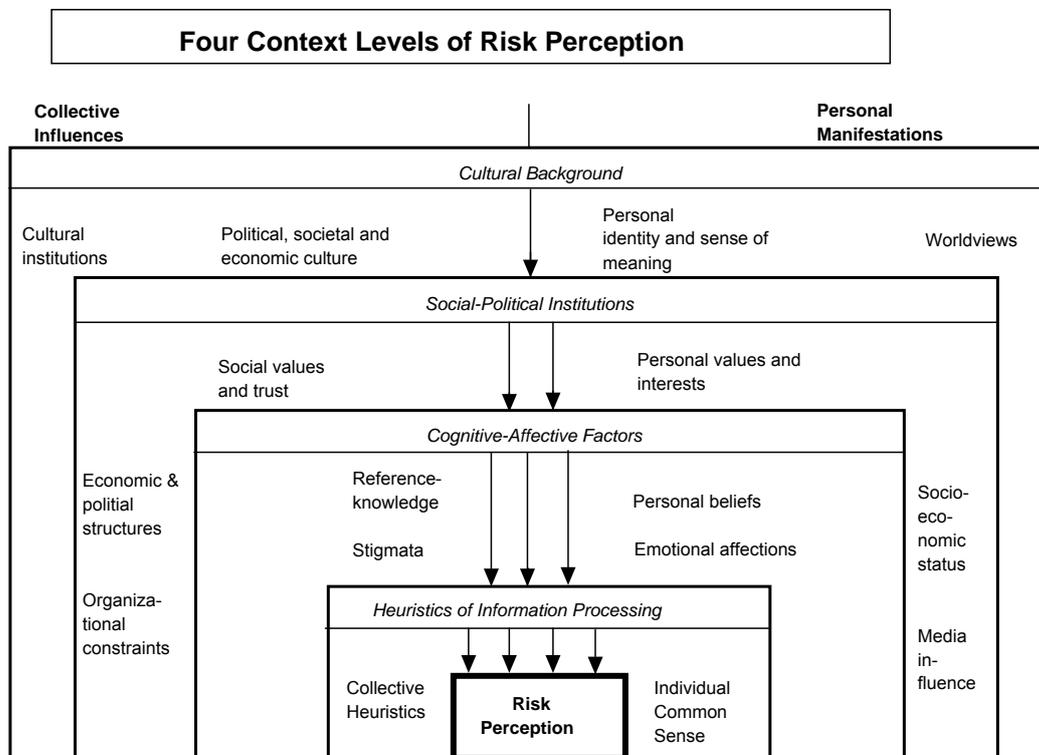
Figure 4.1: Four context levels of risk perception
Source: Renn 2008

Each level is further divided in two subsections, representing individual and collective manifestations of risk perceptions. Each level is embedded in the higher level to highlight the mutual contingencies and interdependencies among and between individual, social and cultural variables:

→   *Level 1 (heuristics of information processing)*: The first level includes the collective and individual heuristics that individuals apply during the process of forming judgements. These heuristics are independent of the nature of the risk in question or the personal beliefs, emotions or other conscious perception patterns of the individual. Heuristics represent common-sense reasoning strategies that have evolved over the course of biological and

cultural evolution (Ross 1977, Kahneman and Tversky 1979, Breakwell 2007). They may differ between cultures; but most evidence in the field of psychological research shows a surprising degree of universality in applying these heuristics across different cultures (Renn and Rohrmann 2000). Recent research results suggest that these heuristics are more appropriate for problem solving in many everyday situations than previously assumed (Gigerenzer and Selten 2001). Regardless of the normative value that these heuristics may offer, they represent primary mechanisms of selecting, memorizing and processing signals from the outside world and pre-shape the judgements about the seriousness of the risk in question.

→ *Level 2 (cognitive and affective factors)*: The second level refers to the cognitive (knowledge-based) and affective (emotion-based) factors that influence the perception of specific properties of the risk in question. Cognition about a risk source governs the attribution of qualitative characteristics (psychometric variables) to specific risks (e.g. dread or personal control options) and determines the effectiveness of these qualitative risk characteristics on the perceived seriousness of risk and the judgement about acceptability (Slovic 1992). It is interesting to note that different cognitive processes can lead to the same attribution result. In an empirical study, Rosa et al. (2000) were able to show that for the Japanese sample the arousal of catastrophic images was associated with the degree of individual knowledge of and familiarity with the respective risk in question, whereas US respondents linked collective scientific experience and knowledge to catastrophic potential. The two samples were, however, identical in assigning the degree of catastrophic potential to a set of technologies, even if they had different mental models about what constitutes catastrophic potential. The fact that individuals, within their own culture or by their own agency, are able to choose between different cognitive routes justifies the distinction between the two primary levels: cognitive factors and heuristics.

Whilst cognitive factors have been extensively explored, emotions have in the past been widely neglected in risk perception research (Breakwell 2007). More recently, however, psychologists have discovered that affect and emotions play an important role in people's decision processes (Loewenstein et al. 2001, Slovic et al. 2002). People's feelings about what is good or bad in terms of the causes and consequences of risks colour their beliefs about the risk and, in addition, influence their process of balancing potential benefits and risks. Affective factors are particularly relevant when individuals face a decision that involves a difficult trade-off between attributes, or where there is interpretative ambiguity as to what constitutes a 'right' answer. In these cases, people often appear to resolve problems by focusing on those cues that send the strongest affective signals (see and Kunreuther 2000, Peters et al. 2004). On the collective level, stigmata referring to risk sources or activities play a similar role in stimulating emotional responses (Slovic et al. 2002).

→ *Level 3 (social and political institutions)*: The third level refers to the social and political institutions that individuals and groups associate with either the cause of the risk or the risk itself. Most studies on this level focus on trust in institutions, personal and social value commitments, organizational constraints, social and political structures, and socio-economic status. One important factor in evaluating risk is the perception of fairness and

justice in allocating benefits and risks to different individuals and social groups (Linnerooth-Bayer and Fitzgerald 1996). Theoretical approaches, such as reflexive modernization (Beck 1994) or the social arena metaphor (Jaeger et al. 2001), provide a plausible explanation of why the debate on equity and justice has become so relevant for risk perception (Knight and Warland 2005). Other studies have placed political and social organizations, and their strategies to communicate with other organizations and society at large as the prime focus of their attention (Clarke 1989, Shubik 1991).

The media, the perceived norms and values of one's reference group (this is the group to which one would like to or believes they to belong to) and organizations also shape individual and societal risk experience. Press coverage appears to contribute substantially to a person's perception of risk, particularly if the person lacks personal experience with the risk and is unable to verify claims of risks or benefits from their own experience. In contrast to popular belief, however, there is no evidence that the media create opinions about risks or even determine risk perceptions. Studies on media reception rather suggest that people select elements from media reports and use their own frame of reference to create understanding and meaning. Most people reconfirm existing attitudes when reading or viewing media reports (Peters 1991, Dunwoody and Peters1992, Breakwell 2007).

→ *Level 4 (cultural background)*: The last level refers to cultural factors that govern or co-determine many of the lower levels of influence. The most specific explanation for cultural differences about risk perceptions comes from the 'cultural theory of risk' as explained above.

In addition to the theory of cultural prototypes, there are two sociological concepts that provide plausible explanations for the link between macro-sociological developments and risk perceptions. The theory of reflexive modernization claims that individualization, pluralisation and globalization have contributed to the decline of legitimacy with respect to risk professionals and managers (Beck 1994, Marshall 1999, Mythen 2005). Due to this loss of confidence in private and public institutions, people have become sceptical about the promises of modernity and evaluate the acceptability of risks according to the perceived interest and hidden agenda of those who want society to accept these risks (Beck 1992). The second approach picks up the concept of social arenas in which powerful groups struggle for resources in order to pursue their interest and objectives. Here, symbolic connotations constructed by these interest groups act as powerful shaping instruments for eliciting new beliefs or emotions about the risk or the source of risk (Renn 1992, Jaeger et al. 2001).

All four levels of influence are relevant in order to gain a better and more accurate understanding of risk perception. In spite of many questions and ambiguities in risk perception research, one conclusion is beyond any doubt: *abstracting the risk concept to a rigid formula, and reducing it to the two components 'probability and consequences', does not match people's intuitive thinking of what is important when making judgements about the acceptability of risks*, in particular technological risks (Mazur 1987, Pidgeon 1997, Wilkinson 2001). Paul Slovic (1992) stated this point quite clearly: "To understand risk perception, one needs to study the psychological, social and cultural components and, in particular, their mutual interactions. The framework of social amplifi-

cation may assist researchers and risk managers to forge such an integrative perspective on risk perception. Yet, a theory of risk perception that offers an integrative, as well as empirically valid, approach to understanding and explaining risk perception is still missing" (ibid., 150).

It is already a challenge for natural scientists and technical experts to understand the complex interactions between human interventions and reactions of the natural environment. In complex systems, even simple phenomena are hard to explain, let alone predict since they interact with the system as a whole. The system as whole reacts differently from what may be expected from examining each individual part Integrated models are one approach to include complex relationships between natural hazard and human interventions. They address many interactions between human and natural responses and attempt to characterize different kind of uncertainties and degrees of ambiguity.

Equally important is the question of how non-experts conceptualize and approach complexity and uncertainty when they make judgments about natural hazards and compose their own actions in relation to them. How do people understand and process information that contains descriptions of complex relationships and explanations of uncertainties? Several authors have concluded that complexity and perceived uncertainty may lead to an attenuation of risk if the risk is related to (familiar) natural hazards and to an amplification of risk if the risk is novel and technological (Plapp and Werner 2006, 107, Slovic 1997, 171-172, McDaniels et al. 1995, 587). This general observation relies, however, on a set of modifiers. Two important modifiers are personal experience and trust in experts and authorities (see also below). Personal experience may be an excellent guide for a more profound knowledge and understanding of uncertainties. Trust can act as a mediator between a complex, difficult-to-understand situation and the selection of appropriate action. As most people do not possess detailed knowledge of what complexity and uncertainty mean in a specific context they are forced to rely on experts and managers. Trust is used as a shortcut to reduce the necessity of making highly informed judgments since trustworthy experts step in and make the judgment on the behalf of those who lack the expertise or experience to understand the situation (Siegrist and Cvetkovich 2000, 714). This can result in a reduction of perceived uncertainty. Due to the fundamental affective dimension of trust (which involves items like honesty, integrity, good will or lack of particular interests), trust in experts is often lacking and difficult to generate, sustain or regain (Espluga 2009, 268).

One possibility for making uncertainties better understood in risk perception is to provide very transparent information and to engage in an adaptive, iterative process. Funtowicz and Ravetz suggest a new methodological approach, where "uncertainty is not banished but managed and values are not presupposed but made explicit. Theories of deterministic chaos and non-linear systems have provided insights into the uniqueness and instability of global environmental systems. Contrary to early expectations, these theories do not furnish new tools for knowledge and control on the model of classical physical science, rather than open the way to a new conception of science in which knowledge and ignorance will always interact creatively" (Funtowicz and Ravetz in Kasperson and Kasperson 2001, 177). The fact that uncertainty of the complex system 'climate change' has to be taken into account in natural hazard perception has implications for risk governance (see Chapter 4.4 below).

4.3 Mapping risk perception factors of natural hazards in Europe: an overview of the current literature

Risk perception depends on many factors, some of which have been discussed in the previous section. As natural hazards vary, ranging from sudden events such as flash floods to long lasting and slowly developing dangers such as droughts, so do risk perception studies. We collected around 30 risk perception studies from Europe that were conducted over the last decade in order to figure out those factors found which influence people's risk perception most (an overview of these studies is to be found in Wachinger and Renn 2010).

Out of the studies considered, only a few of them draw valid comparisons across the whole range of natural hazards. In addition, these studies differ in approach and test design. Most of the studies focus on floods, some include avalanches, mud slides, volcanic risks and heat waves. They all have in common that the perception of the natural hazard is linked to potentially influencing factors. These factors can be divided into four groups: risk, informational, personal and context factors (Table 4.2).

Table 4.2: Tested risk factors in risk perception studies in natural hazards research

Groups of factors	Factors
Risk factors	▪ Perceived likelihood of an event, perceived or experienced frequency of hazardous event
Informational factors	▪ Source and level of information, media coverage, involvement of experts in risk management
Personal factors	▪ Age, gender, educational level, profession, stakeholder membership, personal knowledge, personal disaster experience, trust in authorities, trust in experts, confidence in different risk reduction measures, involvement in cleaning up after a disaster, feelings associated with previously experienced floods, world views, degree of control, religiousness
Context factors	▪ Economic factors, vulnerability indices, home ownership, family status, country, area of living, closeness to the waterfront, size of community, age of the youngest child

Source: Wachinger and Renn 2010

Although the limited number of 30 studies does not allow representative inferences, this sample is sufficient to explore the most important factors and to discuss their significance for risk perception.

→ *Risk factors* do not play a very important role in the risk perception of natural hazards (Heitz et al. 2009). The likelihood of a disaster is barely taken into account when making judgments about perceived risk levels (Miceli et al. 2008). The perceived magnitude of a disaster is also of little importance for people's risk perception (Haimes 2004). This is surprising since catastrophic potential is a rather strong predictor for risk perception in the field of technological risks (Slovic 1987).

→ *Informational factors*: The type and source of information has been shown to have a significant though low impact on risk perception. However, much of this impact could be explained by differences in the perceived trustworthiness of the authorities providing the information (Heitz et al. 2009). Information provided by the mass media shapes risk perception to some degree but if persons report that they have had personal experience with

hazards media coverage does not play a major role (Siegrist and Gutscher 2006). However, media reports about an expected flood can stimulate people to recall the previous experience of a flood event (Felgentreff 2003).

→ Most of the *personal factors* tested in the studies show little to no significant influence on risk perception. In some studies there were weak but significant correlations between risk perception and selected personal characteristics, such as age: people aged under 25 and over 45 underestimated the danger of flash floods inundating a specific road section (Ruin et al. 2007). In another study, younger people perceived the risks of flood as being more serious than older people (Miceli et al. 2008). However, most studies did not find any age-dependency (Barberi et al. 2008, Siegrist and Gutscher 2006, Grothmann et al. 2006, Sjöberg et al. 2000). A similarly ambiguous situation exists with regard to gender (Barberi et al. 2008, Plapp et al. 2006, Grothmann et al. 2006). Women rate flood risk as more serious than men (Miceli et al. 2008). They also seem to be more worried about volcanic risks (Barberi et al. 2008). However, when these effects were controlled for hazard-experience, gender did not make any difference. Lastly, the educational level of the respondents had hardly any influence on risk perception (Miceli et al. 2008, Plapp and Werner 2006, Armas 2008, Barberi et al. 2009).

Several studies were able to demonstrate that *experience* is a significant and strong predictor for risk perception (Plapp and Werner 2006, Felgentreff 2003, Grothmann et al. 2006, Miceli et al. 2008, Terpstra 2009, Heitz et al. 2009, Siegrist and Gutscher 2006). In the study by Plapp and Werner (2006), personal experience proved to be the most influential factor among many others tested. Some studies explored 'flood experience' in more detail (Terpstra 2009, Miceli et al. 2008). Positive or negative *feelings associated with personal flood experience* were found to have different effects on perception and preparedness intentions (Terpstra 2009): negative feelings associated with previous experience decrease trust in official flood protection measures and increase risk perceptions while positive feelings increase trust in authorities and decrease risk perception. An Italian study revealed a correlation between feelings of worry and the adoption of protective behaviour (Miceli et al. 2008). However, the longer the time distance between the experienced event and the time of the interview the less pronounced the effect. Risk perception and risk awareness reach high levels directly after a flood event, but soon fade away over time and approximate average levels. It seems to be essential to help people recall the experience of the flood if one wants to motivate them to take protective actions against a new flood (Felgentreff 2003).

In addition to personal experience, the second most important factor for risk perception of natural hazards seems to be trust in authorities and confidence in protective measures (Terpstra 20009, Armas 2009, Heitz et al. 2009, Barnes 2002). The influence of trust on risk perception has been extensively studied in the context of risk preparedness. Trust in flood protection, for example, lessens perceptions of flood likelihood and magnitude and, through this route, reduces intentions to prepare for floods (Terpstra 20009). These results from the Netherlands can be compared to the results from a flood-study in Romania, where the lack of resources and mistrust in authorities reinforces non-adaptive behaviours (Armas 2009). These different effects of trust on risk preparedness as shown in

the two studies may be due to differences in political culture and different experience with authorities in general.

⟶ *Context factors* are routinely investigated but they are often conflated with personal factors. For example, personal flood experience is often documented as an intervening variable for explaining regional differences in flood risk perception (Ruin et al. 2007, Kaiser et al. 2004, Siegrist and Gutscher 2008). Many studies show that the perception of flood risks depends on the place of residence (areas with frequent floods versus rare floods) (Brilly and Polic 2005; for muddy floods see Heitz et al. 2009).

Economic factors do not seem to play a significant role in risk perception, with the exception of home *ownership*. Grothmann et al. (2006) were able to show that perceived economic impacts had little influence on risk perception as well as on the willingness to take precautionary measures. The only economic variable that had an influence on both dependent variables was home ownership. The most powerful predictor was again recent exposure to a flood.

Many open questions remain where further research is warranted. Our analysis of the 30 studies points to the importance of two major variables: *experience of hazardous events in the past* and *trust in experts and authorities*. Of minor but still significant importance are home ownership and media coverage. These insights can be used for both risk communication and risk governance.

Risk perception and participation

The perception of flood events has been found to change after participation processes (Stanghellini and Collentine 2008, Slinger et al. 2007). Research indicates that people become more aware of floods and are more motivated to initiate protective action if they are involved in a participatory exercise. This seems mainly due to a shift towards more trust in authorities and the experts. As a result of successful participation exercises, the public and the scientists were willing to learn from each other and to adjust their perceptions and behaviour once they were confronted with reliable information on exposure, consequences and protective measures. Another effect of the participatory workshops was that the citizens were less focused on technical measures and indicated that they wished policy makers to spread their attention more evenly over the full range of flood risk management measures including stricter zoning and building flood reservoirs and polders (Slinger et al. 2007).

4.4   Some implications for social capacity building

The findings – particularly the high relevance of the experience of hazardous events and trust in authorities and measures as factors influencing risk perception – suggest some important implications for any social capacity building effort:

→   As the impact of information on people's risk perception seems to be influenced by differences in the perceived trustworthiness of the authorities providing the information, a possible information campaign will only be successful if it is based upon trustful relations between residents and the authorities providing information. If such a relation does not exist, trust-building measures are indispensable. This finding thus underlines the importance of *knowledge, network and motivational capacities* in risk awareness campaigns.

→   Several studies were able to demonstrate that experience is a significant and strong predictor for risk perception. Risk perception and risk awareness reach high levels directly after a disastrous event, but soon fade away over time and approximate average levels. It seems to be essential to help people recall the experience of the flood if one wants to motivate them to take protective actions against a new flood. This first of all highlights *knowledge capacities* but also relates to *motivational capacities*.

→   The impact of participation processes on changed risk perception calls for risk-adapted types of participatory approaches. Renn, for instance, argues that depending upon the type of risk (simple, complex, uncertain or ambiguous) *different types of participation* are required, as shown by the 'risk management escalator' (Figure 4.2). Floods, for example, are usually perceived as "natural hazards" and therefore rate relatively low on the perceived risks scale compared with technological hazards (Plapp and Werner 2006, 107, Slovic 1996, 171-172, McDaniels et al. 1995, 587). A limited participation effort that includes the directly affected stakeholders would probably be sufficient to absorb potential discontent and to sustain trust. However, this picture is gradually changing, as shown above flood risks tend to be regarded as being more and more induced by humans rather than by God or nature (Sjöberg 2000, Baan et al. 2004). They fall out of the category "natural" occurrences and are associated with (inappropriate or faulty) human actions. This shift in accountability places more stress on those institutions that regulate and administer flood protection. According to Renn (2008) these "human made" floods then necessitate a more elaborated discourse system, in which civil society representatives of need to be represented (Figure 4.2). The consequences for risk communication and risk governance will be taken up in Chapter 9.
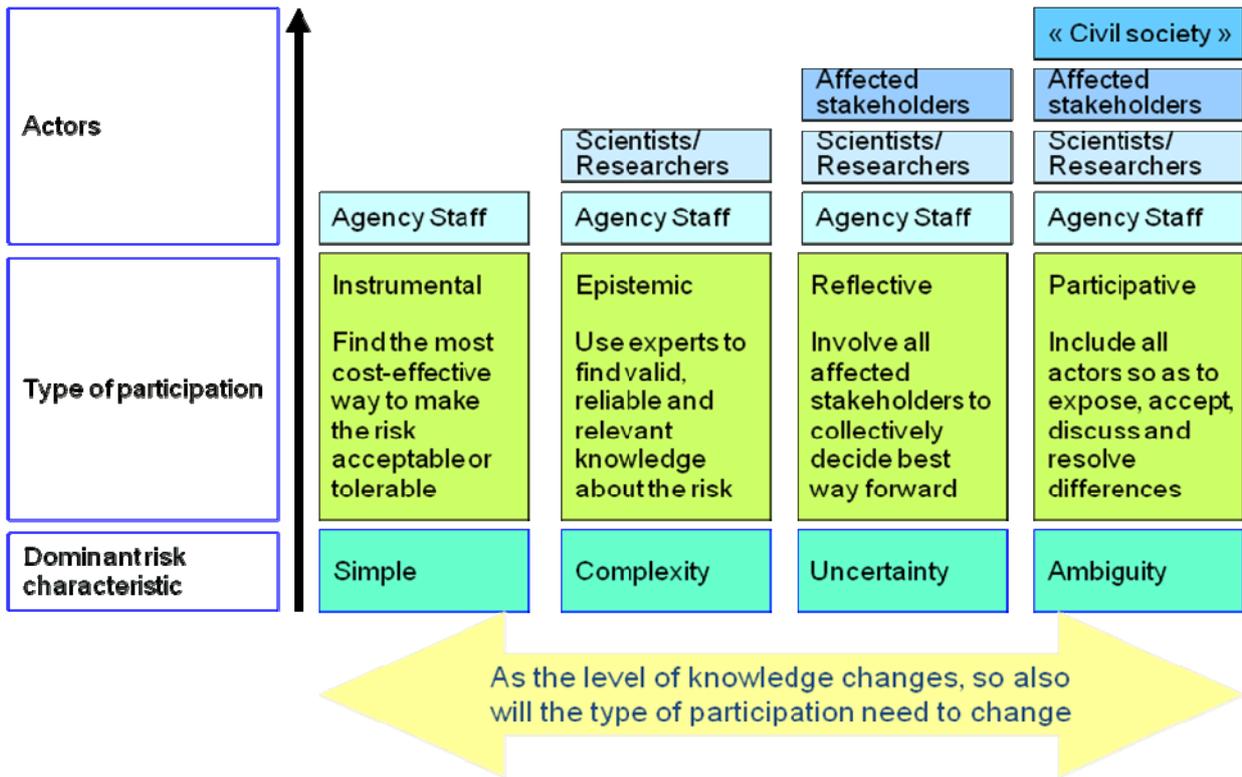
Figure 4.2: The risk management escalator

Source: adapted from Renn (2008)

5 Social vulnerability to natural hazards

Sue Tapsell, Simon McCarthy

The contribution of social vulnerability studies to the field of natural hazards research and risk management practice has been to introduce a view that incorporates how residents at risk are exposed to, and how they adapt to and cope with the impact of natural disasters by aiming at unravelling how broader societal structures and processes influence and define people's exposure as well as their coping and adaptive capacities. For understanding and explaining vulnerability the hazard itself (e.g. a river) is of subordinate interest. On the contrary, the main focus of social vulnerability research is that it is not the height of a flood or the intensity of an earthquake that defines its social, psychological, health related and economic consequences; it is rather within the *societal* context that one can truly comprehend and explain how severe the consequences are. In this vein *social vulnerability* focuses on the social dimensions of a hazard and a disaster respectively. It is very much inspired by sociological and geographical writings in social theory and development studies, but it has also been applied in natural hazards research (O'Keefe et al. 1976, Susman et al. 1983, Steinführer et al. 2009). To be sure, in the literature, there are many more definitions of vulnerability (overviews are given by: Weichselgartner 2001, Thywissen 2006, Bohle and Glade 2008). Yet, what most vulnerability approaches share is the assumption that a vulnerability assessment – be it qualitative or quantitative, top-down or bottom-up, inductive or deductive – is a first step for developing management or adaptation strategies.

As the following section will reveal, in spite or maybe even because of quite substantial research related to vulnerability, it remains a fuzzy concept with a number of partly overlapping definitions and meanings; this has practical implications particularly with regards to attempts to measure, evaluate and assess vulnerability.

5.1 Challenges in conceptualising 'vulnerability'

'Vulnerability' has emerged as a central concept for understanding what it is about the condition of people that enables a hazard to become a disaster. However, almost every aspect of vulnerability conceptualisation and measurement is the subject of intense debate. Such debate is occurring in many different academic domains and it is recognized that the understanding and use of particular names for concepts may differ between them. Relevant to this work are the differences between the natural and social sciences (Gallopin 2006).

The concept of vulnerability originated in two different areas of research: in hazard research as well as in poverty and development research (Adger 2006, Sakdapolrak 2007). The hazard research paradigm (White 1974) was rejected as being too simplistic (Hewitt 1983); in poverty research it was predominantly a rejection of the concept of poverty that resulted in the concept of vulnerability. It was argued that the economic situations of actors alone would not explain collective crises, such as famines, satisfactorily (Bohle and Krüger 1992). Under the impression of the devastating famine crises in the Sahel-Zone during the 1970s and 1980s an increasing attention was paid to the underlying reasons for these famines. This view is elaborated most explicitly by Watts and Bohle who aimed at unravelling the "causal forces of hunger and famine" (Watts and Bohle 1993, 43). By investigating creeping crises such as hunger and famine, they identify 'causal powers' such as entitlements, empowerment and political economy that cause specific effects; that is vulnerable conditions. Another prominent example with regard to

natural hazards is presented in Blaikie and his colleagues' book publication "At Risk" (Blaikie et al. 1994) which was meanwhile reworked to a certain extent and published again (Wisner et al. 2005). They reconstruct the causes resulting in the vulnerability of actors by concentrating on natural hazards. For them the structural production of vulnerable conditions as well as the physical hazards are important since both put pressure on people: "The basis for the pressure and release idea is that a disaster is the intersection of two opposing forces: those processes generating vulnerability on one side, and physical exposure to hazard on the other" (Blaikie et al. 1994, 22).

However, during the 1980s and 1990s it became increasingly apparent that differences and variations in the vulnerability of groups and people cannot be sufficiently explained from a macro-perspective alone and by exclusively considering structural aspects (van Dillen 2002, 54). It was increasingly acknowledged that people held as vulnerable might perceive or experience their own 'vulnerability' differently than external observers. Therefore, actor-oriented approaches have developed arguing that all people develop strategies to deal with their uncertain future. The 'sustainable livelihood security' approach is such an example (Carney et al. 1999). It focuses more thoroughly on the 'internal side' of vulnerability "using a (high resolution) micro perspective, often based on 'activities' and 'assets'" (van Dillen 2002, 64). The literature also indicates that social vulnerabilities may change between the different stages of the disaster cycle, and that people can move in and out of vulnerability depending upon their position in the cycle (see for example De Marchi et al. 2007, Steinführer and Kuhlicke 2007). However, what these previous approaches share is their assumption that vulnerability needs to be examined within the wider context, in particular the social conditions in which risk-exposed people live, think and make choices (also see Blaikie et al. 1994, Wisner et al., 2005).

After first attempts to define vulnerability predominantly as a consequence of political, economic, and social construction (to avert any admonitions of environmental determinism), vulnerability increasingly becomes a hybrid concept and the coupled character of the human-environment system is underlined (e.g. McCarthy and Martello 2003, Turner II et al. 2003). The latter development is mirrored in frameworks understanding vulnerability "in a holistic manner in natural and social systems" (Adger 2006, 272). In this vein, vulnerability analysis attempts to identify "some of the complexity, interconnectedness, and iterative nature of the components giving rise to and comprising vulnerability" (Turner II et al. 2003, 8077). A prime example for this strategy is the "Framework for Vulnerability Analysis in Sustainability Science" outlined by Turner and his colleagues (Turner II et al. 2003). Rather than simply focusing on one single hazard or source of stress, they seek to analyze the different elements of vulnerability of a bound system at a specific spatial scale. This framework thus takes into account both the natural and social sphere and tries to incorporate the interaction between both areas by focusing particularly on feedbacks and loops. Table 5.1 provides an overview of the most important approaches to social vulnerability in the field of natural hazards.

Table 5.1: Conceptual frameworks and models for assessing social vulnerability to natural hazards

Conceptual frameworks, models and approaches	Authors	Description
Exposure or biophysical model	Burton et al. 1993; Anderson 2000	The identification of conditions that make people or places vulnerable to extreme natural events
Vulnerability as a social condition	Blaikie et al. 1994; Wisner et al. 2005; Hewitt 1997	the assumption that vulnerability is a social condition, a measure of societal resistance or resilience to hazards
Hazards of place	Hewitt and Burton 1971, Cutter et al. 2000 and 2003	Incorporates both biophysical and social indicators to provide an all-hazards assessment of vulnerability at the local level
BBC framework	Birkmann 2006	Combines hazard and vulnerability in a risk reduction perspective. Explicitly links vulnerability to the three spheres of sustainability: society, economy and environment. Permits the inclusion of more social perspective-driven research to identify the root causes of vulnerability. Shows the distinction of hazard analysis as a different field from vulnerability analysis.
Assessment of coupled human-environment systems	Turner et al. 2003	Framework for the assessment of coupled human-environment systems to assess who or what are vulnerable to multiple environmental changes. They suggest that vulnerability is registered not by exposure to hazards alone but also resides in the sensitivity and resilience of the system experiencing such hazards.
Pressure and Release (PAR) model	Wisner et al. 2004	Assesses the *progression* of vulnerability, as rooted in social processes and underlying causes which may be quite remote from the disaster event. The Pressure aspect focuses on the processes generating the vulnerability and natural hazard event, while the Release aspect focuses on the reduction of the disaster to relieve the pressure and reduce vulnerability.
Access model	Wisner et al. 2004	An expanded analysis of the principle factors in the PAR model that relate to human vulnerability and exposure to physical hazard. Focuses on the process by which the natural event impacts upon people and their responses. Complements the PAR model. The two models function at a variety of time scales as root causes, dynamic pressures and unsafe conditions are subject to change.
Participatory Rural Appraisal (PRA), Participatory Action Research (PAR) and 'sustainable livelihoods' (SL) approaches	Chambers 1983; Chambers and Conway 1992; Winchester 1992; Moser 1998; Cannon et al. 2003	Developed within the context of research in less developed countries. Livelihood analysis seeks to explain how a person obtains a livelihood by drawing upon and combining five types of 'capital' which are similar to the assets that are involved in the Access model.
Community-Based Participatory Research (CBPR)	Israel et al. 1998; Hatch et al. 1993	Combines research methods and community capacity-building strategies to bridge the gap between knowledge produced through research and the translation of this research into interventions and policies. Recognises the community as a *social entity* with a sense of identity and a shared fate. Emphasizes both qualitative and quantitative research methods. Researchers work *with* rather than *in* communities in an equal partnership to strengthen a community's problem-solving capacity.

Source: Tapsell et al. (2010)

5.2   Quantitative and qualitative approaches to assessing social vulnerability

Social vulnerability is one part of disaster risk assessments and crucial information necessary for supplementing hazard and mitigation assessments. Improving risk reduction and disaster preparedness requires first and foremost the identification and assessment of various vulnerabilities of societies, economies, institutional structures and environmental resource bases through tools to measure vulnerability (Birkmann and Wisner 2006). Like in other fields of the social sciences, a fundamental distinction is to be made between more quantitative approaches, on the one hand (focusing on vulnerability indicators and indices), and more qualitative ones (placing greater emphasis on bottom-up approaches and self-assessments of those hold 'vulnerable'), on the other. The type of approach taken may be dictated by the required scale of the study by whether the focus is upon analysing attributes or processes. For example, quantitative approaches based on statistical analysis may be more suitable for measuring attributes e.g. in larger scale studies, while more contextual and qualitative approaches will be appropriate for understanding processes and relationships e.g. in community level and bottom-up studies. However, both approaches may rely, to greater or lesser extents, on the use and development of indicators to measure social vulnerability.

Measuring, mapping and finding the right indicators: methodological challenges

The international community defines the measuring of vulnerability and risk as a key activity within the final document of the World Conference on Disaster Reduction, the Hyogo Framework for Action 2005-2015 (UN/ISDR 2006). The Framework underlines the fact that the impacts of disasters on social, economic and environmental conditions should be examined through indicators or indicator systems to assess vulnerability. Yet, if defining (social) vulnerability is a contested task, attempts to measure (social) vulnerability are even more contested (i.e. the *paradox* as put forward by Birkmann (2006) "We aim to measure vulnerability yet we cannot define it precisely"). However, the rationale behind measuring vulnerability and the use of vulnerability indicators has been summarized by Birkmann (ibid.) who discusses different definitions and conceptual frameworks used by the different schools of thought in the following way:

Rationales of measuring vulnerability (Birkmann 2006)
- Define where the greatest need is and set priorities e.g. by deriving knowledge about spatial distribution patterns
- determine actions e.g. by improving intervention tools
- monitor progress and analyse trends
- measure effectiveness of mitigation approaches
- anticipate undesirable states
- inform policymakers and practitioners
- alert the public and raise awareness
- stimulate discussion
- gain funding e.g. for poverty reduction initiatives
- represent social responsibility
- look at the social roots of vulnerability

Procedures for the selection of indicators of vulnerability tend to follow two general approaches – a deductive approach based on a *theoretical* understanding of relationships, and an inductive approach based on *statistical* relationships, although conceptual understanding does have a role to play in both (Adger et al. 2004). The most important aspect of indicator development is to ensure that the indicators selected serve the needs of the research question and test the concepts to be operationalised.

There exists a wide range of indices and frameworks to assess social vulnerability to natural hazards at spatial scales ranging from the global to individual (see Appendix A to the WP4 report; Tapsell et al. 2010). Many of the studies are based on measuring attributes or factors influencing vulnerability rather than understanding relationships or processes. For example, socio-economic and demographic characteristics of vulnerability have been identified by The United Nations Universities Institute for Environment and Human Security (UNU-EHS) which has been active over the last decade to look into state-of-the-art vulnerability assessment, particularly in the field of hazards (e.g. Birkmann and Wisner 2006, Birkmann 2006, Adger et al. 2004). Some of the key factors thought to influence social vulnerability are summarized in Table 5.2 (see also Tierney et al. 2001, Putnam 2000).

Table 5.2: Factors that influence social vulnerability

Factor	Examples
Lack of access to resources	Information (e.g. of hazards, protective action decision options, etc); knowledge (i.e., this translates to more informed and prepared citizens and includes understanding of warning sources (environmental, informal and formal) and mitigation, (preparedness and response actions); and technology (e.g. warning communication devices such as radios, cell phones, televisions)
Limited access to decision making	Political power and representation
Lack of social capital	Social networks and connections
Beliefs and customs	That neglect or ignore hazards or mitigation of hazards and their effects. Ethno-cultural differences, for example, perception of disasters as 'Acts of God'
Building stock and age	Number, density and type of buildings and whether or not their age predates significant building design codes and enforcement
Frail and physically limited individuals	Those who are unable to take protective actions or require outside assistance to do so (e.g. very young or old, sick, disabled)
Weakness in infrastructure and lifelines	Type and density of infrastructure and lifelines
Demographic changes	Population shifts which result in more people living in at risk areas
Increased mobility	More people live in new surroundings and are unfamiliar with the risks in their new areas, and how to respond to them

Source: adapted from Cutter et al. (2003)

Although there have been numerous initiatives to measure, qualify and/or assess social vulnerability in its different dimensions within Europe and for different natural hazards to date which are well summarised and documented (e.g. Adger 2000, Pelling 2002, Adger et al. 2004, Birkmann 2006), the majority of approaches have been based on the use of indicators of vulnerability. To provide an example, Table 5.3 shows common indicators for social vulnerability in relation to flooding identified by a review of literature for the FLOOD*site* project (Tapsell et al. 2005). These

include indicators of elements at risk, exposure indicators as well as susceptibility and resilience indicators (Messner and Meyer 2005). The symbols indicate whether the variable may be an indicator of increased or decreased social vulnerability (+ = increases vulnerability, - = decreases vulnerability). As the list is extensive it could be argued that most people will exhibit at least some of these indicators. In this sense the number and possible *combination* of applicable indicators may, in a certain population, indicate an increase or decrease in the potential for social vulnerability.

Table 5.3: Common social vulnerability indicators identified from literature review

Common indicators
- Age - children and very elderly (+)   - Gender - women (+)   - Employment (-)   - Unemployment (+)   - Occupation (depending upon whether skilled (-) or unskilled (+), also linked to income and financial status)   - Education level (higher educational level -, low educational level +)   - Family/household composition (large families +, single parents +, single person households +, home owner -, renter + etc.)   - Nationality/ethnicity (minorities +, new migrants +)   - Type of housing (single storey accommodation +, mobile housing +)   - Number of rooms (low number indicates overcrowding +)   - Rural/urban (low income rural +, high density urban +)   - Levels of risk awareness and preparedness (high awareness -, low awareness +)   - Previous flood experience (no experience +, high experience -)   - Access to decision-making (increased access -, little access +)   - Trust in authorities (no +, yes -)   - Long-term-illness or disability (+)   - Length of residence (linked to prior experience, short residence +)   - Serviced by flood warning system (yes -, no +)   - Type of flood (indicates potential damage levels)   - Flood return period (indicates potential damage levels)

Source: Tapsell et al. 2005

Indicators represent key characteristics or attributes that contribute to specific aspects of vulnerability in a subgroup of the total population at risk from a hazard, rather than an all inconclusive investigation of the relevant factors in the total population. Indicators are qualitative or quantitative parameters that describe features of certain, often complex and ill-defined, phenomena and communicate an assessment of the phenomena involved (Dopheide and Martinez 2000). Many of these initiatives for measuring vulnerability often lack a systematic and transparent approach (Birkmann 2006). There is still no consistent set of metrics used to assess social vulnerability to environmental hazards, although there have been calls for just such an index (Cutter et al. 2003). Research findings are fragmented and there is still no consensus on a) the primary factors that influence social vulnerability, b) the methodology to assess social vulnerability, or c) an equation that incorporates quantitative estimates of social vulnerability into either overall vulnerability assessment or risk.

The most important aspect of indicator development is to ensure that the indicators selected serve the needs of the research question and test the concepts to be operationalised. A number of other issues also need to be considered if choosing an indicator approach for assessing social vulnerability, some key ones include: data availability, quality, validation, weighting and evaluation, comparison across time and space, and the relational aspects of the chosen indica-

tors. However, one of the things that most authors agree on is the importance of developing a conceptual model as a basis for any indicator development.

By way of summary, taxonomic approaches can be advantageous if there is sufficient empirical knowledge and the aim is to compare the disaster risk between different areas. Such approaches also have the advantage that they may have the potential to put the issue of social vulnerability on the public agenda, as they may contribute to a very important aim of all vulnerability assessment, that is to sensitize administrations and politicians for the issue of social vulnerability at all (Benson 2004). Additionally, indicators and indices may be transferable to other contexts and allow for cross-regional or cross-national comparison (Kuhlicke et al., submitted).

Alternative approaches to measure and assess social vulnerability

However, according to Wisner (2005), the use of taxonomies of 'vulnerable groups' such as women, the elderly, people living with disabilities, is not without problems. Although these groups may often have 'special needs' and there is empirical support for the use of such "check lists", the taxonomic approach fails in that it produces too many 'false positives' e.g. not *all* women are equally vulnerable (Fordham 1998, Morrow 1999). Communities and even individuals in a household will vary in knowledge, skills and culturally and socially determined rights to resources according to age and gender.

Wisner et al. (2004, 30) therefore emphasise the importance of taking a 'bottom-up' approach and document the importance of local knowledge and action as well as stressing the importance of the skills, capacities and political consciousness of ordinary people. Wisner et al. (2004, 15) suggest that there is a movement away from the use of simple taxonomies or checklists of 'vulnerable groups' to a concern with "*vulnerable situations*" which people move into and out of over time. To fully understand these vulnerable situations a more contextual approach for assessing vulnerability is necessary, one that also focuses on understanding the processes that contribute to vulnerability production and social capacity building, e.g. via use of the PAR model (see above, Chapter 3.2 and Figure 3.1). Kuhlicke et al. (submitted) suggest a *local contextual approach* that is both sensitive to local contextual conditions and the temporal dimension of social vulnerability by differentiating indicators for the three phases of the disaster cycle. Such a contextual approach does not immediately refuse the use of indicators; it rather tries to test and evaluate their usefulness by applying them in a specific context.

In this vein, many other participatory assessment techniques such as Participatory Rural Appraisal (PRA), Participatory Action Research (PAR) and 'sustainable livelihoods' (SL) approaches have been developed within the context of research in less developed countries (e.g. Chambers 1983, Chambers and Conway 1992, Winchester 1992, Moser 1998, Cannon et al. 2003 and Table 5.1 above). Community or citizen-based risk assessments are another way of approaching social vulnerability assessment. Wisner (2006) discusses various qualitative and participatory approaches to assess vulnerability and coping capacity using such self-assessment tools. Community-Based Participatory Research (CBPR) has been proposed as one approach that combines research methods and community capacity-building strategies to bridge the gap between knowledge produced through research and translation of this research into interventions and policies. CBPR actually emphasizes both qualitative and quantitative research methods; researchers work *with* rather than *in* communities in an equal partnership and attempt to strengthen a community's problem-solving capacity through collective engagement in the research process. Communities can thus be involved in assessing their own vulnerability and ad-

dressing their own priorities for increasing their capacity to prepare for, cope with and mitigate the effects of disasters. Wisner et al. (2004) thus emphasise the importance of taking a 'bottom-up' approach and document the importance of local knowledge and action as well as stressing the importance of the skills, capacities and political consciousness of ordinary people. Further evidence from the literature indicates that people need to be included in defining their own vulnerabilities (Heijmans 2004, Delica-Willison and Willison 2004).

Scales of analysis

Methodologically, *scale matters*. The most detailed social vulnerability assessments are conducted at the local level, often of individuals or households. However, methodological decisions often mean sacrificing localised detailed case study approaches for more broadly based patterns and distributions (Cutter, 1996). National-level assessments, such as the use of census data, can result in loss of information and capturing local pockets of variability. Most studies take either a top-down macro perspective or bottom-up meso or micro perspective, although a middle ground approach can also be taken which also allows the opportunity to include local knowledge and local coping capacities/practices (e.g. Hilhorst and Bankoff 2004, Few 2007). However, in many conceptual vulnerability frameworks the allocation of scales and levels is missing or not explicitly described. Yet the literature indicates that vulnerability assessments and scale are highly intertwined, not only in application but also in conceptualisation, and needs more scientific development (Adger 2004, Birkmann and Wisner 2006, AEA 2008, Birkmann et al. 2009).

5.3   Empirical findings and insights from Europe[8]

A number of both qualitative and quantitative studies have been undertaken focusing on household and community impacts and responses to floods in Europe which include aspects of social vulnerability assessment, mainly on the social and economic impacts of floods and on the recovery process. Recent empirical studies on riverine and flash floods conducted in Italy, Germany and Great Britain for the EC FP6 FLOOD*site* project have provided some challenging insights a) on cross-country comparisons, and b) on the effectiveness of applying "classical" vulnerability indicators such as age, gender or income. These findings indicate that such indicators alone are insufficient to explain social vulnerability (Steinführer et al. 2009, Kuhlicke et al., submitted). No individual, community or group was found to be *per se* highly vulnerable and no evidence for the vulnerability of certain social groups across all phases of a flood event was observed. Rather, different groups were identified as being more or less vulnerable at certain points in time within the disaster cycle, before or during the disaster or with higher damages and more psychological stress in the aftermath. Therefore the coping capacity of different groups in relation to a specific hazard needs to be considered in the different, and partially overlapping, phases of the event. One indicator which was shown to be context/location specific is that of renting property. In the UK renting is often associated with lower income social groups, while in other parts of Europe e.g. Germany, renting is common among all social groups. Thus in all the countries studied the local context was found to be very significant, and the importance of understanding this factor when analysing a natural hazard event and its impacts on individuals and communities is crucial.

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[8] For the sake of readability, we omit most literature references in this section. For full references see WP 4 report (Tapsell et al. 2010, 36-41 and Appendix B ibid.).

In Italy, few additional examples of social vulnerability analysis could be found. According to Maurizio Rozza (the person responsible for Agenda 21 in the province of Gorizia), *"In Italy....'risk' pertains only to physical phenomena and it is not considered to be determined also by social factors"* (personal communication, 2010). Bruno (1985) evaluated the context of social vulnerability to natural hazards by exploring the interactions between risk and vulnerability, and comparing this to the actual situation in the country. This work and that of Pelanda (1982) identified a specific Italian sociological trend in the interpretation of natural hazards based around the perception that the pre-existing socio-systemic vulnerability of a community exacerbates 'risk'. Yet there is a general lack of contemporary literature in Italy on social aspects of vulnerability to natural hazards, and very little attention to it is paid in practice. In terms of delivery of services, in Italy it seems that risk culture and policy consider that natural risk itself causes vulnerability.

In Germany, there has also been some research focusing on social vulnerability to natural hazards. Although Birkmann (e.g. 2006, 2007) has discussed various approaches to measuring risk and vulnerability to hazards using indicators and indices, and this has been influential in researching adaptation to climate change, these studies were not specifically related to Germany. However, more recently, Fekete (2010) has explored the development of a social vulnerability index for riverine floods, and in particular a methodology to validate such studies.

In the UK there have been a number of studies focusing on aspects of social vulnerability in relation to floods. The Environment Agency in England and Wales is currently developing a policy on vulnerability and has funded research on vulnerable or 'hard to reach' groups for the last ten years in order to better understand the social impacts of flooding and recovery, to improve awareness of flood risk and flood preparedness, and for the provision of more targeted flood warnings. In the past, studies have also been carried out to assess the public perception of flooding, flood risk and structural flood alleviation schemes, and findings have shown that flood experience is key to influencing risk awareness and response. A national database of receptors vulnerable to flooding has been produced using social flood vulnerability data based on the Social Flood Vulnerability Index (SFVI) (Tapsell et al. 2002) and census data. Information is assimilated into a GIS and query system which can be interrogated on a 100m by 100m grid scale.

In France, according to Gaillard et al. (2010), more recent work on vulnerability has used a spatial-territorial approach (known in French as *'territoriale'*) and has tended to downplay social considerations. However, depending on the scale of application the social is evident: for IN-SEE (2003) the smallest unit of analysis is the 'catchment of life' which includes social, cultural and economic aspects. Moreover, the presence of visible engineering structures has been said to be unrealistically reassuring of safety thus influencing people's perceptions of personal and community vulnerability, and thus increasing such vulnerability. 'Dyke risk red zones' have been reported on some of the French risk prevention plans, and this has partly contributed to why the State decided to strengthen civil security management policies with the 2004 law (Loi de modernisation de la sécurité civile) which allows the issue of municipal civil security plans (plans communaux de sauvegarde).

In the Eastern European states only one study was found from Romania (although others are likely to exist), where there has been little research to date on social vulnerability to natural hazards. Only one article has been published on social vulnerability to seismic risk in the city of Bucharest (Armas 2008), although several other studies remain unpublished or are awaiting publication (personal communication with I. Armas, 2010).

5.4 Implications for social capacity building

Although there exist many different views on how to define vulnerability, there seems to be a consensus that it is in a very general sense constituted by two different dimensions. On the one hand, there is a rather static component which relates to people's exposure to natural hazards as well as to societal processes and structures they are not able to simply alter and change. On the other hand, it includes a more dynamic and action oriented side relating to people's awareness of, as well as knowledge about, natural hazards, their motivation and attitude to act and take responsibility, as well as their financial and other resources to adapt to natural hazards.

→ Social capacity building efforts should target both sides of social vulnerability: they may work to lessen the external side (i.e. exposure) through influencing more over-arching risk governance, emergency response or even targeting those areas of social inequality. On the internal side, the approach becomes a more *personalized* process focused on enhancing social resilience to *combat social vulnerability from within*: e.g. focused on educating, improving the level of perceived risk, building motivation and a sense of responsibility within individuals and communities to manage and mitigate their own risk (particularly a requirement for flood hazard). These efforts aim at improving *the whole range of social capacities* (knowledge, motivational, network, economic capacities as well as institutional and procedural capacities).

→ The *normative dimension of social capacity building efforts* ("Who defines what on which grounds") applies also for any vulnerability assessment. While it can be argued that indicator analysis is useful, it is best used as a means for interacting with the public itself, or its surrogates, to obtain their input about potential vulnerability reduction measures. People's vulnerability thus needs to be seen in the light of their capacities and abilities to influence and define their own fortunes. Indicators of vulnerability also need to be related to the specific contexts of European countries and regions and are best developed with a specific policy purpose in mind, which in turn should determine the scale, method and approach used in their development: Who are the vulnerable people one wants to refer to, which is the target group that is to be researched, and which is the potential end-user group? Furthermore, taxonomic top-down and hazard-of-place approaches account for only a fraction of actual social vulnerabilities to natural hazards and need to be complemented by bottom-up approaches and detailed contextualised research.

→ Just as suggested by the aforementioned conceptualisation of social capacity building, social vulnerability should also be defined with regard to different *actors* (individual, organizational), *levels* (community, institutions) and, if relevant, according to certain geographical *scales* (local, regional, national, global). It is certainly helpful to unpick how social vulnerability is differently defined at these different societal scales, and to consider in any one study whether the investigation is focused on different drivers and/or timescales.

6   Risk communication

Corina Höppner, Matthias Buchecker

The contribution of risk communication studies to this field of research and practice are numerous. Of particular relevance of the overall approach of social capacity building is the refocusing of the official goals of communication from changing public views on risk in the 1970s, to gaining public acceptance for the sources of risk and their management, and more recently, to the building of trust in risk management bodies (Frewer 2004). This chapter will shed light on risk communication processes, actors and practices in with respect to natural hazards in Europe. In a first step, risk communication will be distinguished from risk education in order to make the arguments that follow in Chapters 6 and 7 more clear.

6.1   Risk communication (in contrast to risk education)

In the early risk management literature, the notion of risk communication used to be rather narrow. Accordingly, risk communication was seen as a transfer of information that was designed to respond to public concerns or public needs related to real or perceived hazards. More recently though, there has been a tendency to understand risk communication as an interactive *exchange* rather than a one-way transfer of information, knowledge and opinions among/between those responsible for managing risks and those who may be affected by the risks (WHO1998, De Marchi et al. 2006). Plough and Krimsky (1987) have argued that it was the need for risk managers to gain public acceptance for policies and technologies that significantly stimulated the study of risk communication in the first place. One reason for the increasing interest in two-way communication has arguably been the failing of previous communication efforts to deliver the desired changes in risk related behaviours (e.g. Kollmuss and Agyeman 2002).

This move towards two-way communication has been associated with a fundamental development in the literature on risk in general. Bennett and Calman (2001, 3) notes that "there has been a progressive change in the literature on risk: from an emphasis on 'public misperceptions', with a tendency to treat all deviations from experts estimates as products of ignorance or stupidity, via empirical investigation of what actually concerns people and why, to approaches which stress that public reactions to risk often have a rationality of their own, and that 'expert' and 'lay' perspectives should inform each other as part of a two-way process."

CapHaz-Net understands risk communication as both a one-way transfer of hazard and risk related information and their management, and as a two-way exchange of related information, knowledge, attitudes and/or values. We see risk communication as a preventive activity that prepares communicating actors to better cope with hazard events and to reduce the adverse impacts on people and social systems. Thus, we first distinguish risk communication from disaster, crisis and emergency communications that tend to occur during, and in the immediate aftermath a crisis or disaster. In our review we were primarily concerned with communication taking place between professionals (e.g. risk managers, decision-makers) on one hand and concerned stakeholders and the public at the other hand, bearing in mind that risk communication also occurs between professional partners. Second, we distinguish risk communication from risk education. Risk education refers to the transfer of more generalised (thematic, organisational or technical) knowledge on hazards and risks including different skills from professionals in teaching institutions (schools, providers of courses) to persons in schooling and training within a formalised institutional setting (Table 6.1).

Table 6.1: Distinguishing risk communication from risk education

	Risk communication	**Risk education**
Process	Information and knowledge exchange between (ideally) equal sides, occurs purposefully or not	Specific expertise is passed on to another person purposefully, contains an element of training
Power relation	(At least) two parties involved with (ideally) symmetrical relationship	(Usually) two parties involved with asymmetrical relationship (one party with the power to sanction the other)
Organisational context	Low(er) degree of formalization and institutionalization; can be both oriented to particularly affected stakeholder groups or the wider public; only general rules of communication exist, specific roles and rules of risk-related communication emerge with the process itself	Highly formalized and institutionalised; group specific, target-oriented, takes place in specialised organisations, roles and rules are pre-established
Motivation	Transmission and exchange of knowledge and information, situation oriented, purpose ranges from very short-term warning to long-term social capacity building. This may also include the motivation to manipulate other actors	Transmission not only of knowledge, but rather of an entire worldview, including specific skills, values and lifestyles; broader in scope and aims, defined by long-term behavioural learning successes, related to changing attitudes, believes and behaviour

Source: CapHaz-Net consortium

In CapHaz-Net we focused on empirical evidence for the following five broad categories of effects of the risk communication:
→ knowledge related effects,
→ attitude/motivation related effects (e.g. awareness raising, interest in further information),
→ behaviour related effects,
→ social/organisational effects (e.g. trust, democratic learning, relationships),
→ and psychological effects (e.g. anxiety, stress).

Of course, these categories are not mutually exclusive and risk communication campaigns will often have more than one goal, for example, to raise awareness *and* change behaviour, or to improve people's knowledge *and* change their attitudes to risks.

6.2 Actors, channels and purposes as key elements of risk communication: what needs to be considered?

Actors

Communication occurs between individuals, groups, private and public institutions, in small or mass communication settings. Communication may take place within and across local, regional, national or international levels and involved actors can be regarded as nodes in communication chains or networks between which information flows in one or many directions. The strength, stability, frequency and direction of the information flow, and the centrality of the actors (i.e. whether one actor/node is more central because it communicates with all other actors, whereas all others do only communicate with this central actor) are the defining characteristics of such networks. Based on Gray et al. (1998) and in accordance with the typology of actors developed in Chapter 3 the following general types of actors in risk communication can be identified (Table 6.2).

Table 6.2: Actors, purposes and functions of risk communication

		Actors according to Gray et al. (1998)	Purposes and functions
Organisational actors	Public	▪ Government and regulatory agencies ▪ Politicians ▪ Science ▪ Trade unions ▪ Media	▪ improve relationships (build trust, cooperation, networks); ▪ enable mutual dialogue and understanding; ▪ achieve shared solutions ▪ involve actors in decision making.
	Private	▪ Industry ▪ Media (TV, radio, newspaper) ▪ Science	
	Voluntary	▪ Non-governmental organizations and groups	
Individual actors		▪ The exposed/concerned/ affected public ▪ The general public	▪ raise awareness; ▪ encourage protective behaviour; ▪ inform to build up knowledge on hazards and risks; ▪ inform to promote acceptance of risks and management measures; ▪ inform on how to behave during events; ▪ warn of and trigger action to impending and current events; ▪ reassure the audience (to reduce anxiety or 'manage' outrage)

Source: Höppner et al. 2010

While there is no consistent terminology throughout the risk literature, authors tend to speak of experts and decision-makers (scientists and experts, decision-makers and managers in government and regulatory agencies) on the one hand and stakeholders (nongovernmental organizations and groups, industry, trade unions) and the public at-risk, concerned or affected on the other hand. Another way to distinct groups of actors is to identify them as the source or messenger (e.g., scientific community, agencies, interest groups, eye-witnesses), the transmitters (e.g. media, institutions, interest groups, opinion leaders, members of the public) and/or the receivers (e.g., general public, affected citizens, groups members, experts, managers, institutions, media) of communication (e.g. Renn 2008). Needless to say that, in reality, one actor can have multiple roles in the communication process. The media, for instance, can be the receiver and transmitter of (scientific) communication as well as one source that generates risk related messages.

In some cases, the constellation of actors might be even more complex in the field of natural hazards as actors with responsibility for, or with a stake in the handling of, natural hazards and risks differ not only between risk management or governance phases (pre-assessment, appraisal, characterisation/evaluation, management) but also across risk phases before, during and after a hazard event and across different spatial levels (see Coulthard et al. 2007 for an example of the complex range and breadth of actors involved in flood risk management in the floods of June 2007 which affected the city of Hull, in the North East of England).

Purposes and functions

The literature on the purposes of risk communication generally takes a management perspective. Accordingly, risk communication may serve many of the functions and purposes outlined in Table 6.3. In the logic of CapHaz-Net, communication is one means to foster the development by

which social capacities to prepare for and cope with natural hazards developed at the individual, group, community and organisation level (for more on communication purposes by hazard management phases see Lindell and Perry 2004).

Table 6.3: Examples of communication purposes and functions in the natural hazards risk cycle

Before event: prevention and preparation	During event: warning and emergency response	After event: recovery and reorganisation
Awareness raising	Warning of event, announcing emergencies	
Encouraging specific protective behaviours	Triggering behavioural response by people at risk and those managing the risk, e.g. close flood barriers, begin to mobilize emergency resources	Encouraging specific behaviours
Information provision, where and how to get information, how to read information, on specific actions that can be taken	Information provision and coordination, what to do and whom to contact	Information provision and coordination
Reassurance, outrage management	Reassurance, outrage management	Reassurance, outrage management
Building authority and assigning responsibility, improving relationships and building trust	Stimulating compliance with those in authority	Building authority and (re-) assigning responsibility, improving relationships and building trust
Keeping memory alive		Keeping memory alive
Pre-assessing, appraising, and evaluating risk; planning and implementing measures, evaluating measures and communication		Assessing the situation, planning and implementing recovery measures, evaluating performance of measures and communication
Mutual understanding and learning (from different perspectives, types of knowledge and opinions)		Learning from past event

Source: Höppner et al. 2010

A point to add is that communication efforts at the national or more local level do not necessarily serve all these purposes to the same extent. There might be a bias towards for example communication to assure safety rather than communication to raise awareness or to assess and evaluate risk situations (e.g. Terpstra 2009). An emphasis might also lie on promoting trust in authorities and acceptance of mitigation measures rather than on mutual exchange and understanding among stakeholders (Irwin 2006, Wynne 2006). And finally, communication purposes can be seemingly conflicting, e.g. a public relations manager of potentially hazardous industries might want to reduce public concerns, whereas other actors might aim at increasing people's concern to trigger their preparedness and protective actions.

Modes, channels and tools

Ideally, the choice of communication modes, channels, and tools is guided by the purposes and functions of communication. Communication occurs in

- *written* (e.g. newspaper, letter, report),
- *oral* (e.g. lecture, storytelling, conversation) and
- *non-verbal/visual* modes (e.g. gestures, body language, sign language, facial expression, images, movies etc.).

A further common distinction is between a *one-way communication* mode in which information is transferred in one direction, and a *two-way-communication* mode where information flows in both directions between the communicating actors. Two-way communication takes a non-dialogical form if one actor consults the other and a *dialogical* form if actors engage in an inter-active exchange of information. Communication channels are either *face-to-face* (direct) or *mediated* (indirect). Table 6.4 presents an extensive typology of communication channels and tools according to the purpose and direction of communication.

Table 6.4: Examples of communication channels and tools according to the purpose and direction of communication

Purpose and direction of communication	Description	Channel and tools
Information provision (also education) One-way communication	- At-a-distance/indirect communication of information with no feedback mechanism	- Leaflets, brochures, information packs, video, newsletters - Reports, documents, protocols - Exhibitions/displays (non-staffed) - Advertising Media (TV, radio, newspapers) - Internet (information provision)
Information seeking/consulting, non-dialogical two-way communication	- Communication to receive feedback from all types of actors - Communication is either indirect or face-to-face	- Site visits - Exhibitions/displays (staffed) - Open house - Consultation document - Internet (information/feedback) - Free telephone line (automated and staffed) - Teleconferencing - Public meeting - Public inquiry/hearing - Deliberative opinion poll
Dialogue, two-way communication	- Enable mutual exchange and under-standing - engage participants in in-teractive framing and appraisal pro-cesses and/or the evaluation and pri-oritisation of options - Identify areas of consensus and dif-ferences on issues	- Community Advisory Committees - 'Planning for real' - Meetings - Visioning - Deliberative Workshops - Internet Dialogue - Consensus building/conference and mediation - Deliberative mapping - Citizen panels - Citizen juries

Source: adapted from Burgess and Chilvers (2006)

As with risk communication studies in general, comprehensive overviews of communication tools are rare in the field of natural hazards too. Exceptions are Tapsell et al. (2005) who provides a summary of technology-assisted tools to disseminate flood warnings and McCarthy (2007) who lists intra- and inter-organisational communication tools in flood warning, prevention and response. Hagemeier (2007) gives an overview of communication tools organised by the spatial level at which they are usually applied in five European countries (see Table 6.4). Such comprehensive reviews of existing and potential tools are, to our knowledge, still lacking for natural hazards other than floods.

Table 6.5: In use communication tools by spatial level of application

Local	Local-regional	Local-national	National-international
- Activities (festivals, charity events) - Presentations - Public discussions - Information events - Emergency training - Quiz - Public displays - Municipal gazette - Info letters - Flood columns and boards - Education trails - Citizen initiatives	- Risk and hazard maps - Telephone Hotlines - Text messages	- Exhibitions - School days - Fairs (Flood fairs) - Leaflets, brochures, fact sheets - Articles in press media, radio and TV features - Blogs - Internet - Newsletters and mailing lists - WAP/i-mode	-Thematic books - TV and video documentaries (e.g. 'Xynthia – Chronicles of a catastrophe) - Talk shows

Source: adapted from Hagemeier (2007)

A final observation at this point is that, at present, it seems to be common sense that risk communication needs to employ and combine a variety of communication channels and tools to be effective (e.g. Tapsell et al. 2005). For instance, Wagner's (2005) recommendation for hazard prone communities is to complement continuous/permanent communication through 'quiet witnesses' such as high-water marks, or objects that indicate the areal extension of past hazard events and information boards located next to eye-catching structural measures, with occasional exercises by fire or civil protection services. While the first may help to keep memory and knowledge of past events alive, the latter might additionally stimulate people's interest in taking preventive actions.

6.3   Approaches used in the communication on natural hazards

Reviewing the literature it appears that there are hardly any communication frameworks and tools specifically developed for the field of natural hazards. Interestingly, the term risk communication frequently appears in risk literature and more recently in risk management frameworks such as the OECD framework on 'Critical Components for Managing Catastrophic Risks' (Kleindorfer et al. 2009) or the 'Cycle of integrated risk management' by the Swiss National Platform for Natural Hazards (PLANAT). What becomes clear though is that while these frameworks acknowledge the importance of communication, precisely what communication might look like (in terms of actors, purposes, tools, content) is left largely to the imagination. In the following we briefly illustrate how approaches are combined to serve different purposes or functions of communication in the natural hazard literature.

Communication to raise awareness and to change risk related behaviours

How to influence risk related attitudes and behaviours through communication appears to be a main concern in the natural hazard related literature. An integrated communication framework has recently been presented by O'Neill (2004) in the context of flooding at the community level (see Figure 6.1).
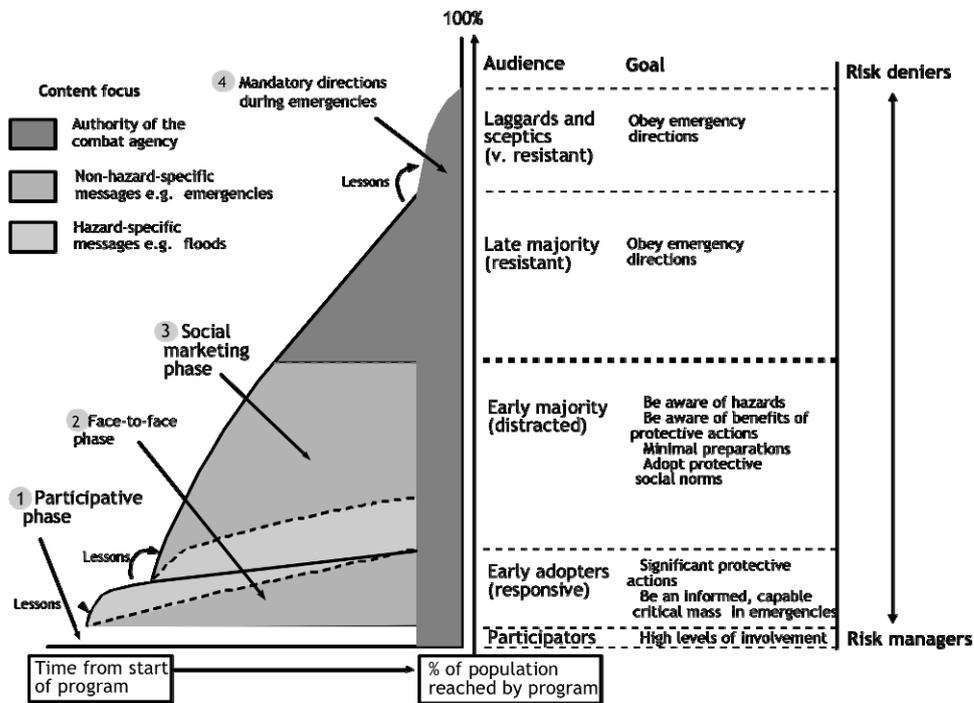

Figure 6.1: Integrated model of risk communication

Source: O'Neill (2004)

O'Neill (2004) suggests that according to the characteristics of the audience different communication tools are needed and the goals of communication vary. O'Neill advises that the relatively small number of people in a community with a high willingness to invest time and energy in adopting actions should be involved from the very start of a communication programme and in a more participatory, face-to-face way to benefit from their local knowledge, creativity and time when developing community approaches. These very engaged individuals might act as 'local champions' or 'peer educators' to fellow residents. To encourage protective behaviour amongst those in denial about natural hazard risks or those resistant to change their behaviours other communication tools, particularly social marketing techniques, are more appropriate to get the message across about how to behave in particular situations.

Communication to enable mutual understanding and dialogue

Other authors have worked on improving communication to elicit mental models and enable mutual understanding. Translated back to the field of natural hazards, such communication may ultimately serve different ends, for instance socially robust decision-making, participatory problem framing, option scoping and appraisal or consensus building. Kolkman et al. (2005; 2007) for instance advocate a frame reflection and mental model mapping technique to enable mutual

understanding between decision-makers, experts and stakeholders (in this case representatives of special interest groups) in the context of integrated environmental assessment (EIA) and flood defence planning. Similarly, Burgess and colleagues (2007) propose a deliberative mapping methodology to engage experts and citizens in an interactive dialogue on problem framing and option definition that might be adopted for the appraisal of natural hazard risks. Kenyon (2007) and Scolobig et al. (2008) have recently presented participant-led multi criteria approaches for evaluating flood mitigation measures in Scotland and Italy, respectively. Stanghellini and Collentine (2008) have put forward a model for facilitating stakeholder participation in the management of catchment areas (CATCH model). Again, the focus is on structuring dialogue and deliberation among managers and stakeholders to ultimately enable mutual understanding and to resolve areas of conflict. In the U.S., focus groups and participatory mapping techniques have recently been trialled to enable mutual understanding on risks and alternative strategies to adapt to natural hazards between different domain-centred stakeholder groups in local land-use planning. The project succeeded in initiating a dialogue between these groups and in establishing shared goals such as increasing local resilience through sustainable community development (Frazier et al. 2010).

Communication to improve relationships and coordination

Another interesting way to approach risk communication on natural hazards has been put forward by McCarthy (2007). Drawing on intra- and inter-organisational communication approaches he shows that communication on risks between and across the spectrum of risk managing entities before, during and after flooding events (in his study the author examines risk communication on floods between management bodies at the national level in the UK) is as much about defining and improving relationships as it is about conveying information and direction. Accordingly, the management of natural hazards by public and private organisations can be understood as merging classical task-oriented approaches to communication with approaches that focus on strengthening relationships and human resources within and between organisations. These relationships and resources build the foundations for the effective cooperation between departments, agencies and organisations with high task interdependencies (Bouwen and Taillieu 2004). To this end organisations involved in the management of natural hazards need to apply a wide range of communication channels, modes and tools (see Table 7).

Table 6.5: Organisational communication

Communication	Classical approach	Human relations approach	Human resources approach
Content	Task	Task, social	Task, social, innovation
Direction	Vertical (downward)	Vertical and horizontal	All directions team based
Channel	Usually written	Often face to face	All channels
Style	Formal	Informal	Both esp. informal

Source: Miller (2003)

6.4   Research on the effects of risk communication

We found that, in the field of natural hazards, there is little systematic empirical research on the effects of risk communication on the different types of social capacity. Literature from related fields such as climate change and natural resource management suggests that one-way communication that uses multiple tools and channels has some success in raising awareness and changing attitudes. At the same time though such communication has only limited effects on people's trust in risk managers and on their actual behaviour. In comparison, there is some evidence that two-way risk communication can positively impact on the relationships and trust between risk managers, stakeholders and the public as well as facilitate the development of more effective communication chains and the social acceptance of mitigation measures. Furthermore, face-to-face communication can improve the effectiveness of one-way communication with respect to changing people's risk related actions or preparing them for the negative psychological effects of hazard events. Combining one-way and two-way communication to more comprehensive communication strategies thus seems to be the most promising way.

6.5   Mapping risk communication practices across Europe

In the following we present some of the findings from our review of 60 risk communication practices in 16 European countries (see Table 6.6).

Table 6.6: Inventory of risk communication practices

Number of practices:	60
Countries:	16
Hazards:	40 floods, 8 debris flows, 7 landslides, 6 storms, 5 heatwaves, 4 snow avalanches, 4 storm surges, 3 rockfalls, 3 droughts, 3 earthquakes, 2 rock avalanches, 2 forest fires
Spatial level:	24 local, 13 national, 8 national-regional, 6 regional-local, 4 national-regional-local, 3 regional
Communication mainly serves to:	46 provide information, 22 warn of events, 12 train emergencies, 11 forecast events, 10 implement non-structural measure (6 land-use planning, 4 risk/hazard maps), 8 develop non-structural measures (7 land-use planning, 1 risk/hazard map), 7 implement structural measures, 7 develop structural measures, 2 develop warning systems

Source: Höppner et al. 2010

The results of this explorative analysis of communication practices can be summarized as follows:

→   There are only a few 'best practices' that comprehensively apply lessons and guidelines from the risk communication literature, e.g. that communication should be based on the needs of the audience. Hence, we can conclude that there is a considerable gap between the theory and practice of risk communication on natural hazards in Europe.

→   We furthermore found that particularly at the national and regional level one-way communication with stakeholders and the public dominates. Two-way communication practices were largely limited to the local level and were found in the context of floods but hardly for any of the other natural hazards CapHaz-Net is concerned with.

→ The bulk of communication practices aims at informing the public (on hazard, risks, mitigation and prevention measures, how to behave in the case of an event, and to promote acceptance), raising awareness, triggering protective action, and warning of upcoming events. Only few practices explicitly consider relationship management, outrage management, the preparation for adverse psychological/emotional effects, keeping memories alive, mutual understanding and learning as explicit objectives of communication. Or, from the perspective of social capacity building, the bulk of communication practices aim at developing knowledge capacities and attitudinal/motivational capacities (e.g. awareness) rather than at fostering social/organisational and psychological capacities.

→ Most of the reviewed communication practices include good or innovative tools that could be combined to produce more comprehensive and effective communication strategies. Indeed, while many promising tools are currently being trialled in Europe, they are often disparate and not embedded in long-term communication plans.

6.6 Further implications for social capacity building

Different communication approaches yield different potential for social capacity building. Whether knowledge, attitudinal/motivational, social/organisational and/or psychological capacities are fostered and at which levels (e.g. individual, organizational) will arguably depend on the purpose and content of communication as well as the selected modes, channels and tools. We might hence hypothesise that the more capacities are lacking, the more diversified the communication modes, channels and tools have to be in order to address these 'deficits'.

While we have discussed communication as a means to build social capacities, communication (the ability and skills to communicate) might also be viewed as basic social capacity (of social systems and their entities) itself (as in the CapHaz-Net WP1 report on social capacity building by Kuhlicke and Steinführer 2010, 17 and in the participation literature, e.g. Powell and Colin 2009). Communication capacities not just include rhetoric skills and internalised rules of fairness, but also the ability to adopt an extended range of roles within the communication process (Junker et al., 2007). Communication capacities are basic in that they are fundamental prerequisites for forming networks and relationships.

Communication is furthermore the process through which actors define what capacities are needed, who lacks what capacity and how this deficit could be dealt with. Again, we might speculate whether the result of this process would alter depending on what actors are involved and through which modes, channels and tools they communicate. Or in other words, would dialogical interaction between 'capacity builders' and those who should develop capacities result in different perceptions about what capacities are needed?

Time is also a crucial factor when elaborating the relationship between communication and social capacities. Not all capacities develop in the same time frame. In particular social and organisational capacities arguably require more time to unfold than others and they may not necessarily evolve in a linear fashion but alternately progress and regress (Powell and Colin 2009). The choice about one-off, repeated or continuous communication is thus a vital one.

In the reasoning of CapHaz-Net social capacity building can be seen as an iterative learning process within and between individuals, communities and organisations (see also WP1 report). An overarching function of communication is hence to enable iterative evaluation, critical reflection and feedback on practices, and to store and pass memories and experiences. In this

way, communication is a means to learn from practices and to adapt them. Translated back to natural hazards this means that capacity building not only requires communication to review outcomes of single risk phases but also communication to enable learning between risk cycles. Such evaluation and learning processes ideally take place within and outside the official management domain.

7 Risk education considering natural hazards

Blaž Komac

In recent policy documents, it is widely agreed that education for disaster reduction must become an integral part of any educational strategy aimed at promoting and creating thriving and sustainable societies (UN/ISDR 2006 and 2007, DKKV and UN/ISDR 2009a). The Hyogo Framework for Action 2005–2015, for example, contains several links to capacity building and inter alia especially mentions risk education referred to as "the transfer of knowledge, technology and expertise to enhance capacity building for disaster risk reduction" (UN/ISDR 2006, 5). What is more, several international organizations provide education programs in natural hazards, and many of them rely on the implementation of the Hyogo Framework and the United Nations Decade of Education for Sustainable Development 2005–2014. It is important to point out the relative absence of this kind of activity in Europe.

Education efforts with respect to natural hazards are rather under researched in the social sciences, maybe, because education and textbook research are somewhat separated from the disciplines which are usually considering natural hazards and disasters (for an exception: Ronan et al. 2010, Vitek and Berta 1981). Therefore, with respect to this topic, CapHaz-Net could not build upon equally grounded and long research traditions as, for example, with respect to social vulnerability, risk perception or risk communication. After clarifying what we mean by 'risk education', the following section will therefore also contain some findings from explorative research on European curricula and geography textbooks.

7.1 CapHaz-Net's understanding of risk education

Risk education is related to risk communication and it is often difficult to clearly identify the boundary between them in practice. Risk education as defined in CapHaz-Net refers to the transfer of more generalised (thematic, organisational, technical) knowledge and skills on natural hazards and risks from professionals in teaching institutions (schools, providers of courses) to persons in schooling and training (see also Table 6.1 above). Risk education has a much higher degree of formalisation than risk communication as it is codified in the frame of national curricula and textbooks for pupils of different age. However, it may – and in many cases – it should also consider less formalised and dialogue oriented elements (cf. UN/ISDR 2010, Wisner 2006a).

Furthermore, it needs to be borne in mind that the notion of knowledge transfer is not restricted to a relationship between teachers and pupils. Rather children are also regarded as major transmitters of risk-related knowledge to their parents and other people in their social network (Cardona 2004, Stoltman et al. 2004, Wisner 2006a). We should not neglect the role of 'teaching-the-teachers' as equally important for improving risk education at schools.

Due to the lack of primary research, CapHaz-Net's main focus is on the formal risk education of teenagers in schools and considers both national curricula and official textbooks.[9]

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[9] In the WP 6 report, also less formal modes and tools of learning and teaching (e.g. games, museums, and nature trails) are considered (Komac et al. 2010).

7.2   Embedding risk education

In any education effort, a distinction needs to be made between information and knowledge as well as between learning and education. First, one has to distinguish between *conceptual and procedural knowledge.* Conceptual knowledge is based on data and information, and procedural knowledge is comprised of skills and abilities.[10] If knowledge is regarded as a codified set of information, it is independent of the subject to some extent. Second, the process acquiring knowledge is *learning*, which, however, does not merely involve accumulating knowledge and information, but is a creative process in which information is transformed into new insights. Learning can also be defined as the personification of information in order to lend it the character of knowledge. Because this process is more important than the information itself, an important goal of education is 'to learn how to learn'. Third, learning includes forgetting. Just like knowledge, also the memory of a certain disaster remains preserved in the social sphere only for a certain period of time (Komac 2009). In spite of the frequency of some natural processes (which play a part in people's memory; Biernacki et al. 2008) and numerous opportunities to provide information and keep data, people soon forget even extreme events unless they are recorded in newspapers, yearbooks, popular publications, chronicles, information panels at the site itself, or websites, or are kept vivid through socially active preservation of memory such as education and various kinds of public events. Therefore memory, 'consciousness' and, in particular, experience impact on building social capacity.

Risk education comes into play because it is often difficult to provide direct experience in practice. Thus, empirical learning is substituted for by case studies presented in textbooks. Education is a comprehensive process that encompasses the learning of knowledge and the learning of skills. Learning has a long-term effect on changing the personality, and subsequently on social development as a whole. It "encompasses formal and informal transmission of knowledge, and engagement of groups of people […] in identifying hazards and feasible actions to mitigate them and to prepare for the risk that cannot be reduced" (Wisner 2006a, 7). Education includes the formal public and private education systems, vocational and professional training courses, community-based self-assessment, local and indigenous knowledge, and public discourse involving the media, games, awareness campaigns, museums, memorials, and special events (Wisner 2006a; see in more detail Komac et al. 2010).

Education is not so much seen as knowledge acquisition but more as a series of processes through which knowledge, skills, values, and actions are acquired (Murdoch 2004). It is not preparing pupils and students for a static world, rather it must prepare learners to cope with an increasingly changing and complex world. In a society in which education has focused on transmitting 'what we know', it is a challenge to develop a widespread view that 'how we come to know' is very important in modern society. An important outcome of inquiry should be useful knowledge about the natural and human-designed worlds raising questions like how these worlds are organized, how they change, interrelate, and how do we communicate about, within, and across these worlds? (Bransford et al. 1999).

Knowledge of natural phenomena and processes is part of general education encompassing the issues of peace and peace education, democracy and authoritarian countries, environmental protection, economizing, development and the related development of humanism, social

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[10] In a similar vein, the distinction between knowledge capacities and procedural capacities (see Section 2.4 above) is to be understood.

(in)equality, and, last but not least, protection against natural hazards (Senegačnik 2005). The last issue also includes knowledge of the wider and immediate local region, and the phenomena and processes in it. Natural hazards in particular show that education must take into account key world problems and resolve them by using a problem-based approach, whose goal is to raise awareness about phenomena and processes, increase sensitivity to specific phenomena, and develop the ability to perceive development trends.

An important principle is derived from this: in order to be effective and influence social development, natural-disaster and hazard education must focus on concrete phenomena and processes in space. However, this is impossible without basic scholarly, cultural (including humanitarian), and psychophysical awareness of knowledge mediators, in modern society these being primarily school teachers. Risk education at school should comply with the specific characteristics of each country, but its principle objectives need to be long-term, although we should also focus on short-term activities (to train children to protect themselves, to escape hazards, and to be ready to administer first aid). Education about natural hazards should focus on the establishment of a 'culture of risk' or a 'culture of resilience and prevention.'

An interesting example from Turkey is to be mentioned in this context, as it was concrete disasters that led to an intensification of risk education activities. Several intensive training programs for disaster awareness took place in Istanbul after the series of earthquakes there in 1999. By the end of 2000, over 3,000 teachers were trained and certified as instructors in thirty-two districts of the city. These in turn taught more than 34,000 teachers, 6,000 personnel, and more than 350,000 parents. In this way, 826,000 children were also instructed. Through the help of sponsors, the training program was extended to three other Turkish provinces, reaching an additional 1.5 million people. In 2004/05 a five-day master instruction program was offered to 132 trainers from fifty provinces. They taught 16,000 school-based instructors, who in turn taught teachers, parents, and others, reaching at least 2.4 million people (UN/ISDR 2006[a]).

Education about natural hazards should thus start in childhood and continue throughout life, corresponding to each person's age, risks, duties, and responsibilities. It should cover not only the prevention of professional risks, but should be extended to all areas of activity, child or adult, that are related to the risks posed by natural hazards. Proper means to address and reach all relevant individuals and communities should be defined. A major difficulty, however, arises from the fact that people usually sooner or later leave formal teaching institutions. Adults usually might have a prejudice against the idea of returning to school although adult education does not necessarily mean returning to school. Therefore different methods of education, such as meetings, seem to be more appropriate.

7.3 Empirical insights: explorative curricula and textbook research

As in-depth research on formal risk education in Europe, let alone its effects, is largely missing from the research on natural hazards, some empirical findings from explorative research on national curricula and geography textbooks from a wide range of European countries will be presented in more detail.

Natural hazards as part of national curricula

Curricula ('syllabi') are used by teachers to adapt the teaching objectives and contents to the learning practice. They are key to transmitting knowledge about natural hazards in schools because they entail formal publications of teaching objectives and contents according to the school type and the students' age group (Böhn 1999).

According to the World Conference on Disaster Reduction, 36 of 113 (32%) reporting countries claimed to have national efforts to teach disaster-related subjects or some form of disaster-related teaching in primary or secondary schools. In Europe, among them are the Czech Republic, France, Greece, Hungary, Portugal, Romania, Russia, Slovenia and Sweden, to mention but a few.

Risk education themes can be included in different school forms and in the curricula of several subjects, such as geography, social sciences, biological sciences, forensics, physics, history, and domestic sciences. In Macedonia, for example, children already learn about natural hazards in primary school (at ages ten to fourteen), especially in geography classes and in part also in physics, chemistry, and biology classes. The Czech chemistry and physics curricula contain certain aspects of natural hazards. In France, a seven-hour course is dedicated to natural hazards, and a special program titled First Gestures was developed for preschools. In Greece and Hungary, primary-school curricula also include natural hazards. In Germany each state (*Bundesland*) is responsible for its curricula and there are sixteen different curricular arrangements. Beginning in 1993, natural hazards were a required subject in seventh and eighth grades, focusing on regions of the world at risk, the causes of risk, and impact of hazards. Table 7.1 provides an overview of different risk- and hazard-related activities in different European countries.

Table 7.1: Recent efforts in school safety and disaster-risk-reduction education

Country	Year initiated	School structural safety	School disaster-risk management	Hazard education in K-12 schools	School disaster-risk reduction & preparation	Teacher training	Community disaster-risk reduction	Special and other
Czech Republic	2005			X				
France	2005			X	X			
Germany	2004			X				
Greece	2005			X				
Hungary	2005, 2007			X			X	
Lithuania	2005			X				
Macedonia	2007	X						
Monaco	2005			X				
Portugal	2005			X				
Romania	2005, 2007			X			X	
Russia	2005			X	X			
Sweden	2005			X				
Turkey	2005, 2007	X		X	X	X	X	
United Kingdom	2005, 2007		X	X				

Source: Disaster education (2007), App. 6

Researching geography textbooks as means of risk education on natural hazards

In formal risk education, school textbooks are still the main means of teaching and learning. Textbooks are composed media, which combine text equally with pictures, maps, charts, diagrams, and tables. They follow a specific programme and teaching, psychological, and methodical principles, and are in line with educational and school needs and tasks. Textbooks are a stable source of information compared to the other media and teaching resources (Schmithüsen 2003): (1) because several changes are needed before they change (e.g. change of curriculum, methodological approaches) and a lot of time is needed to produce good textbooks; (2) also the information provided in textbooks often tends to be very stable (as also textbooks from different countries and different epochs, respectively, tend to describe, for example, similar historical disasters or region-specific hazards).

One of the major school subjects in which natural hazards are being taught is geography. In addition to this, geography textbooks tend to lean on the paradigms of physical and human geography. Geography textbooks are instructional books that transmit findings and knowledge about landscape phenomena and processes as well as social developments and problems.

This section identifies differences between various European countries with regard to risk education based upon explorative textbook research. To this end, the secondary-school geography textbooks at the Georg Eckert Institute for International Textbook Research in Braunschweig, Germany, were analysed. This institute has what is probably the largest collection of textbooks in the world. It has been operating since 1951, and in 1991 UNESCO authorized it to coordinate international research on textbooks. The institute's library has more than 240,000 units, of which textbooks account for 171,000 units and scholarly studies account for approximately 68,000 units (GEI 2010).

A horizontal analysis of the content was conducted, which means that textbooks from various countries covering the same course were examined in terms of specific content. This study belongs to inter-textual strategies, which study the internal composition of a textbook and its components or the textbook itself. We are not interested in an expert-assessment strategy to study textbooks, in which value judgments ought to be made on the assessments of textbooks provided by teachers and other professionals; this was impossible due to the nature of the CapHaz-Net project. The result of our work is thus an analysis of the frequency of specific text and visual textbook components, and their content-related definition. We were interested in the share of natural hazard-related text and graphical components in the textbooks as expressed in the number of pages and graphic features (e.g., photographs, maps, sketches, and newspaper abstracts), the treatment of natural hazards, the type of disasters covered, and examples of natural hazards described in the textbooks. Our research can thus not answer the question "How effective is risk education through textbooks?", as we did not assess the effectiveness of education, which is indeed very difficult to do and requires specific in-depth research.

A total of 166 textbooks and more than 37,000 pages from thirty-five European countries were selected and examined. The analysis thus provided an insight into the current situation in various countries, in which attention must be drawn to the fact that the textbooks selected naturally do not represent the only possible selection because it was impossible to examine all the textbooks and also because the institute does not have all of them. The majority of the textbooks were social-geographic (42%), about a fifth (23%) were more physical-geographic while about a third (36%) were regional geographic.

Both with regard to the single European countries (Figure 7.1) and to different European regions at a large scale, a highly differentiated risk education landscape becomes obvious. Western Europe dedicates the most attention to natural hazards (5.2%), and Eastern Europe the least (0.7%). The share of pages containing descriptions of natural hazards is still above 3% in Northern Europe (3.6%) and South-eastern Europe including Turkey (3.4%). The shares in Central and southern Europe exceed 2% (2.8 and 2.3%, respectively). There are certainly many reasons for these differences. Among them, we suggest the political division of Europe after WWII and the distinct world and nature views related to the different regimes as well as persistent welfare differences as being important.
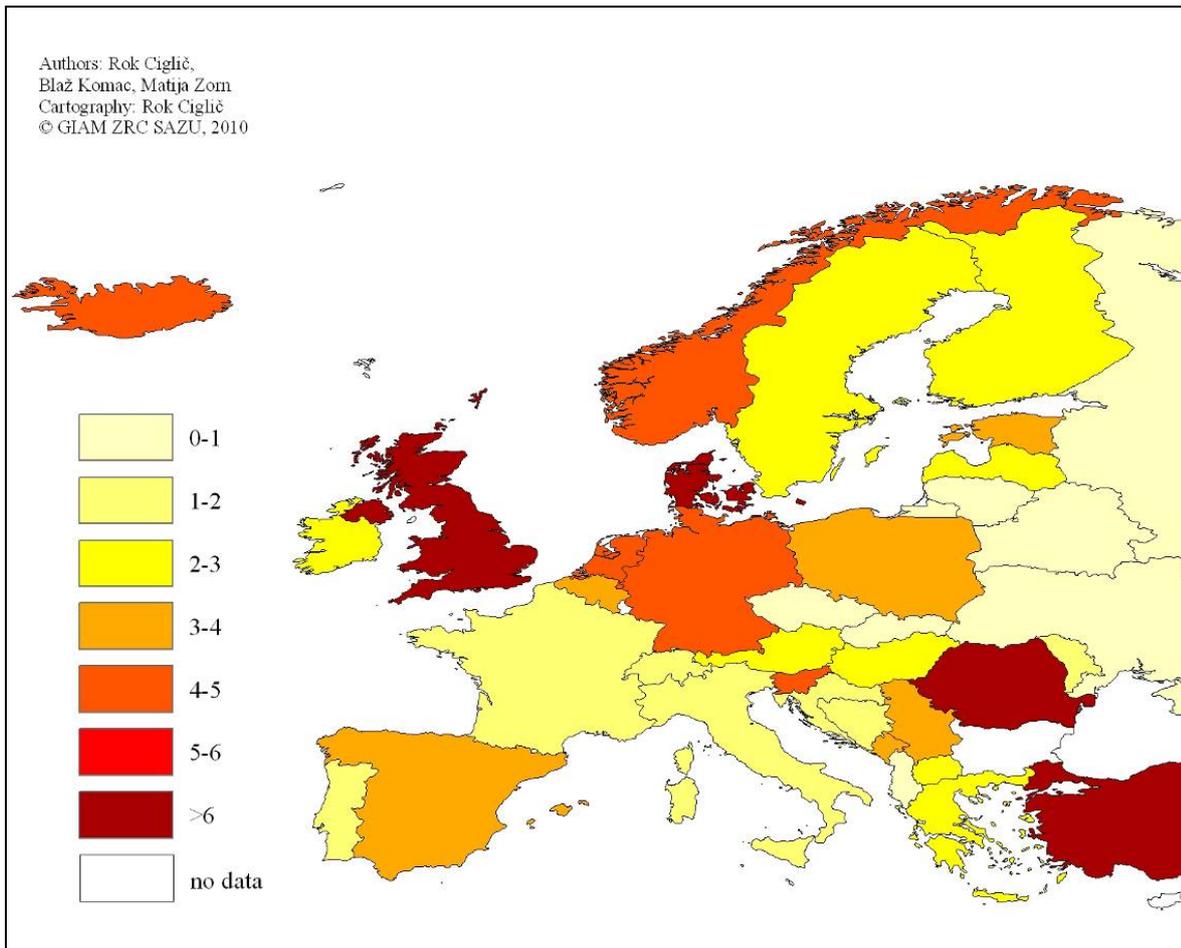
Figure 7.1: Natural hazards as course content expressed in the share of pages in European secondary-school geography textbooks
Source: Komac et al. (2010)

Nearly 1,000 pages (i.e., 966) or four-fifths of the total pages in the textbooks covering natural hazards are dedicated to descriptions of natural hazards. The largest share is dedicated to earthquake descriptions (23%), and more than one-fifth (21%) of pages focus on describing volcanoes as generators of volcanic hazards. These are followed by descriptions of floods (18%) and, surprisingly, erosion (14.5%). The share of other natural hazards mentioned in textbooks is below 10%. Fairly large attention is directed to landslides and rockfalls (8%), and storms (7%), whereas droughts (3.5%) and avalanches (2.5%) are dealt with less often. Descriptions of wave surges and tsunamis (1%) are even more frequent than descriptions of forest fires (0.8%), although forest fires are quite common in southern Europe, for instance.

The share of pages in European textbooks was compared to the number of events, victims, and economic damage in the last century (table 7.2). In terms of the share of pages in European textbooks, earthquake descriptions are most overrepresented compared to the average (i.e., 29%). Volcanic descriptions account for almost the same share (27%), followed by descriptions of floods (23%). Descriptions of landslides are less frequent (10%) as well as of storms, although they are quite common in Europe (9%); descriptions of tsunamis (1%) and fires (1%) are also very common. The picture is different when taking into account the occurrence of individual natural hazards in Europe over the last century (i.e., from 1900 to 2005). According to the number of events, floods are the most important; there were more than 400 during this period, accounting for nearly one-fourth of all natural hazards. Storms account for one-fourth of natural

hazards (i.e., 268), and major earthquakes for one-fifth of all natural hazards (i.e., a total of 232). With regard to the number of events, textbooks dedicate sufficient attention to earthquakes and floods. The number of pages dedicated to storms is clearly low, and rather long descriptions are dedicated to volcanoes.

The picture also differs if the number of pages is compared to the number of victims in Europe over the last century. Earthquakes predominate strongly, causing more than 300,000 deaths (89% of victims). Surprisingly, more than 16,000 deaths were caused by landslides (5%), whereas the 11,200 flood victims (3%) and 7,200 storm victims (2%) are as expected.

Table 7.2: Shares of pages containing descriptions in textbooks, examples described in textbooks, and events, victims, and economic damage caused by natural hazards in Europe from 1900 to 2005

	Share of textbook pages containing descriptions (estimated)	Share of examples described (estimated)	Share of events 1900–2005 (N = 1,126)	Share of victims 1900–2005 (N = 363,004)	Share of economic damage 1900–2005 (sum = $219,173,000)
Earthquake	0.29	0.28	0.21	0.89	0.34
Flood	0.23	0.21	0.39	0.031	0.440
Landslide	0.10	0.05	0.08	0.047	0.010
Volcano	0.27	0.31	0.01	0.002	0.000
Fire	0.01	0.03	0.07	0.001	0.017
Storm	0.09	0.11	0.24	0.020	0.191
Wave surge and tsunami	0.01	0.02	0.00	0.007	0.000

Sources: Urban habitat 2010, Komac et al. 2010. Note: The estimate excludes data on erosion, avalanches and drought, which account for approximately 20% of all the examples described in textbooks, because no data on the number of victims in Europe over the last century could be obtained.

Besides this imbalance between disaster occurrence in the textbooks and that in reality, the textbooks are suggestive of the impression that natural hazards are less common in Europe than 'elsewhere' in the world, because examples from non-European regions predominate. For example, floods are in a number of European textbooks presented by the case of Bangladesh although monsoon floods can be rather different than lowland or torrential floods in Europe. This imbalance toward non-European hazards and disasters, respectively, is perhaps due to the fact that out of Europe disasters are more 'spectacular' or cause higher levels of casualties and economic damage, and are therefore more often reported in the media.

In spite of its explorative character, the textbook analysis brought about that the 'European risk education landscape' is far from uniform. However, a number of textbooks do not cover the topic accordingly – either at all or in its European dimensions or in covering the social aspects alongside the physical ones. On the other hand there are many good examples of textbooks from methodological and contents' perspective (for details see the WP 6 report; Komac et al. 2010).

7.4   Implications for social capacity building

Risk education is key to social capacity building for natural hazards. Education in the field of natural hazards is actually about increasing the capacities of the public to address natural disasters. Or the other way around: social capacity building is a key feature of education. The following social capacities are addressed by risk education:

→   Just like risk communication, risk education also has a strong focus on developing *knowledge capacities* at the levels of the individual and of organisations (though the latter were not focussed on in the review). These include knowledge to comprehend the causes and the impacts of natural disasters. Knowledge transfer is being done via formal and less formal means and tools aiming at a wide range of different social and age groups.

→   Moreover, formal risk education (at school) has a very strong focus on the development of further skills, particularly of *procedural capacities*, i.e. the ability and knowledge of how to learn, where to get information and how to use it, for example how to increase personal and societal safety. This is probably as important as gaining knowledge capacities.

→   Risk education also has the intention to develop *motivational capacities*, particularly to raise awareness of the processes and phenomena. However, there is almost no research on the effects of risk education; thus, it cannot be judged how successful risk education is in practice. Moreover, it is questionable whether the imbalance toward non-European hazards (as found in the textbooks) actually contributes to risk awareness and knowledge, or whether thus these hazards will be regarded as something 'far away' and, thus, of less relevance for oneself.

Besides educating children, the most important issue in this regard is the necessity to train teachers in new knowledge and skills related to natural hazards. Increasing knowledge and skills raises their awareness and changes their perception of risk and personal responsibility, and therefore their impact on behaviour. But knowledge of potential reactions to a threat does not equal knowledge of actual behaviour in the face of a natural disaster (Riad et al. 1999) or in other words: "perceived responsibility plays an unimportant role in the (flood) preparedness decisions" (Terpstra 2009, 139). At the level of implementing this topic, there is a need for greater awareness of the special features of risk education, a need for proper materials and other resources, including cooperation with experts, local stakeholders and authorities, which in turn results in the need of sufficient funds available. An example is 'MEMO RISK' which was developed and applied in the Loire River catchment. It brings together local government and schools in order to survey local disaster risk situations and awareness. The results not only support the knowledge and motivation bases of pupils it also documents the risk perception and local knowledges about hazards (UN/ISDR 2010, 18-20).[11] Ideally, risk education is thus a capacity building strategy of promotion of safety that encourages positive behaviour, leading to modification of societal and individual risk states and behaviours that prevent people from living a safe life. Risk

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[11] We are grateful to Olivier Schick for giving us insights about this specific example at and subsequent to the Ljubljana workshop in June 2010. More information in French is available via: http://www.prevention2000.org/memorisks/

education should be included in mainstream school curricula and it should aim to assist people in forming positive attitudes and practices and to participate in wider civic processes

Access to information is of crucial importance to increase social capacity, which has been noted in other 'risk discourses', too. Information access which can be improved also through education will result in improved understanding of processes and phenomena as well as of their consequences, and of effects of the mitigation strategies. In this regard we have to mention the basic geographic question of 'place', because every natural disaster occurs under specific conditions (time) at a specific place. Knowing the 'times' and 'places' is essential to understanding the potential impact of natural hazards especially if the place is personalized, related to person's everyday life. In this regard, many European textbooks still need considerable improvement -yet, this is by far not to suggest restricting the teaching of natural hazards and disasters to 'European' ones. But to develop applicable social capacities, cases from familiar settings will help to motivate the next generations for dealing with and learning about natural hazards.

One goal of social capacity building should therefore be to improve and strengthen the capacity of education systems at the national, regional and local levels to achieve quality improvements in education activities. Social capacity building via risk education includes the development of human resources as well as that of infrastructural and institutional levels (Muturi 2005). Future risk education has to refer to the private and the public sectors of social capacity building as well as to individual and organizational actors. On the individual level we should build individual knowledge and skills on risks and ways to act and the ability to find and understand information. It is needed to develop motivational capacities such as self-confidence and their personal abilities to critically analyse information and to creatively engage in finding solutions to a problem, building personal responsibility. On the community level social and organisational capacities should be developed by building networks between community individuals, groups and organizations and by focusing on local ownership of the education programme. Therefore social capacity building in risk education needs to include the development of cohesion between all listed levels, improvement of knowledge and skills transfer (education methods), improvement of performance of education systems (evaluation), and program management (curricula).

8 Research gaps

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In all of the covered fields, in the course of the literature reviews and the thematic workshops a number of research gaps emerged. Since defining open research questions is at the heart of CapHaz-Net, the following section focuses on major gaps in knowledge in the single fields of interest. The research gaps identified are based on the single WP reports and collective efforts of the consortium as well as input and observation from participants of the single workshops. We subsequently defined major *research gaps* with regard to the single thematic topics.

8.1 Research gaps in the field of risk governance

The literature as well as the workshops revealed that the topic of 'governance' is a relatively new topic in natural hazard and disaster research. Whilst there are some studies on the relationship between governance and social vulnerability, these are mainly focused on the issue of disaster recovery and situated in a developing world context (Pelling 2003, Gunewardena 2008). Consequently, we could not identify any substantial scholarly contribution dealing thoroughly with the governance of natural hazards within Europe. The report on risk governance (cf. Walker et al. 2010) as well as this Knowledge Inventory have started to outline some of the themes along which the topic of 'the governance of natural hazards' should be researched more intensively in the future. Relevant topics are, among others, the question of whether it is possible to identify principles of 'good governance'. There is also the issue of to what extent a variety of processes associated with new forms of governance – for example, multiple actors working across different scales, diverse forms of responsibility and control and increased privatization – are operating across Europe, and what effect these processes may be having on the ways in which natural hazards are managed. Further research is therefore needed to assess the potential positive and negative implications of changes in risk governance processes across Europe. For example, it is important to establish whether new forms of governance can lead to benefits such as reduced damages from natural hazards as well as greater flexibility, communication and coordination between actors and the empowerment of local communities, or whether there are also negative implications such as the reduced accountability of different agencies and the continuing dominance of the most powerful actors involved.

Key research aims are therefore as follows:
- To what extent can shifts towards the new governance be seen across Europe, and what variation is there? Have some EU member states seen stronger and more significant processes of change than others?
- How might wider patterns of 'rolling back' and 'hollowing out' of the state, privatization, devolving and sharing of power have positive or negative implications for processes producing vulnerability and shaping the intensity of disaster experiences?
- To what extent do differences between forms of risk necessitate different forms of governance process? Can models applied largely to technological risks be translated to natural hazards? Are there important differences between types of natural hazard – e.g. floods, alpine hazards, droughts and heatwaves – in terms of their type of onset, magnitude, frequency, periodicity, spatiality etc., that need to be taken into account?

8.2 Research gaps in the field of risk perception

The research field on risk perception is well established within the social sciences. However, it focused so far on technological risks and on the underlying heuristics, values and assumptions that lead to more or less acceptance of novel technologies. There is still a major research need with regard to natural hazards and how individual, social and cultural determinants influence natural hazard perception. The report on risk perception (cf. Wachinger and Renn 2010) shows results of the resent literature on natural hazards: Perceiving risks of flooding, droughts and alpine hazards perception seems to be mostly dependent on previous experiences of hazardous events and on the trust in authorities and measures.

Yet, there is a lack of systematic, empirically well-designed research further substantiating these findings. Are there, for instance, differences in the perception of trust, responsibility and accountability with respect to authorities and risk managers in different social contexts and European countries? If yes, what implication does this have for risk management and loss prevention? Are "experience" or "trust" practicable criteria for the quality of risk communication and participation processes in risk governance approaches? Such kind of research is particularly relevant with regard to the design of risk communication strategies within risk governance. It could hence significantly contribute to the reduction of vulnerability. The intensity and frequency of natural hazards will vary with the advance of climate change. The perception of risks associated with climate change is closely related to the perception of complexity and uncertainty in general. How do laypersons conceptualize the complex relationship between human activities and climate reactions? How uncertainty is framed in everyday perception and how is it resolved in personal actions? Does the way in which experts deal with uncertainty alter their perceived trustworthiness? How does complexity interact with the process of amplification and attenuation of risk? Responses to these questions will have an impact on the reception of risk communication programs and management decisions. These interactions are hardly investigated in the field of natural hazards although perception of complexity and uncertainty influences the credibility of information sources and shapes personal protective behaviour.

Key research objectives are therefore:
- An improved understanding of underlying triggers influencing risk perception with respect to natural hazards
- An improved understanding of the connections between risk perception and people's ability and willingness to apply preventive measures for loss prevention
- An improved understanding of how people deal and cope with complexity and uncertainty :
- An improved understanding of how perceived complexity and uncertainty may lead to perceived ambiguity with respect to natural hazards
- An improved understanding of how perceived complexity and uncertainty may trigger processes of amplification or attenuation of risk
- Best practise examples and guidelines for taking risk perception into account in risk governance and risk communication

8.3 Research gaps in the field of social vulnerability

The research field on social vulnerability is well established within the social sciences. However, so far it is mainly focused on developing countries and/or the North American context. In the European context it is still an emerging field of research. The objectives of any further research

would be to contribute to a better understanding of how social vulnerability in relation to natural hazards can be reduced across Europe in order to increase people's resilience and increase their capacity to cope with future events. More specifically, research is needed on conceptual issues relating to vulnerability, methodological questions of how to improve the measurement and assessment of social vulnerability, gaps on how best to apply the knowledge, and concerns over existing data and data gaps.

The following specific research gaps have been highlighted:

- An improved understanding of how social and environmental inequalities contribute to an increased exposure as well as reduced coping and adaptive capacity of certain groups and areas

- An improved understanding of social vulnerability to different natural hazards, particularly earthquakes, heat waves, droughts and volcanic eruptions as these appear to be under-researched. Inter- and transdisciplinary small-scale projects pursuing a contextual research strategy with a focus on high density urban areas appear as particularly relevant. A possible topic emphasis could be laid on how potentially vulnerable groups such as migrants and transients adapt to and cope with their vulnerability.

- An improved understanding of how individuals, but also organisations and communities perceive their own vulnerability and how different groups construct their own or the vulnerability of other groups differently. There is a need to distinguish between risk and vulnerability perception explicitly and to understand how the two interact and shape people's behavioural responses, as there is hardly any research on how the perception of vulnerability affects people's reactions. This includes actual and perceived responsibility for action, denial of the risk and also misperception of the cultural context limiting action.

- A better understanding is needed of responses to, and remaining barriers to, addressing social vulnerability. For example, what are the social, economic, political, legal and institutional processes which produce, exacerbate or perpetuate social vulnerabilities? How do processes such as an ageing population and increasing economic polarization across Europe contribute to different vulnerability patterns across Europe? Finally, what role does the recovery process that follows a disaster have in influencing the kinds of vulnerabilities that may or may not develop in the longer-term?

- A better understanding of relational aspects of vulnerability seems necessary as most definitions and approaches to vulnerability treat it as a property of situated agents. What remains unaddressed is the relational nature of vulnerability, namely that vulnerability is in part an effect of relations, of the institutionalized patterns of interaction, within a community and above all between the former and the acting organizations and authorities, as established at regulatory or routine level. Which accounts for the fact that acting for reducing vulnerability has often rebound effects: A certain strategy may improve something (e.g. the resistance of an aras by an heightened dike) while reducing something else (e.g. the individual coping and adaptive capacity. In other words, vulnerability should be conceived and analysed also as an interactional and institutional effect.

The work would necessitate an integrated approach involving multi-disciplinary teams of researchers and would contribute to European policy in relation to the management of the risk from natural hazards, including their impacts, and would also input into the implementation of

relevant EU legislation such as the Floods Directive. In addition it would benefit practitioners in the field of natural hazard management, as well as the associated effects and damages, by informing the production and implementation of appropriate methods and tools for their use.

8.4 Research gaps in the field of risk communication

Indications exist that well designed risk communication strategies can have a considerable impact on regions' capacities to cope with natural hazards. The practice of risk communication on natural hazards in Europe is, however, very diverse depending on natural, social, political and cultural factors. There is a lack of systematic empirical knowledge on how risk communication strategies influence a region's capacities to cope with natural hazards and which conditions enable or inhibit regions to establish efficient long-term risk communication strategies. Such strategies would combine a variety of communication tools to serve different purposes and to build different kinds of capacities. Conditions and effects of risk communication strategies should be considered comprehensively including physical, individual, social, organisational, political and cultural aspects. More attention should be paid to the question of how evaluations of the impacts of communication efforts and their contribution to social capacity building could be implemented in practice, e.g. as a part of broader resilience assessments.

Furthermore, little is known about the influence of design and framing on the success of risk communication efforts in the field of natural hazards and it seems that, although a key to successful information transfer, these issues have been largely neglected by researchers so far.

Finally, both researchers and practitioners should endeavour to find ways to integrate the pre-assessment and appraisal of the variety of natural, socio-economic, cultural and political risks that are relevant to the everyday life and the quality of life of people and communities. How, for instance, could the public dialogue on regional risk management be integrated into a wider discourse on sustainable regional development (e.g. ecology, economy, health, life quality) and thus help in bringing natural hazards closer to people's lives?

8.5 Research gaps in the field of risk education

In general, the social dimensions of natural hazards are rare in European risk education; support from research is needed for changes in this regard. In future, studies should further investigate if and how risk education influences risk perception, social vulnerability and behavioural changes. Currently there is a lack of evaluation and research in the field of (school) risk education in Europe. Therefore, there is lack of knowledge about the efficacy of risk education (transmission of knowledge, skills).

EU-level studies of risk education on possible improvements of curricula, textbooks and other teaching tools and methods for risk education are necessary. A problem of different responsibilities of institutions involved in risk education has been identified and should be investigated in detail (who should be involved in planning and preparing the curricula).

There is a need for multidisciplinary risk education but a lack of financial, institutional and other means to achieve it. Further research on partnerships (local, regional, state, EU) responsibilities (personal, institutional) and liability in risk education is needed. Risk education can be related to climate change, sustainability, and sustainable development, building capacity in an uncertain world or other similar issues. Linkages between educational policies and risk education are rare – there is a need for educating the decision makers and a need for more intensive

collaboration with them to improve the gap between the knowledge producers (scientists) and knowledge users (teachers, decision makers, pupils) by co-producing knowledge.

We recommend testing different aspects of risk education in pilot studies because risk education is supposed to have long-term effects on people's beliefs, motivation, responsibilities, trust, behaviour, and coping strategies, especially with regard to high spatial mobility and transition from 'space of locations' to 'space of flow', and because risk education is supposed to be more effective if it is local-oriented. Risk education should occur within a specific social and spatial context – regional and local educational programmes can have a substantial long-term effect if they are focusing on local natural hazards-related issues. Countries that share common natural hazards (e.g. in shared river basins) should address educational information for students through joint efforts (development and publication of curricula, textbooks). There is a clear need for further research of indigenous knowledge related to natural hazards in Europe. Last but not least, risk education should not neglect the educational values of the internet and other media, arts, and literature.

9 Towards more resilient societies: Summary and outlook to the second project phase

Christian Kuhlicke & Annett Steinführer with support from Matthias Buchecker, Corina Höppner, Blaž Komac, Simon McCarthy, Ortwin Renn, Sue Tapsell, Gisela Wachinger, Gordon Walker, Rebecca Whittle

This report aims at structuring an emerging field of research, as the scientific discussion on social capacity building for natural hazards in Europe needs yet to evolve. Therefore, a detour was taken via established fields of expertise from the broad range of the social sciences and their insights in order to develop a scientifically sound and practically relevant understanding of social capacity building.

9.1 Summary

⟶ The concept of capacity building gains relevance on the policy level. Yet, the scientific discussion on the interrelation of natural hazards and building capacities in a European context has not yet evolved. Some points, however, need to be considered. *Social capacity building* has a strong normative dimension as building capacity often entails a paternalistic stance, in the sense that an actor or a group of actors is considered by an outsider as lacking a certain skill, a resource or a capacity. This judgment is mostly made from a position of superiority. This implies that the interrelations of 'capacity builders' and those 'deficient' of a certain capacity need to be carefully taken into account. Social capacity building is, furthermore, not simply linear; it is rather a dynamic process taking places on different scales be influenced by different time horizons and ideally based on iterative and mutual exchange and learning among individual and collective actors in the private and the public sectors, including people and communities at risk as well as organisations involved in risk and disaster management.

⟶ The topic of *risk governance* is relevant in this context, as it indicates that recently a broad shift has been taking place in how societies are *governed* and this is also relevant to the handling of natural hazards and disasters. The nature of the shift is unclear and contrasting accounts and explanations have been offered. However, some characteristics of this transition – for example, a 'rolling-back' of the state, increased privatisation and the growing number of actors (private companies, partnerships, non-governmental organisations (NGOs) etc.) in the political decision-making process – can be seen all over Europe, though in different degrees.[12] Current shifts and alterations of governance regimes need to be understood in their ambivalent implications. Potential positive implications with regard to distributed responsibilities may be the integration of formerly separated fields of risk management, the empowerment of local people and communities and a more effective decision-making; potential negative impacts may be unclear responsibilities and an increasing fragmentation of policy making and implementation.

⟶ The findings of *risk perception* studies have implications for risk governance, risk communication as well as social capacity building in general as through the broader governance

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[12] However, from a wider historical viewpoint, risk governance had started on the local level and in the private sphere. Only in the recent past, the state took control of natural hazards. Yet, the transition we refer to here is far from being a return to a past state.

shifts a greater responsibility is put on actors from the private sectors as they are increasingly encouraged or demanded to individually reduce the potentially damaging consequences of a natural hazards. However, findings from risk perception studies clearly underline that the awareness of a hazard does not necessarily translate into preparedness or concrete actions. The findings rather underline the relevance of the experience of hazardous events as well as the trust in authorities and measures as factors influencing risk perception. This finding suggests some important implications for any social capacity building effort: A possible information campaign, for instance, will only be successful if it is based upon trusting relations between residents and the authorities providing information. Therefore, the development of trust-building strategies is a crucial part of the capacity building process.

→ The concept of *social vulnerability* is gaining increasing relevance in policy documents. Yet, the question of how to define vulnerability and how to measure it remain contested. While it can be argued that indicator analysis is useful, it is best used as a means for interacting with the public itself, or its surrogates, to obtain their input about potential vulnerability reduction measures. Thus, people's vulnerability needs to be seen in the light of their capacities and abilities to influence and define their own fortunes. Indicators of vulnerability also need to be related to the specific contexts of European countries and regions and are best developed with a specific policy purpose in mind, which in turn should determine the scale, method and approach used in their development: Who are the vulnerable people one wants to refer to, which is the target group that is to be researched, and which is the potential end-user group? Furthermore, taxonomic top-down and hazard-of-place approaches account for only a fraction of actual social vulnerabilities to natural hazards. Therefore, inductive and participatory assessments need to be also considered.

→ Aspects of *risk communication* seem to gain increasing relevance in practice, as decision-making processes become more inclusive and as the increasing recognition of the complexity of certain problems are requiring participatory approaches where scientists as well as involved authorities no longer have a uniquely privileged position. An ideal, but hitherto rarely practiced, function of communication should be to enable iterative evaluation, critical reflection and feedback on practices, and to store and pass memories and experiences. In this way, communication is a means to learn from practices and to adapt them. Translated back to natural hazards this means that capacity building would not only require communication to review outcomes of single risk phases but also communication to enable learning between risk cycles. Such evaluation and learning processes ideally take place within and outside the official management domain. Moreover, communication should be considered as a basic social capacity in that it is a fundamental prerequisite for forming networks and building trustful relationships between authorities, the public and any other type of stakeholders.

→ *Risk education,* with respect to natural hazards, is a genuine social capacity building effort which includes all age groups and goes well beyond mere dissemination of knowledge. It also includes capacity building on a motivational and procedural basis, as teaching always includes the notion of 'learning to learn'. To start with in this rather poorly developed re-

search field, CapHaz-Net has a major focus on formal education, the curricula and materials used there. This can be justified, among others, by the fact that children and teenagers are mostly not part of risk management exercises and formal participation processes. Yet, within compulsory institutional settings (what schools typically are) they can be easily addressed. Moreover, children and teenagers are also important transmitters of risk-related knowledge to parents, other children etc. However, risk education is by far not restricted to formalised schooling, but rather includes a wide range of arenas, tools, actors, and materials within the broad field of Education for Sustainability (EfS).

9.2 Outlook: Toward more resilient societies

The findings from the previous discussion will feed directly into the second project phase as the concept of social capacity building is further developed by increasingly turning our attention to the question of how to move towards more resilient societies. A first specification is given in section below. We will furthermore organise three hazard related regional workshops allowing us to take specific contexts of institutionalised patterns of interaction, management, and governance into account.

Social capacity building as intervention and participation

It was previously stated that the concept of capacity building gains relevance on the policy level and that the scientific discussion on the interrelation of natural hazards and building capacities in a European context has not yet evolved. To structure the debate, we therefore propose to distinguish in an (a) interventionist approach on the one hand, and a (b) participatory approach on the other. This difference is also utilised to elaborate relations to subsequent topics and will be further elaborated throughout the second half of CapHaz-Net.

→ *Interventionist approaches*: The focus is on the public sector, particularly on the policy dimension as well as legal and regulatory systems (cf. also Nunn 2007). It aims at stimulating and supporting capacity building in specific sectors, localities, or regions by providing measures, strategies, and entire policy frameworks (McGinty 2003, Craig 2007). An external institutional framework or organisation is hence set up in order to intervene and to initiate and promote endogenous processes (Land 2009); it is hence aiming at enabling social capacity building (cf. also Gualini 2002) by including rules and norms "structuring the interaction" of people and creating the "power to achieve purposes that would be unreachable in their absence" (Scharpf 1989, 152, quoted in Gualini 2002, 36). Involved organisations from the public sector may develop such a frame, be responsible, and control its implementation as well as its evaluation. Private actors may be involved in various stages and to varying degrees (cf. also Unnerstall 2010).

Table 9.1: Advantages and possible limitations of interventionist approaches

Advantages	
▪ Formulate measures, and strategies to support a certain idea (e.g. resilient societies) or participate in activities or sectors ▪ Provide a general frame aiming at assisting actors to rediscover, develop, and build different kinds of capacities ▪ May delegate responsibilities to adapt to and cope with a increasingly complex environment and stimulate transformation processes allowing adaptation to changing situations and requirements	McGinty 2003, Banks and Shenton 2001 Johnson and Thomas 2007 Maconick 2002
Possible limitations and challenges	
▪ Often entails a paternalistic stance, in the sense that an actor or a group of actors is considered by an outsider as lacking a certain skill, a resource or a capacity ▪ Often capacity building efforts are imposed on actors without their willingness to participate or agreement on deficits, methods and possible outcomes ▪ Focus is often on individual abilities and skills, while economic, political and institutional obstacles and barriers are neglected ▪ Involved actors may be underequipped (e.g. economically) resulting in a bias towards more powerful and better equipped actors	Tendmanson 2003, Nunn 2007 FCDL 2004, Beazley et al. 2004 Fudge 2009, Beazley et al. 2004 Glendinning et al. 2002, Banks and Shenton 2001

Source: authors' considerations

→ *Participatory approaches*: The focus is on in the private sector particularly on individual actors and different kinds of communities. Such an approach aims at empowering actors by increasing their autonomy and agency (Pavey et al. 2007) to "develop their own self-confidence and skills to challenge prevailing local and wider structures of domination" (Pelling 2007, 375). Here the focus is on locally driven and locally owned capacity development processes. The Hyogo Framework for Action 2005-2015 clearly supports such approaches by identifying it as one of its priorities: "Both communities and local authorities should be empowered to manage and reduce disaster risk by having access to the necessary information, resources and authority to implement actions for disaster risk reduction"[13]. This is a relevant statement as it clearly underlines the interconnectedness of disaster risk reduction efforts with an empowering and participatory approach (cf. also Pelling 2007, 374).

Table 9.2: Advantages and possible limitations of participatory approaches

Advantages	
▪ May stimulate self-help of communities and an increased autonomy of private actors and communities ▪ Actors and communities can determine their own values and priorities and preferred patterns of organisation without external pressures and aims	Christenson and Robinson 1980, Pavey et al. 2007 Eade and Williams 1996, Kaplan 2000
Possible limitations and challenges	
▪ Difficult to find ideal balance between efficiency (controlling labour and time costs) and inclusiveness (expanding participation) ▪ Local elites may dominate the process as a result there may be a tendency for building the capacity of the powerful and less the capacity of disadvantaged or marginalised groups	Pelling 2007 Pelling 1998, Banks and Shenton 2001, Eade 1997

Source: authors' considerations

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[13] http://www.unisdr.org/eng/hfa/docs/Final-report-conference.pdf

Interlinkages and overlaps between interventionist and participatory approaches: Apparently both approaches may be interlinked and may influence each other: While an interventionist approach may ideally result in an endogenous and locally embedded capacity building process that is owned by the actors involved; a locally developed participatory approach, on the other hand, may gain such momentum that is challenges and alter existing policy frames and/or regulatory systems.

Social capacity building as a dynamic process: Generally it needs to be kept in mind that social capacity building is a dynamic process which is influenced by many factors such as: the concrete experience of a disaster in locally specific risk environments, but also broader societal changes and processes, which are developed and reinforced over time. In this vein, the iterative nature of learning processes, particularly with respect to capacity building, needs to be underlined. Social capacity building may be based on single-, double- and triple-loop learning processes (cf. Argyris and Schön 1978, Ramalingam 2008. Johnson and Thomas 2007).

Identifying and assessing social vulnerabilities

The topic of 'social vulnerability' has gained increasing relevance in the scientific community as well as in the national and international policy arena. The measuring of vulnerability and risk is considered as a key activity within the final document of the World Conference on Disaster Reduction, the Hyogo Framework for Action 2005-2015 (United Nations 2005, Hyogo Framework for Action 2005-2015). The Framework underlines the fact that the impacts of disasters on social, economic and environmental conditions should be examined through indicators or indicator systems to assess vulnerability.

Also with regard to social capacity building a vulnerability assessment is of to not only identify current exposures and susceptibilities; it is also necessary to take into explore existing or lacking coping and adaptive capacities, at least this is suggested by the concept of social vulnerability from its outset (Anderson and Woodrow 1989, Davis et al. 2004, Timmermann 1981, Chambers 1989, Blaikie et al. 1994).

In line with the basic differentiation of social capacity building in interventionist approaches on the one hand, and participatory approaches on the other, CapHaz-Net distinguishes between (a) taxonomic, deductive and (b) situative, inductive approaches, in regards to vulnerability assessment (Wisner 2004, 2005, Pelling 2007, Kuhlicke et al. 2011d). Both approaches follow different aims and purposes, rely on different methods, focus on different spatial levels, and allow different degree of participations.

→ *Taxonomic, deductive vulnerability assessments*: Such assessments aim at identifying areas, groups or sectors with the greatest needs (i.e. a high level of vulnerability) by relying on different indicators and indices. The underlying hypothesis of such assessments is the existence of a strong positive correlation between socio-economic and/or demographic status and vulnerability. There have been many different indexes developed over the last decade (for an overview cf. Birkmann 2006). The spatial level may go from the level of neighborhoods, to the local, regional, national and international level. The underlying purposes is, among others, to identify vulnerable areas in order to set priorities and develop

intervention measures and strategies aiming at reducing the vulnerabilities of areas or population groups with the greatest needs. It is hence rather policy oriented.

Table 9.3: Advantages and possible limitations of taxonomic, deductive vulnerability assessments

Advantages

▪ Puts the issue of social vulnerability on the public agenda and into the "heart of government thinking"	Benson 2004
▪ Provide information for strategies measures and plans	
▪ Provides simple and understandable information and allows comparison of the vulnerability of specific areal units (e.g. locality, regions, nation states)	Fekete et al. 2009

Possible limitations and challenges

▪ Often fail in that they produce too many 'false positives', as, for example, not all elderly people are equally vulnerable throughout the entire risk cycle	Wisner 2004
▪ Mostly rely exclusively on statistical (e.g. census) data or on the use of quantitative techniques neglecting the local/regional context	Wisner 2004, AEA 2008 Pelling 2007
▪ Challenge of down-scaling the assessment as many national-level assessments can result in loss of information and capturing local pockets of variability	Tapsell et al. 2010, Fekete 2009, Kuhlicke et al. submitted
▪ In the European context there is a lack of empirical studies of social vulnerability hampering the validation of indices and indexes	

Source: authors' considerations

→ *Participatory, inductive vulnerability assessments***:** Such assessments aim to better understand actors' perception of their own vulnerabilities and capacities in order to develop locally embedded and applicable adaptation, coping measures, and strategies. As it follows an inductive approach such assessments have not clear hypothesis in mind but rather provide the space of allow actors to develop their own definitions of their own vulnerabilities and capacities. There have been many different techniques developed and applied during the last decades such as Participatory Rural Appraisal (PRA), Participatory Action Research (PAR), 'sustainable livelihoods' (SL) (e.g. Chambers 1983, Chambers and Conway 1992, Winchester 1992, Moser 1998, Cannon et al. 2003), community or citizen-based risk assessments (Wisner 2006) as well as participatory disaster risk assessment (Pelling 2007). The underlying purpose of such a participatory assessment is to identify and strengthen various forms of capacities and to raise awareness on the local or regional level.

Table 9.4: Advantages and possible limitations of participatory, inductive vulnerability assessments

Advantages

▪ Actors can identify and asses their own vulnerabilities and capacities	Pelling 2007, Bankoff et al. 2004
▪ Allows the integration of local stocks of knowledge, experiences, and perceptions into the assessment	
▪ Makes different and possibly conflicting views and opinions apparent and allows mutual learning processes	

Possible limitations and challenges

▪ Up-scaling is a challenge as results are dependent on the definition context and therefore, making comparison and aggregation across locations difficult	Pelling 2007, Fekete et al. 2009

Source: authors' considerations

Integrating taxonomic and participatory assessments: Recently attempts have developed aiming at integrating taxonomic and situative approaches which still allow for cross-location or cross-regional comparison but are still context-sensitive (Moser 1998, Kuhlicke et al. submitted). Similarly, Kolkman et al. (2005; 2007) advocate a frame reflection and mental model mapping technique to enable mutual understanding between decision-makers, experts, and stakeholders. Similarly, Burgess and colleagues (2007) propose a deliberative mapping methodology to engage experts and citizens in an interactive dialogue on problem framing and option definition that might be adopted for the appraisal of natural hazard risks. Kenyon (2007) and Scolobig et al. (2008) have recently presented participant-led multi criteria approaches for evaluating flood mitigation measures.

Risk communication: providing information and enabling dialogue and exchange

Aspects of *risk communication* gain increasing relevance in practice, as decision-making processes become more inclusive and as the increasing recognition and acknowledgement of uncertainties are requiring participatory approaches. An important insight with regard to social capacity building derives from risk communication studies itself: While initial studies focused on changing public views about risks in more recent times the exchange of knowledge, opinions values, and worldviews between different kinds of actors has becomes a relevant topic in risk communication research. Hence, there are 'lessons learned' from this field with regard to social capacity building.

In line with the basic differentiation of social capacity building in interventionist approaches on the one hand, and participatory approaches on the other, CapHaz-Net distinguishes between (a) information provisioning communication measures and strategies and (b) information seeking and/or dialog-oriented communication measures and strategies, with regard to risk communication (based on Burgess and Chilvers 2006, cf. also Höppner et al. 2010). Both approaches follow different aims and purposes and rely on different channels and tools.

⟶ *Information providing communication*: Such communication measures and strategies may have many different purposes such as: raising awareness, encouraging protective behavior, or warning residents at risk. What they share is that they are mostly developed and implemented by a responsible public organisation. Such communication measures or strategies are indirect, one-way communication with no feedback mechanisms. The relevance of this dimension of risk communication is underlined by the Hyogo Framework for Action 2005-2015 as governmental organisations should "provide easily understandable information and disaster risk reduction and protection options, especially to citizens in high risk areas, encourage and enable people to take action to reduce risks and build resilience"[14]. Yet, this dimension should not only relate to providing easy accessible information about natural hazards, it should also include the task of providing information about legal and regulatory systems.

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[14] http://www.unisdr.org/eng/hfa/docs/Final-report-conference.pdf

Table 9.5: Advantages and possible limitations of information providing communication

Advantages

▪ Cost-effective and low transaction costs	Lundgren and McMakin 2009
▪ May be a necessary and quite efficient way of warning actors about an immediate possible crisis in order to stimulate a prescribed behaviour	Gutteling and Wiegman 1996, Lundgren and Mac-Makin 2009,

Possible limitations and challenges

▪ Seems to have a positive effect on awareness, but hardly any effect on behaviour, learning and active engagement	Moser 2010
▪ Cannot overcome the expert/lay dichotomy and hence the view that risk communication is mostly about information transfer	Plough and Krimsky 1987, Morgan et al. 2001
▪ How to bring together the instrumental side of risk communication with normative (e.g. the right to be involved on the grounds of democratic emancipation) and substantive rationales (contribute values, perspective and values)?	Lundren and MacMakin 2009

Source: authors' considerations

→ *Dialogic versus non-dialogic communication processes:* Such communication measures and strategies may also have different purposes such receiving feedback on certain measures and strategies, looking for relevant information which are missing, enabling mutual exchange, understanding and learning, building and improving trust and relationships, or engaging actors in an interactive and open appraisal and assessment processes. Such communication measures or strategies are set-up in two way communication forms and this either in a non-dialogical, information seeking/consulting manner, or in a dialogical manner. Information seeking communication aims at receiving some kind of feedback for reassuring, for instance, that previously provided information is understood and taken up. Dialogical communication aims at open and mutual exchange and allows, among others, the identification of different or similar opinions, views, worldviews and values among and between different actors.

Table 9.6: Advantages and limitations of dialogic communication

Advantages

▪ Seems to have positive influence on risk perception, behaviour, engagement and social and mutual learning.	Moser 2010, Mosert et al. 2008, Stanghellini and Collentine 2008, Slinger et al. 2007 Lundgren and McMakin 2009
▪ Acknowledges the relevance of underlying values and norms and aims at gradually eliciting and exchanging these values.	Kasperson et al. 1992; Bouwen and Taillieu 2004; Joseph et al. 2008, Earle and Cvetkovich 1995, Kolkman et al. 2005, 2007, Arnstein 1969
▪ Increases trust in governing organisations and improves relationships and achieves wider acceptance of measures and hence reduce conflicts and improves mutual understanding.	

Possible limitations and challenges

▪ Practicability, given time and financial constraints in management practice.	Lundgren and McMakin 2009, Arnstein 1969
▪ Sense of responsibility of the stakeholders/the public	Junker et al., 2007; Buchecker et al., 2003

Source: authors' considerations

Complementary communication strategies: In recent debates, trends have been towards combining single approaches to benefit from their respective strengths and ultimately to increase the effectiveness of risk communication (for extensive guidelines and recommendations see Renn 2008; Lundgren and McMakin 2009, Höppner et al. 2010, for examples cf. Fischhoff 2006, Gutteling and Wiegman 1996, O'Neil 2004). Attempts to conceptualise different approaches as complementary rather than mutually exclusive are remarkable given that the past has been rich in tensions between some of the outlined approaches. These tensions stem from seemingly fundamentally different assumptions regarding the nature of risk, human rationality, and the purposes of risk communication. Instead of focusing on single risk communication actions, recent research findings suggest to shift to long-term risk communication strategies based on reflections on the context (Hostmann et al. 2005; Junker und Buchecker 2008; Höppner et al. 2010).

Risk education: Knowledge acquisition and transfer

In recent policy documents, it is widely agreed that education for disaster reduction must become an integral part of any educational strategy aimed at promoting and creating thriving and sustainable societies. The Hyogo Framework for Action 2005–2015, for example, contains several links to capacity building and inter alia especially mentions risk education referred to as "the transfer of knowledge, technology and expertise to enhance capacity building for disaster risk reduction" (UN/ISDR 2006, 5).

Risk education, as defined in CapHaz-Net, refers to the transfer of more generalised (thematic, organisational, technical) knowledge and skills on natural hazards and risks from professionals in teaching institutions (schools, providers of courses) to persons in schooling and training. In this vein, risk education has a high degree of institutionalisation as it is codified in the frame of national curricula and textbooks for pupils of different age. However, it may – and in many cases – it should also consider and be complemented with less formalised and dialogue oriented elements (cf. UN/ISDR 2010, Wisner 2006a). In line with the basic differentiation of social capacity building in interventionist approaches on the one hand, and participatory approaches on the other, CapHaz-Net distinguishes between (a) curriculum based, standardised education as well as in (b) participatory and locally embedded education, with regard to risk education. It is apparent from the previously outlined understanding of education that the curricular based, standardised education is the rule and that in most cases only within an existing curricular participatory and locally embedded education tools can be applied.

→ *Curriculum based, standardised education on natural hazards*: Such modes of education are based on a clearly defined and prescribed curricular specifying relevant stocks of knowledge to be transmitted within specific subjects, measurable steps, outcomes, and aims. They are embedded in the larger education systems (cf. also Wisner 2006a). Its overall conditions are constructed around the teacher as the central transmitter of knowledge and mostly rely on text-books and ready-made material.

Table 9.7: Advantages and limitations of curriculum based, standardised education on natural hazards

Advantages	
▪ Enables the introduction of the topic into schools and hence prepares a frame stimulating and encouraging engagement with the topic of natural hazards. ▪ May contribute to an improved understanding of underlying natural and socie-tal processes resulting in decreased vulnerabilities. ▪ Contributes to the acquisition of procedural knowledge (ability and knowledge of how to learn, where to get information about natural hazards and so on). ▪ Seems to contribute to a higher degree of preparedness and knowledge among pupils, although empirical bases remain small. ▪ May contribute to a further spreading of knowledge via personal networks (e.g. parents etc.).	Ronan et al. 2010
Possible limitations and challenges	
▪ If system is very standardised it may be difficult for teachers to innovate and provide space of hazard related experimental learning ▪ Precondition is to train teachers in new knowledge and skills related to natu-ral hazards (e.g. if topic is newly introduced to a curriculum) ▪ Needs the development of human resources, as well as infrastructural, or-ganisational and institutional contexts	Wisner 2006a Muturi 2005

Source: authors' considerations

⟶ *Participatory, locally embedded education on natural hazards*: Such modes of education may provide a general frame that needs to be (and, indeed, may be) adapted to the local context. It engages with a specific locality and focuses on concrete events, environments, and relations. They mostly rely on participatory methods by including other actors (e.g. NGOs, local authorities, scientists etc.) and may be based on specific school related pro-jects.

Table 9.8: Advantages and limitations of participatory, locally embedded risk education

Advantages	
▪ It is suggested that hands-on, experiential learning based on local expe-riences, events, and stocks of knowledge is most effective way of edu-cating pupils; however, empirically not investigated yet. ▪ Allows the integration of different actors from the public and private sec-tors (e.g. NGOs) for integrating different stocks of knowledge and exper-tise. ▪ Stimulates engagement with the local environmental situation as well as with, personal histories of relatives and the wider civil society.	Wisner 2006a UN/ISDR 2010
Possible limitations and challenges	
▪ If the system is very standardised it may be difficult for teachers to inno-vate and provide space of hazard related experimental learning. ▪ Depends mostly on the commitment of individual teachers or schools, might be difficult to involve other local actors/organizations.	Wisner 2006a

Source: authors' considerations

The governance context of social capacity building

Generally is the topic of "risk governance" in the field of natural hazards research as well as disaster risk reduction a relative new one. The "Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters" has, for instance, identified the topic of "Governance: Organisational, legal and policy framework" as specific gaps and challenge which needs more attention in future research and practice.

A topic that needs further attention is a better understanding of how societies are governed and how this relates to the field of natural hazards and social capacity building. Current alterations of the governance patterns (i.e. with regard to legal frameworks, policies and the organisational set up) are still unclear and contrasting accounts and explanations have been offered. However, some characteristics of this transition – for example, a 'rolling-back' of the state, increased privatization of risk, the responsibilisation of actors from the private and public sectors and the entry and growing diversity of new forms of actors (private companies, partnerships, non-governmental organizations (NGOs) etc.) into the political decision-making process – can be seen all over Europe, though in different degrees. Yet, it was argued previously that current shifts and alterations of governance regimes need to be understood in their ambivalent implications (cf. also Table 3.1).

Contextualising social capacity building: Regional Hazard Workshops in Europe

By means of three **Regional Hazard Workshops** with local and regional policy-makers and stakeholders CapHaz-Net brings together the scientific knowledge collected in the first project phase with different hazard and vulnerability but also with diverging institutional and regional contexts. We chose three privileged observatories to better understand how social capacity building works in practice. Different regional contexts were selected where natural hazards are part of individuals', organisations' and communities' daily experience and practice. The regional character of the workshops derives from the need to consider these phenomena in their specific context.

More specifically, the single Regional Hazard Workshops will address the following issues:
- ⟶ **Heat-related hazards** represent, at least for some European regions, a relatively recent hazard related to climate change. Thus, the regional practices from areas with longer experience such as Southern Europe will be of interest and of relevance for other European regions. The Regional Hazard Workshop will lay open such regional experience and practices and CapHaz-Net will spread this knowledge.
- ⟶ **Alpine hazards:** In the Alps there exist long-lasting experiences, wide-spread local knowledge, and practices in risk mitigation and management as well as participatory approaches. The Regional Hazard Workshop will, among others, also discuss the issue of transferability of these practices and experiences to other hazards as well as to other mountain regions.
- ⟶ **River floods** are one of the most wide-spread and, in economic terms, one of the most damaging natural hazards across Europe. The Regional Hazard Workshop will, among others, also address the regional relevance and application of the European Floods Directive.

This bottom-up approach will allow us to: (a) identify best initiatives and practices together with gaps of knowledge; (b) compare social capacity building activities in different contexts and in relation to different natural hazards; (c) return to the state-of-the-art knowledge developed in the first phase of the project with new insights and ideas.

9.3 Further embedding: Challenges of European societies facing natural hazards

The negative impacts of natural hazards will remain a crucial challenge for European societies in the future. Apart from climate change, which is expected to be of importance for the future occurrence of disasters resulting from natural hazards and inadequate social capacities, in this final section we want to highlight three major societal processes which interact with societies' ability to build social capacities for natural hazards in the European setting:

⟶ (1) *Social and demographic changes*: European societies are characterised by an increasing social polarisation accompanied by diminishing middle classes and a growing importance of international migration and mobility. Demographic changes impact in different ways on the future fortunes of European societies, but ageing is an encompassing feature which also influences social capacities to prepare for, cope with and recover from the negative impacts of natural hazards. Another major trend is the on-going urbanisation in contrast with the depopulation and ageing of rural regions. Both processes affect social coherence and the commitment for voluntary work, two relevant aspects of capacity building in the context of natural hazards, in rather distinct ways.

⟶ (2) *Globalization*: is not only restricted to flows of goods, finances and people but might also intertwine with the negative impacts of natural hazards, as the transnational aggravation of the Iceland volcano outbreak in early 2010 showed which heavily affected cross-European and even global airplane traffic.

⟶ (3) *Increasing fragmentation at different spatial scales:* Europe is far from becoming a homogeneous continent but it is characterised by a mosaic of prosperous and declining regions nearby as well as excluded neighbourhoods in close vicinity to upper- and middle-class areas. The same exposure to natural hazards might thus lead to distinct vulnerabilities nearby. Policy approaches (including risk management) need to take these small-scale fragmentations into account and develop inclusive approaches for all the different spatial scales and socio-economic/-demographic groups.

All of these challenges need to be taken into account when considering 'natural hazards and social disasters' (Felgentreff and Glade 2008) from a social science perspective (not only) in Europe.

10 References

Adger, W. N. (2000): Social and Ecological Resilience: Are They Related? Progress in Human Geography 24(3), 347-364.

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

Adger, W.N., Brooks, N., Bentham, G., Agnew, M., Eriksen, S. (2004): New indicators of vulnerability and adaptive capacity. Technical Report 7. Tyndall Centre for Climate Change Research: Norwich.

Adger, N., Hughes, T. P., Folke, C., Carpenter, S. R., Rockstrom, J. (2005): Social-ecological resilience to coastal disasters. Science 309 (5737), 1036-1039.

AEA (2008) Preliminary assessment and roadmap for the elaboration of Climate Change Vulnerability Indicators at regional level. Reference: ENV.G.1/ETU/2008/0092r. Final Report to the European Commission. Restricted Commercial. ED45669. Issue Number 3. AEA: London.

Ali Memon, F., Butler, D. (2006): Water consumption trends and demand forecasting techniques. In: Butler, D., Ali Memon, F. (eds.): Water Demand Management. IWA Publishing: London.

Alexander, D. (2009): The MOVE project. Presentation given at the coordinators' meeting of FP7 natural hazard projects in Brussels, 28 October 2009.

Allen, R. (ed.) (2002): The Penguin Concise English Dictionary. Penguin: London.

Anderson, M.B. (2000): Vulnerability to disaster and sustainable development: A general framework for assessing vulnerability. In: Pelke, R. Jr and Pielke, R. Sr, (eds.): Storms (Vol. 1). Routledge: London, 11-25.

Anderson, M., Woodrow, P. (1989): Rising from the Ashes. Development Strategies in Times of Disasters. Intermediate Technology Publications: London.

Argyris, C., Schön, D. (1978): Organizational Learning: A Theory of Action Perspective. Addison-Wesley: Reading et al.

Argyris, C., Schön, D. (1996): Organizational Learning II. Theory, Method and Practice. Addison-Wesley: Reading et al.

Armas, I., (2008): Social Vulnerability and seismic risk perception. Case study: The historic center of the Bucharest Municipality, Romania. Natural Hazards 47, 397-410.

Armas, I, Avram, E. (2009): Perception of flood risk in Danube Delta, Romania. Natural Hazards 50, 269-287.

Arnstein, S. R. (1969): A Ladder of Citizen Participation. Journal of the American Planning Association 35(4), 216-224.

Baan, P.J.A., Klijn, F. (2004): Flood risk perception and implications for flood risk management in the Netherlands. International Journal of River Basin Management 2(2), 113-122.

Bankoff, G, G. Frerks und D. Hilhorst (2004): Mapping Vulnerability: Disasters, Development and People. Earthscan: London.

Banks, S., Shenton, F. (2001): Regenerating Neighbourhoods: A critical look at the role of community capacity building. Local Economy 16(4), 286-298.

Barberi, F, Davis, MS, Isaia, R, Nave, R, Ricci, T. (2008): Volcanic risk perception in the Vesuvius population. Journal of Volcanology and Geothermal Research 172(3-4), 244-258.

Barnes, P. (2002): Approaches to community safety: Risk perception and social meaning. Australian Journal of Emergency Management 17(1), 15-23.

Barton, A. H. (1969): Communities in Disaster: A Sociological Analysis of Collective Stress Situations. Doubleday: Garden City, NY.

Baser, H., Morgan, P. (2008): Capacity, change and performance. Study Report. Discussion Paper No. 59B. European Centre for Development Policy Management.

Beazley, M., Griggs, S., Smith, M. (2004): Rethinking Approaches to Community Capacity Building. University of Birmingham: Mimeo, Birmingham.

Beck, U. (1992): Risk Society: Toward a New Modernity. Sage: London.

Beck, U. (1994): The reinvention of politics: towards a theory of reflexive modernization. In: Beck, U, Giddens, A, Lash, S, (eds.): Reflexive Modernization: Politics, Tradition and Aesthetics in the Modern Social Order. Stanford University Press: Stanford, 1-55.

Beggs, J., Haines, V., Hulbert, J. S. (1996): The effects of personal network and local community contexts on the receipt of formal help during disaster recovery, International Journal of Mass Emergencies and Disasters 14(1), 57-78.

Bell, R., Glade, T. (2004): Quantitative risk analysis for landslides – Examples from Bildudalur, NW Iceland. Natural Hazards and Earth System Sciences 4, 117-131.

Bennett, P., Calman. K. (2001): Risk Communication and Public Health. Oxford University Press: Oxford.

Benson, C. (2004): Macro-economic concepts of vulnerability: Dynamics, complexity and public policy. In: Bankoff G, Frerks G, Hilhorst, D (eds.) Mapping vulnerability: Disasters, development and people. Earthscan: London, 159-173.

Berkes, F. (2007): Understanding uncertainty and reducing vulnerability: Lessons from resilience thinking, Natural Hazards 41 (2), 283-295.

Bevir, M., Rhodes, R. A. W. (2003): Searching for civil society: Changing patterns of governance in Britain. Public Administration 81(1), 41-62.

Bevir, M. & Trentmann, F. (2007): Introduction: Consumption and citizenship in the new governance. In: Bevir, M., Trentmann, F. (eds.) Governance, Citizens and Consumers: Agency and Resistance in Comtemporary Politics. Palgrave Macmillian: Basingstoke.

Biernacki, W., Działek, J., Janas, K., Padło, T. (2008): Community attitudes towards extreme phenomena relative to place of residence and previous experience. In: Liszewski S. (ed.): The influence of Extreme Phenomena on the Natural Environment and Human Living Conditions. Łódź: Łódzkie Towarzystwo Naukowe, 207-237.

Birkmann, J., Wisner, B. (2006): Measuring the un-measurable: The challenge of vulnerability. UNUEHS: Bonn.

Birkmann, J. (2007): Risk and vulnerability indicators at different scales: Applicability, usefulness and policy implications. Environmental Hazards 7(1), 20-31.

Birkmann, J. (ed.) (2006): Measuring vulnerability to natural hazards: Towards disaster resilient societies. United Nations University Press: New York.

Birkmann, J., von Teichman, K. (2009): Addressing the Challenge: Recommendations and Quality Criteria for Linking Disaster Risk Reduction and Adaptation to Climate Change. In: Birkmann, J., Tetzlaff, G., Zental, K-O. (eds.): DKKV Publication Series 38, Bonn.

Blaikie, P., Cannon, T., Davis, I., Wisner, B. (1994): At Risk: natural hazards, people's vulnerability and disasters. Routledge: London.

Bohle, H.-G. (2001): Vulnerability article 1: Vulnerability and criticality. IHDP Newsletter Update. (consulted 10.10.2007), URL:
http://www.ihdp.uni-bonn.de/html/publications/update/update01_02/IHDPUpdate01_02_bohle.html.

Bohle, H.-G. (2005): Soziales oder unsoziales Kapital? Das Sozialkapital-Konzept in der Geographischen Verwundbarkeitsforschung. Geographische Zeitschrift 93(2), 65-81.

Bohle, H.-G., Glade, T. (2008): Vulnerabilitätskonzepte in Sozial- und Naturwissenschaften. In: C. Felgentreff und T. Glade. Naturrisiken und Sozialkatastrophen. Berlin, Spektrum Akademischer Verlag: Heidelberg, 99-120.

Bohle, H.-G., Krüger, F. (1992): Perspektiven geographischer Nahrungskrisenforschung. Die Erde 123(4), 257-266.

Bollin, C., Hidajat, R. (2006): Community-based disaster risk index: Pilot implementation in Indonesia. In: Birkmann, J. (ed.): Measuring vulnerability to natural hazards: Towards disaster resilient societies. United Nations University Press: New York, 271-289.

Bostrom, A., French, S.P., Gottlieb, S. J. (2008): Risk Assessment, Modeling and Decision Support. Springer: New York.

Bourdieu, P. (1986): The forms of capital, In: Richardson, J. G. (ed.): Handbook of Theory and Research for the Sociology of Education. Greenwood Press: New York, 241-258 (first in German in 1983).

Bouwen, R., T. Taillieu (2004): Multi-party collaboration as social learning for interdependence: Developing relational knowing for sustainable natural resource management. Journal of Community & Applied Social Psychology 14, 137-153.

Bransford, J. D., Brown, A. L., Cocking, R. R. (eds.) (1999): How People Learn – Brain, Mind, Experience, and School. National academy press: Washington.

Breakwell, G.M. (1994): The echo of power: A framework for social psychological research. The Psychologist 17, 65-72.

Breakwell, G.M. (2007): The psychology of Risk. Cambridge University Press: Cambridge.

Bruno, F. (1985): Imprevedibilità del rischio e vulnerabilità sociale al disastro. Disastri Naturali e Protezione Civile, Centro Culturale Sant'Ambrogio: Milano.

Buckle, P. (1998): Redefining community and vulnerability in the context of emergency management, Australian Journal of Emergency Management 13(4), 21-26.

Burgess, J., Chilvers, J. (2006): Upping the ante: A conceptual framework for designing and evaluating participatory technology assessments. Science and Public Policy 33(10), 713-728.

Burgess, J., A. Stirling, J., Clark, G., Davies, M. Eames, K., Williamson, S. (2007): Deliberative mapping: a novel analytic-deliberative methodology to support contested science-policy decisions. Public Understanding of Science 16, 299-322.

Burton, I., Kates, R.W., White, G. F. (1993): The Environment as Hazard, (2nd Ed). Guildford Press: New York and London.

Cannon, T., Twigg, J. and Rowell, J. (2003): Social vulnerability, sustainability livelihoods and disasters. Department for International Development (DFID). (consulted 10.10.2007). URL: www.livelihoods.org/info/doc/vulnerability.doc.

Cardona, O. D. (2004): Curriculum adaptation and disaster prevention in Colombia. In: Stoltman, J. P., Lidstone, J., Dechano, L. M. (eds.): International Perspectives on Natural Disasters. Springer: The Netherlands.

Carney, D., Drinkwater, M., Rusinow, T., Neefjes, K., Wanmali, S., Singh, N. (1999): Livelihood approaches compared. A brief comparison of the livelihood approaches of the UK Deparment of International Development (DFID), CARE, Oxfam and the United Nations Development Programme (UNDP). Institute of Development Studies (IDS) Bulletin 20(2), 1-7.

Carr, L. (1932): Disasters and the Sequence-Pattern Concept of Social Change. American Journal of Sociology 38(2), 207-218.

Chambers, R. (1983): Rural Development: Putting the Last First. Longman: London.

Chambers, R. And Conway, G. (1992): Sustainable Rural Livelihoods: Practical Concepts for the 21st Century. IDS Discussion Paper No. 296. Institute for Development Studies, University of Sussex: Brighton, UK.

CCS [Civil Contingencies Secretariat] (2009): Community Resilience Consultation Outputs. Unpublished paper: London.

Chambers, R. (ed.) (1989): Vulnerability. How the poor cope. IDS: Brighton.

Chappells, H. & Medd, W. (2007): Drought, demand and scale: fluidity and flexibility in the framing of water relations. Interdisciplinary Science Reviews 32, 233-247.

Christenson, J. A., Robinson Jr., J. W. (1980): In Search of Community Development, In: Christenson, J. A., Robinson Jr., J. W. (eds.): Community Development in America. Ames, IA: Iowa State University Press.

Christoplos, I., Mitchell J., Liljelund A. (2001): Re-Framing Risk: The Changing Context of Disaster Mitigation and Preparedness. Disasters 25(3), 185-198.

Clarke, L. (1989): Acceptable Risk Making Decisions in a Toxic Environment. University of California Press: Berkeley, CA.

Commission on Global Governance (1995): Our Global Neighbourhood. Oxford University Press: Oxford.

Corfee-Morlot, J., Kamal-Chaoui, L., Donovan, M. G., Cochran, I., Robert, A., Teasdale, P. J. (2009): Cities, Climate Change and Multilevel Governance, OECD Environment Working Papers, No. 14, OECD Publishing: France.

Coulthard T.J., L. Frostick, H. Hardcastle, K. Jones, D. Rogers and M. Scott, (2007): The 2007 floods in Hull. Final report by the Independent Review Body. 21st November 2007. Hull City Council: Hull.

Craig, G. (2007): Community capacity-building: Something old, something new …? Critical Social Policy 27(3), 335-359.

Cutter, S.L. (2006): Hazards, Vulnerability and Environmental Justice. Earthscan: London.

Cutter, S.L., Boruff, B.J. and Shirley, L.W. (2003): Social vulnerability to environmental hazards. Social Science Quarterly 84(2), 242–261.

Cutter, S.L., Mitchell, J.T. and Scott, M.S. (2000): Revealing the vulnerability of people and places: A case study of Georgetown county, South Carolina. Annals of the Association of American Geographers 90(4), 713-737.

Davidson, R. (1997): An Urban Earthquake Disaster Risk Index. The John A. Blume Earthquake Engineering Center, Department of Civil Engineering, Report 121, Stanford: Stanford University.

Davis, I. (2004): Progress in analysis of social vulnerability and capacity. In: Bankoff, G., Frerks, G., Hilhorst, D. (eds.): Mapping Vulnerability: Disasters, Development and People. London: Earthscan: 128-144.

Davis, I., B. Haghebaert, Peppiatt, D. (2004): 'Social Vulnerability and Capacity Analysis' Workshop. Geneva, 25–26 May 2004. Discussion paper and workshop report. ProVention Consortium: Geneva. (consulted 01.10.2010). URL: http://www.proventionconsortium.org/themes/default/pdfs/VCA_ws04.pdf

DEFRA (2005): Making Space for Water: Developing a new Government Strategy for Flood and Coastal Erosion Risk Management in England: A Delivery Plan. Defra: London.

DEFRA (2008): Consultation on Policy Options for Promoting Property-Level Flood Protection and Resilience. Defra: London.

Delica-Willison, Z., Willison, R. (2004): Vulnerability reduction: A task for the vulnerable people themselves. In: Bankoff, Frerkes, G., Hilhorst, D. (eds.): Mapping Vulnerability: Disasters, Development & People. Earthscan: Sterling, VA.

De Marchi, B. (2003): Public participation and risk governance. Science and Public Policy 30, 171-176.

De Marchi, B., Greco, S., Pellizzoni, L., Bock, B., Wiersum, J. (2006): Trust: from hope to action. In: Romano, D., Stefani, G. (eds): How safe is eating chicken? Firenze University Press: Florence, 39-63.

De Marchi, B., Scolobig, A., Delli Zotti, G., Del Zotto, M. (2007): Risk construction and social vulnerability in an Italian Alpine Region. FLOODsite report T11-06-08. (consulted 30.10.2009). URL: www.floodsite.net.

DKKV [German Committee for Disaster Reduction] (2009): Germany – National Progress Report on the implementation of the Hyogo Framework for Action. (consulted 30.10.2009). URL: http://www.preventionweb.net/english/countries/europe/deu/.

DKKV [German Committee for Disaster Reduction] and UN-ISDR [United Nations: International Strategy for Disaster Reduction] (2009): Concept note: Learning to live with risk. Disaster Risk Reduction to encourage education for Sustainable Development. Prepared for World Conference on Education for Sustainable Development (WCESD), 31 March – 2 April 2009: Bonn.

Douglas, M. (1970). Natural Symbols. Barrie and Rockliff: London.

Douglas, M, Wildavsky, A. (1982): Risk and Culture. University of California Press: Berkeley, CA.

Dunwoody, S, Peters, H. P. (1992): Mass media coverage of technological and environmental risks: a survey of research in the United States and Germany. Public Understanding of Science 1/2,199-230.

Eade, D. (1997): Capacity-Building: An Approach to People-Centred Development. Oxford and Eynsham: Oxford.

Eade, D. (2005): Capacity-Building. An Approach to People-Centred Development. Oxfam Development guidelines (first in 1997): Oxford.

Eade, D., Williams, S. (1996): The Oxfam Handbook of Development and Relief. Oxfam: Oxford.

Earle, T. C., Cvetkovich, G. T. (1995): Social trust: toward a cosmopolitan society, Praeger Publishers: Westport, CT.

Faulkner, H., Parker, D., Green, C., Beven, K. J. (2007): Developing a translational discourse to communicate uncertainty in flood risk between science and the practitioner. Ambio 36(8), 692-703.

FCDL [Federation of Community Development Learning] (2004): Building Civil Renewal of Government Support for Community Capacity Building and Proposals for Change. Submission from Federation of Community Development Learning. FCDL: Sheffield.

Fekete, A. (2009): Validation of a social vulnerability index in context to river-floods in Germany. Natural Hazards and Earth System Sciences 9(2), 393-403.

Fekete, A., Damm, M., Birkmann, J. (2009) Scales as a challenge for vulnerability assessment. Natural Hazards, online first.

Fekete, A. (2010): Assessment of Social Vulnerability for River-Floods in Germany. Doctoral thesis, University of Bonn.

Felgentreff, C., Glade, T. (eds.) (2008): Naturrisiken und Sozialkatastrophen. Spektrum Akademischer Verlag: Heidelberg.

Felgentreff, C. (2003): Post-disaster situations as "window of opportunity"? Post-flood perceptions and changes in the German Odra River region after the 1997 flood. Die Erde 134, 163-180.

Few, R. (2007): Health and climate hazards: Framing social research on vulnerability, response and adaptation. Global Environmental Change 17, 281-295.

Fichter, H., Jähnke, P., Knorr-Siedow, T. (2004): Governance capacity für eine wissensbasierte Stadtentwicklung. In: U. Matthiesen. Stadtregion und Wissen. VS Verlag für Sozialwissenschaften: Wiesbaden, 309-336.

Fischhoff, B. (2006): The Psychological Perception of Risk, McGraw-Hill: New York.

Fischhoff, B., Slovic, P., Lichtenstein, S., Read, S., Combs, B. (1978): How safe is safe enough? A psychometric study of attitudes toward technological risks and benefits. Policy Science, 9, 127-152.

Folke, C., Carpenter, S., Elmqvist, T., Gunderson, L., Holling, C.S., Walker, B. (2002): Resilience and sustainable development: Building adaptive capacity in a world of transformations. Ambio 31(5), 437-440.

Fordham, M.H. (1998): Making women visible in disasters: Problematising the private domain. Disasters 22(2), 126-143.

Frazier, T. G., Wood, N. and B. Yarnal (2010): Stakeholder perspectives on land-use strategies for adapting to climate-change-enhanced coastal hazards: Sarasota, Florida. Applied Geography 30(4), 506-517.

French Disaster Reduction Platform (2007): Insurance and Prevention of Natural Catastrophes, Note by French delegation to UN-ISDR, Global Platform for Disaster Risk Reduction, June 2007: Geneva.

Frewer, L. (2004). The public and effective risk communication. Toxicology Letters, 149, 291-397.

Fudge, S. (2009): Reconciling agency with structure: The contradictions and paradoxes of capacity building in Wales' 2000-2006 Objective 1 programme, Critical Social Policy 29(1), 53-76.

Garland, D. (1996): The limits of the sovereign state: Strategies of crime control in contemporary society. British Journal of Criminology 36(4), 445-471.

Gaillard, J.C., Wisner, B., Cannon, T., Creton-Cazanave, L., Dekens, J., Fordham, M., Gilbert, C., Hewitt, K., Kelman, I., Lavell, A., Morin, J., N'Diaye, A., O'Keefe, P., Oliver-Smith, A., Quesada, C. Revet, S., Sudmeier-Rieux, K.,Texier, P., Galderisi, A., Ceudech, A., Ferrara, F. F., Profice, A. S. (2010): Integration of Different Vulnerabilities vs. Natural and Na-tech Hazards, ENSURE Project, Deliverable 2.2.

Gallopin, G. C. (2006): Linkages between vulnerability, resilience, and adaptive capacity. Global Environmental Change 16, 293-303.

García, V. (2005) : El riesgo como construcción social y la construcción social de los riesgos. México D.F.: Centro de investigaciones y estudios superiores en antropología social.

GEI – Georg Eckert Institut für Schulbuchforschung. (2010) (consulted 05.02.2010). URL: http://www.gei.de/en/georg-eckert-institute-for-international-textbook-research.html .

Gigerenzer, G, Selten, R. (2001): Rethinking rationality. In Gigerenzer, G, Selten, R, (ed.): Bounded Rationality: The Adaptive Toolbox. MIT Press: Boston, MA, 1-12.

Glendinning, C., Powell, M., Rummery, K. (eds.) (2002): Partnerships, New Labour and the Governance of Welfare. Policy Press: Bristol.

Gray, P. C. R., Stern, R. M., Biocca, M. (Eds). (1998): Communicating about risks to environment and health in Europe. Kluwer: Dordrecht. The Nehterlands.

Green, C. and Penning-Rowsell, E. (2007): More or less than words? Vulnerability as discourse. Journal of Risk Research 10(8), 1027–1045.

Greiving, S. (2006): Multi-risk assessment of Europe's regions. In: Birkmann, J. (ed.): Measuring Vulnerability to Natural Hazards: Towards Disaster Resilient Societies. United Nations University Press: New York, 210-226.

Greiving S. & Glade T. (2008): Risk Governance for natural hazards: New concept or old hat?- In: Interpraevent (Ed.): Abstracts. Dornbirn: Austria. 26.-30. May 2008.

Grothmann, T., Reusswig, F. (2006): People at risk of flooding: why some residents take precautionary action while others do not. Natural Hazards 38, 101-120.

Gualini, E. (2002): Institutional capacity building as an issue of collective action and institutionalisation: some theoretical remarks. In: Cars, G. et al. (eds.): Urban Governance, Institutional Capacity and Social Milieux. Ashgate: Aldershot, 29–44.

Gupta, J., Termeer, C., Kostermann, J., Meijerink S., van den Brink, Margo, Jong, P., Nooteboom, S., Bergsma, E. (2010): The adaptive capacity wheel: A method to assess the inherent characteristics of institutions to enable the adaptive capacity of society. Environmental Science and Policy, 13, 459-471.

Gunewardena, N. (2008): Human security versus Neoliberal approaches to disaster recovery. In: Gunewardena, N., Schuller, M. & De Waal, A. (eds.): Capitalizing on Catastrophe: Neoliberal strategies in disaster reconstruction. AltaMira Press: Plymouth.

Gutteling, J. M., Wiegman, O. (1996): Exploring Risk Communication Dordrecht, Kluwer: Dordrecht, The Netherlands.

Hagemeier, M. (2007): In der Praxis eingesetzte Informationsinstrumente im Themenbereich Überschwemmungsgebiete/Hochwasserrisiken, Bericht FloodScan: Technische Universität München.

Haimes, Y. Y. (2004): Risk of extreme events and the fallacy of the expected value. In: Sage, A. P. (ed.): Risk Modeling, Assessment and Management. John Wiley & Sons: Hoboken, 299-321.

Hajer, M., Versteg, W. (2005): Performing governance through networks. European Political Science, 4, 340-347.

Handmer, J. (2003): We are all vulnerable. Australian Journal of Emergency Management 18(3), 55-60.

Handmer, J. W., Dovers, S. R. (1996): A typology of resilience: Rethinking institutions for sustainable development. Industrial and Environmental Crisis Quarterly 9(4), 482-511.

Harley, M., Horrocks, L., Hodgson, N., van Minnen, J. (2008): Climate change vulnerability and adaptation indicators. ETC/ACC Technical Paper 2008/9. (consulted 13.08.2009). URL: http://air-climate.eionet.europa.eu/docs/ETCACC_TP_2008_9_CCvuln_adapt_indicators.pdf.

Hatch, J., Moss, N., Saran, A., Presley-Cantrell, L., Mallory, C. (1993): Community research: partnership in black communities. American Journal of Preventive Medicine 9 (6 Suppl), 27–31.

Heijmans, A. (2004): From vulnerability to empowerment. In: Bankoff, G., Frerks, G., Hilhorst D. (eds): Mapping Vulnerability: Disasters, Development and People. Earthscan: London, 115-127.

Heitz, C, Spaeter, S, Auzet, AV, Glatron, S. (2009): Local stakeholders' perception of muddy flood riskand implications for management approaches: a case study in Alsace (France). Land Use Policy 26, 443-451.

Hewitt, K (1995): Sustainable disasters? Perspectives and power in the discourse of calamity, In: Crush J. (ed.): Power of Development, Routledge: London and New York, 115-128.

Hewitt, K. (1997): Regions of Risk: A Geographical Introduction to Disasters, Longman: London.

Hewitt, K. (1983): The idea of calamity in a technocratic age. In: K. Hewitt. Interpretation of Calamity: From the Viewpoint of Human Ecology. Allen & Unwinn: Boston, 3-32.

Hewitt, K., Burton, I. (1971): The Hazardousness of a Place: A Regional Ecology of Damaging Events. Department of Geography, University of Toronto: Toronto.

Hilhorst, D. and Bankoff, G. (2004): Introduction: Mapping vulnerability. In: Bankoff, G., Frerks, G., Hilhorst D. (eds): Mapping vulnerability: Disasters, Development and People. Earthscan: London, 1-9.

Höppner, C., Buchecker, M., Bründl, M. (2010): Risk communication and natural hazards. CapHaz-Net WP5 report: Birmensdorf; soon available at: http://caphaz-net.org/outcomes-results.

Hurlbert, J. S., Haines, V. A., Beggs, J. J. (2000): Core Networks and Tie Activation: What Kinds of Routine Networks allocate Resources in Nonroutine Situations? American Sociological Review 65, 598–618.

IFRC [International Federation of Red Cross and Red Crescent Societies] (2006): What is VCA? An introduction to vulnerability and capacity assessment. IFRC: Geneva.

INSEE [National Institute for Statistics and Economic Studies] (France) (2003): Structuration de l'espace rural: une approach par les basins de vin. Rapport de l'INSEE (avec la participation de IFEN, INEN, SCEES) pour la DATAR – Juillet 2003.

IPCC [Intergovernmental Panel on Climate Change] (2007): Climate Change 2007 – Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the IPCC. M. Parry, O. Canziani, J. Palutikof, P. van der Linden, C. Hanson. (ed.). Cambridge University Press: Cambridge. (consulted 16.07.2009). URL: www.ipcc.ch.

IRGC [International Risk Governance Council] (2008): An Introduction to the Risk Governance Framework, IRGC: Geneva.

IRGC [International Risk Governance Council] (2009): Risk Governance Deficits: An Analysis and Illustration of the Most Common Deficits in Risk Governance, IRGC: Geneva.

Irwin, A. (2006): The politics of talk: Coming to terms with the 'new' scientific governance. Social Studies of Science 36(2), 299-320.

Israel, B. A., Schulz, A. J., Parker, E. A., Becker, A. B. (1998): Review of community-based research: assessing partnership approaches to improve public health. Annual Review of Public Health 19, 173-202.

Jaeger, C. C., Renn, O., Rosa, E. A., Webler, T. (2001): Risk, Uncertainty, and Rational Action. Earthscan: London.

Johnson, H., Thomas, A. (2007): Individual learning and building organisational capacity for development. Public Administration and Development 27, 39-48.

Joseph, C., Gunton, T. I., Day, J. C. (2008): Implementation of resource management plans: Identifying keys to success. Journal of Environmental Management 88(4), 594-606.

Junker, B., Buchecker, M., Muler-Boker, U. (2007): Objectives of public participation: Which actors should be involved in the decision making for river restorations? Water Resources Research 43(10), 11.

Kaplan, A. (2000): Capacity Building: shifting the paradigms in practice, Development in Practice 10 (3/4), 517-526.

Kahneman, D., Tversky, A. (1979): Prospect theory: an analysis of decision under risk. Econometrica 47, 263-291.

Kaiser, G., Witzki, D. (2004): Public perception of coastal flood defence and participation in coastal flood defence planning. In: Schernewski, G., Dolch, H. (eds.): Geographie der Meere und Küsten. EUCC: The Coastal Union, Coastline report 2004-1, 101-108.

Kasperson, R. E., Golding, D., Tuler, S. (1992): Social distrust as a factor in siting hazardous facilities and communicating risks. Journal of Social Issues 48(4), 161-187.

Kasperson, J. X., Kasperson, R. E., and Turner, B. L. (eds.) (1995): Regions at Risk: Comparisons of Threatened Environments. United Nations University Press: Tokyo.

Kenyon, W. (2007): Evaluating flood risk management options in Scotland: A participant-led multi-criteria approach. Ecological Economics, 64: 70-81.

Kirschenbaum, A. (2004): Generic sources of disaster communities: a social network approach. International Journal of Sociology and Social Policy 24 (10/11), 94-129.

Klein, N. (2007): The Shock Doctrine: The Rise of Disaster Capitalism, Metropolitan Books: New York.

Kleindorfer, P., Kunreuther, P., Michel-Kerjau, E., Zeckhauser, R. (2009): Mitigating and Financing Catastrophic Risks. Principles and Action Framework. White Paper. OECD International Network on the Financial Management of Large-Scale Catastrophes. (consulted 30.11.2010). URL: http://www.oecd.org/dataoecd/15/7/43683753.pdf.

Knight, A, Warland, J. (2005): Determinants of food safety risks: A multi-disciplinary approach. Rural Sociology 70(2), 253-275.

Kolkman, M. J., Kok, M., Van der Veen, A. (2005): Mental model mapping as a new tool to analyse the use of information in decision-making in integrated water management. Physics and Chemistry of the Earth 30, 317-332.

Kolkman, M. J., van der Veen, A., Geurts, P. (2007): Controversies in water management: Frames and mental models. Environmental Impact Assessment Review 27(7), 685-706.

Kollmuss, A., Agyeman, J. (2002): Mind the gap: why people act environmentally and what are the barriers to pro-environmental behaviour? Environmental Education Research 8(3), 239-260.

Komac, B. (2009): Social memory and geographical memory of natural disasters. Acta Geographica Slovenica 49(1), 199-226.

Komac, B., Ciglič, R., Gašperič, P., Orožen Adamič, M., Pavšek, M., Pipan, P., Zorn, M. (2010): Risk education and natural hazards. CapHaz-Net WP6 report. Ljubljana. URL: http://caphaz-net.org/outcomes-results.

Kuhlicke, C., Scolobig, A., Tapsell S., Steinführer, A., De Marchi B. (under revision): Contextualizing social vulnerability: findings from case studies across Europe. Submitted to: Natural Hazards.

Kuhlicke, C., Steinführer, A. (2010): Social capacity building for natural hazards. A conceptual frame. CapHaz-Net WP1 report. Leipzig and Braunschweig. URL: http://caphaz-net.org/outcomes-results.

Kunreuther, H. (2000): Insurance as cornerstone for public-private sector partnerships. Natural Hazards Review 1/2, 126-136.

Land, T. (2009): Organism or machine? Capacity 37(1), 7-9.

Lindell, M. K., Perry, R. W. (2004): Communicating Environmental Risk in Multiethnic Communities. Sage Publications: Thousand Oaks, CA.

Linneroth-Bayer, J., Fitzgerald, K. B. (1996): Conflicting views on fair siting processes: evidence from Austria and the US. Risk Issues in Health, Safety and Environment 7(2), 119-134.

Loewenstein, G., Weber, E., Hsee, C., Welch, E. (2001): Risk as feelings. Psychological Bulletin 127, 267-286.

Lundgren, R. E., McMakin, A. H. (2009): Risk Communication – A Handbook for Communicating Environmental, Safety, and Health Risks. WILEY: New Jersey.

Macaulay, J. (2004): Disaster education in New Zealand. In: Stoltman, J. P., Lidstone, J., Dechano, L. M. (eds.): International Perspectives on Natural Disasters: Occurrence, Mitigation, and Consequences. Kluwer: Dordrecht, The Netherlands.

Maconick, R. (2002): Introduction. In: Maconick, R. (ed.): Capacity-Building for Poverty Eradication: Analysis of, and Lessons from, Evaluations of UN System Support to Countries' Efforts. UN: New York.

Manyena, S. B. M. (2006): The concept of resilience revisited. Disasters 30(4), 434-450.

Marshall, B. K. (1999): Globalization, environmental degradation and Ulrich Beck's risk society. Environmental Values, Special Issue: Risk 8(2), 253-275.

Matthiesen, U. (2005): Knowledge scapes: Pleading for a knowledge turn in socio-spatial research. Working Paper. (Consulted 01.02.2006). URL: http://www.irs-net.de/download/KnowledgeScapes.pdf.

May, P.J., Burby, R.J., Ericksen, N.J., Handmer, J.W., Dixon, J.E., Michaels, S., Smith D.I. (1996): Environmental Management and Governance: Intergovernmental Approaches to Hazards and Sustainability. London, Routledge.

Mazur, A. (1987): Does public perception of risk explain the social response to potential hazard? Quarterly Journal of Ideology 11(1), 41-45.

McCarthy, S. (2007): Contextual influences on national level flood risk communication. Environmental Hazards 7, 128-140.

McCarthy, J. and M. L. Martello (2003): Climate Change in the Context of Multiple Stressors and Resilience. A. A. C. I. Assessment. Cambridge, Cambridge University Press.

McDaniels, T., Axelrod, L., Slovic, P. (1995): Characterizing perception of Ecological Risk. Risk Analysis 15(5), 575-590.

McGinty, S. (2003): Community Capacity-Building. Paper presented at Australian Association for Research in Education conference, Brisbane, Australia. (consulted 30.12.2009). URL: www.aare.edu.au.

Medd, W., Marvin, S. (2005): From the politics of urgency to the governance of preparedness: a research agenda on urban vulnerability. Journal of Contingencies and Crisis Management 13(2), 44-49.

Merz, B., Hall, J., Disse, M., Schumann, A. (2010): Fluvial flood risk management in a changing world. Natural Hazards and Earth System Sciences 10, 509-527.

Miceli, R., Sotgiu, I., Settanni, M. (2008): Disaster preparedness and perception of flood risk: a study in an alpine valley in Italy. Journal of Environmental Psychology 28, 164-173.

Mileti, D. S. (1999): Disasters by Design: A reassessment of natural hazards in the United States, Joseph Henry Press: Washington DC.

Morgan M., Fischoff B., Bostrom A. (2001): Risk communication: the mental model approach. Cambridge University Press: New York.

Morrow, B. H. (1999): Identifying and mapping community vulnerability. Disasters 23(1), 1-18.

Moser, S. C. (2010): Communicating climate change: history, challenges, process and future directions. WIREs Climate Change 1(1), 31-53.

Moser, C. (1998): The asset vulnerability framework: re-assessing ultra poverty reduction strategies. World Development 26(1), 1-19.

Mosert, E., Craps, M., Pahl-Wostl, C. (2008): Social learning: the key to integrated water resources management? Water International 33(3), 293-304.

Murdoch, K. (2004): Teaching and learning to live with the environment. In: Stoltman, J. P., Lidstone, J., Dechano, L. M. (eds.): International Perspectives on Natural Disasters: Occurrence, Mitigation, and Consequences. Kluwer Academic Publisher: Dordrecht, The Netherlands, 341-358.

Muturi, H. R. (2005): Space education and capacity building for sustainable development (consulted: 12.10.10). URL: http://www.oosa.unvienna.org/pdf/sap/2005/japan/presentations/P_Muturi.pdf.

Mythen, G. (2005): Employment, individualization, and insecurity: Rethinking the risk society perspective. The Sociological Review 53(1), 129-149.

Nakagawa, Y., Shaw, R. (2004): Social Capital: A Missing Link to Disaster Recovery. International Journal of Mass Emergencies and Disasters 22, 5-34.

Nunn, A. (2007): The capacity building programme for English local government: evaluating mechanisms for delivering improvement support to local authorities, Local Government Studies 33: 465-484.

OECD [Organization for Economic Cooperation and Development] (2002): Flood Insurance, Directorate for Financial, Fiscale and Enterprise Affairs Insurance Committee, Report DAFFE/AS/WD(2002)29.

OECD-DAC [Organization for Economic Cooperation and Development-Development Assistance Committee] (2006): Network on Governance: The Challenge of Capacity Development: Working towards Good Practice, OECD Publications: France.

O'Keefe, P., Westgate, K., Wisner, B. (1976): Taking the Naturalness out of Natural Disasters. Nature 260, 566-567.

O'Neill, P. (2004): Developing a risk communication model to encourage community safety from natural hazards. Presented at the 4th NSW Safe Communities Symposium, Sydney, NSW, 2004. (consulted 10.09.2010). URL:
http://www.ses.nsw.gov.au/multiversions/2304/FileName/Developing_a_risk_communication_model.pdf

Osborne, D., Gaebler, T. (1992): Reinventing government: how the entrepreneurial spirit is transforming the public sector, Reading: MA.

Pahl-Wostl, M., Craps, A., Dewulf, E., Mostert, D., Tabara, Taillieu, T. (2007): Social learning and water resources management. Ecology and Society 12(2): Art. 5 (Consulted: 12.12.10). URL: http://www.ecologyandsociety.org/vol12/iss2/art5/.

Pavey, J. L., Muth, A. B., Ostermeier, D., Steiner Davis, M. (2007): Building capacity for local governance: An application of interactional theory to developing a community of interest, Rural Sociology 72, 90-110.

Pearce, L. (2003): Disaster management and community planning and public participation: how to achieve sustainable hazard mitigation. Natural Hazards 28, 211-228.

Pelanda, C. (1982): Il contributo della sociologia dei disastri all'analisi della vulnerabilità sociosistemica, in Quaderno n. 82-6, Programma Emergenze di Massa, ISIG: Gorizia.

Pelling, M. (1998): Participation, social capital and vulnerability to urban flooding in Guyana. Journal of International Development 10, 469-486.

Pelling, M. (2002): Assessing urban vulnerability and social adaptation to risk - Evidence from Santo Domingo, International Development Planning Review 24(1), 59-76

Pelling, M. (2003): The vulnerability of cities, Earthscan: London.

Pelling, M., High, C. (2005): Understanding adaptation: What can social capital offer assessments of adaptive capacity? Global Environmental Change 15, 308-319.

Pelling, M. (2007): Learning from others: scope and challenges for participatory disaster risk assessment, Disasters 31(4), 373-385.

Peters, H. P. (1991): Durch Risikokommunikation zur Technikakzeptanz? Die Konstruktion von Risiko-‚Wirklichkeiten' durch Experten, Gegenexperten und Öffentlichkeit. In: Krüger, J., Ruß-Mohl, S., (eds.): Risikokommunikationen. Edition Sigma: Berlin, 11-67.

Peters, E., Burraston, B., Mertz, C. K. (2004): An emotion-based model of risk perception and stigma-susceptibility cognitive-appraisals of emotion, affective reactivity, worldviews, and risk perceptions in the generation of technological stigma. Risk Analysis 24(5), 1349-1367.

Petersen, T., Klauer, B., Manstetten, R. (2009): The Environment as a Challenge for Governmental Responsibility – The Case of the European Water Framework Directive. Ecological Economics 68, 2058–2065

Pidgeon, N. F. (1997): The limits to safety? Culture, politics, learning and manmade disasters. Journal of Contingencies and Crisis Management 5(1), 1-14.

Plapp. T. (2001): Perception and Evaluation of Natural Risks. Institute for Insurance of the University of Karlsruhe: Karlsruhe.

Plapp, T. (2004): Wahrnehmung von Risiken aus Naturkatastrophen. Eine empirische Untersuchung in sechs gefährdeten Gebieten Süd- und Westdeutschlands. VVW Verlag Versicherungswirtschaft: Karlsruhe. Karlsruher Reihe II: Risikoforschung und Versicherungsmanagement, 2.

Plapp, T, Werner, U. (2006): Understanding risk perception from natural hazards: Examples from Germany. Risk 21, 101-108.

Plattner, T., Plapp, T., Hebel, B. (2006): Integrating public risk perception into formal natural hazard risk assessment. Natural Hazards and Earth System Sciences 6, 471-483.

Plough, A., Krimsky, S. (1987): The emergence of risk communication studies: Social and political context. Science, Technology & Human Values 12(2-3), 4-10.

Powell, M. C., Colin, M. (2009): Participatory paradoxes: Facilitating citizen engagement in science and technology from the top-down?, Bulletin of Science, Technology & Society 29, 325-342.

Putnam, R. D. (2000): Bowling Alone. The Collapse and Revival of American Community, Simon & Schuster: New York.

Ramalingam, B. (2008): Organisational learning for aid, and learning aid organisations. Capacity 33, 4-6.

Renn, O. (1992): Concepts of risk: A classification. In: Krimsky, S., Golding, D., (eds.): Social Theories of Risk, Praeger: Westport, 53-79.

Renn, O. (2008): Risk Governance. Coping with Uncertainty in a Complex World, Earthscan: London.

Renn, O., Schweizer, P. J., Dreyer, M., Klinke, A. (2007): Risiko. Über den gesellschaftlichen Umgang mit Unsicherheit. Oekom: München.

Rhodes, R. A. W. (1997): Understanding Governance: Policy Networks, Governance, Reflexivity and Accountability, Open University Press: Buckingham.

Rogers-Wright, A. (2009): Rethinking the spaces and institutions of flood governance in Hull. Hull.

Rosenau, J. (2004): Strong demand, huge supply: governance in an emerging epoch. In: Bache, I., Flinders, M. (eds.): Multi-level Governance. University Press: Oxford, 31-48.

Rohrmann, B. (2000): Cross-national studies on the perception and evaluation of hazards. In: Renn, O, Rohrmann, B, (eds.): Cross-Cultural Risk Perception: A Survey of Empirical Studies. Kluwer: Dordrecht and Boston, 55-78.

Rohrmann, B., Renn, O. (2000): Risk perception research – an introduction. In: Renn, O., Rohrmann, B, (eds.): Cross-Cultural Risk Perception: A Survey of Empirical Studies. Kluwer: Dordrecht and Boston, 11-54.

Ronan, K. R., Crellin, K., Johnston, D. (2010): Correlates of hazards education for youth: a replication study. Natural Hazards 53(3), 503-526.

Rosa, E. A., Matsuda, N., Kleinhesselink, R. R. (2000): The cognitive architecture of risk: Pancultural unity or cultural shaping?. In: Renn, O., Rohrmann, B., (eds.): Cross-Cultural Risk Perception: A Survey of Empirical Studies. Kluwer: Dordrecht and Boston, 185-210.

Ross, L. D. (1977): The intuitive psychologist and his shortcomings: distortions in the attribution process. In: Berkowitz, L, (ed.): Advances in Experimental Social Psychology. Random House: New York, 173-220.

Ruin, I., Gaillard, J., Lutoff, C. (2007): How to get there? Assessing motorists' flash flood risk perception on daily itineraries. Environmental Hazards 7, 235-244.

Sakdapolrak, P. (2007): Water Related Health Risk, Social Vulnerability and Pierre Bourdieu. In: K. Warner. Perspectives on Social Vulnerability. UNU Institute for Environment and Human Security: Bonn, 51-59.

Scharpf, F.W. (1989): Decision Rules, Decision Styles and Policy Choices. Journal of Theoretical Politics 1(2), 149-176.

Schmidt-Wulfen, W.-D. (2005). Zur didaktischen Relevanz lokaler Katastrophenwahrnehmungen. Internationale Schulbuchforschung 27(4), 403-405.

Schmithüsen, F. (2003): Wandel des Erdkundeschulbuchs seit dem Kieler Geographentag. Shaker: Aachen.

Schneider, R. O. (2002): Hazard mitigation and sustainable community development. Disaster Prevention and Management 11, 141-147.

Schnur, O. (2003): Lokales Sozialkapital für die „soziale Stadt". Politische Geographien sozialer Quartiersentwicklung am Beispiel Berlin-Moabit. Leske + Budrich: Opladen.

Schwarze, R., Wagner, G. G. (2007): The political economy of natural disaster insurance: lessons from the failure of a proposed compulsory insurance scheme in Germany. European Environment 17, 403-415.

Scolobig, A., Castan-Broto, V., Zabala, A. (2008): Integrating multiple perspectives in social multicriteria evaluation of flood mitigation alternatives. The case of Malborghetto-Valbruna. Environment and Planning C: Government and Policy 26, 1143-1161.

Senegačnik, J. (2005): Geografija Evrope v šolskih učbenikih evropskih držav. PhD. Thesis. Filozofska fakulteta, Oddelek za geografijo: Ljubljana.

Shubik, M. (1991): Risk, society, politicians, scientists, and people. In: Shubik, M, (ed.): Risk, Organizations, and Society. Kluwer: Dordrecht and Boston, 7-30.

Siegrist, M., Gutscher, H. (2006): Flooding risks: A comparison of lay people's perceptions and expert's assessments in Switzerland. Risk Analysis 26(4), 971-979.

Siegrist, M., Gutscher, H. (2008): Natural hazards and motivation for mitigation behavior: People cannot predict the affect evoked by a severe flood. Risk Analysis 28(3), 771-778.

Singh, S. J. (2009): Complex disasters. The Nicobar Islands in the grip of humanitarian aid, Geographische Rundschau International Edition 5(3), 48-56.

Sjöberg, L. (2000): Perceived risk and tampering with nature. Journal of Risk Research 3/4, 353-367.

Sjöberg, L. (2001): Political decisions and public risk perception. Reliability Engineering and System Safety 72: 115-123.

Sjöberg, L., Kolarova, D., Rucai, A. A., Bernström, M. L. (2000): Risk perception in Bulgaria and Romania. In: Renn, O., Rohrmann, B., (eds.): Cross-Cultural Risk Perception: A Survey of Empirical Studies. Kluwer: Dordrecht and Boston, 145-184.

Slovic P. (1987) Perception of risk. Science 236, 280-285.

Slovic, P. (1992): Perception of risk reflections on the psychometric paradigm. In: Krimsky, S., Golding, D. (eds.): Social Theories of Risk. Praeger: Westport, 117–152.

Slovic, P. (1993): Perceived risk, trust, and democracy. Risk Analysis 13(6), 675-682.

Slovic, P. (2000): Informing and educating the public about risk. In: Slovic, P. (ed.): The Perception of Risk. Earthscan: London, 226-227.

Slovic, P., Finucane, E., Peters, D., MacGregor, R. (2002): The affect heuristic. In: Gilovich,T., Griffin, D., Kahneman, D. (eds.): Intuitive Judgment Heuristics and Biases. Cambridge University Press: Cambridge and Boston, 397-420.

Slinger, J., Cuppen, M., Muller, M., Hendriks, M. (2007): How responsive are scientists and policy makers to the perceptions of Dutch and Flemish citizens living alongside the Scheldt Estuary? Insights on Flood Risk Management from the Netherlands, newater.com. (consulted 12.03.2009). URL: http://www.newater.info/caiwa/data/papers%20session/J2/Slinger%20et%20al%20Responsiveness%20of%20scientists%20and%20policy%20makers.pdf.

Smith, J. (2005): Dangerous news: Media decision making about climate change risk. Risk Analysis 25(6), 1471-1481.

Stanghellini, L. P. S., Collentine, D. (2008): Stakeholder discourse and water management – implementation of the participatory model CATCH in a Northern Italian alpine sub-catchment. Hydrology and Earth System Sciences 12, 317-331.

Steinführer, A., Kuhlicke, C. (2007): Social Vulnerability and the 2002 Flood: Country Report Germany (Mulde River). FLOODsite report T11-07-08. (consulted 07.10.2009). URL: www.floodsite.net.

Steinführer, A., Kuhlicke, C., De Marchi, B., Scolobig, A., Tapsell, S., Tunstall, S. (2008): Towards flood risk management with the people at risk: from scientific analysis to practice recommendations (and back). In: Samuels, P., Huntington, S., Allsop, W., Harrop, J. (eds.): Flood Risk Management: Research and Practice. CRC Press/Balkema: Leiden, 945-955.

Stoltman, J. P., Lidstone, J., Dechano, L. M., (eds.) (2004): International Perspectives on Natural Disasters: Occurence, Mitigation, and Consequences. Kluwer: Dordrecht, The Netherlands.

Susman, P., O´Keefe, P., Wisner, B. (1983): Global disasters, a radical interpretation. In: Hewitt, K. (ed.): Interpretation of Calamity: From the Viewpoint of Human Ecology. Allen & Unwinn: Boston, 263-283.

Sweet, S. (1998): The effect of a natural disaster on social cohesion: A longitudinal study. International Journal of Mass Emergencies and Disasters 16, 321-331.

Tapsell, S., R. Burton, S., Oakes, D. J., Parker, D. J. (2005): The Social Performance of Flood Warning Communication Technologies, Technical Report. The Environment Agency: Bristol, UK.

Tapsell, S., McCarthy, S., Faulkner, H., Alexander, M. (2010): Social Vulnerability and Natural Hazards. CapHaz-Net WP4 Report, Flood Hazard Research Centre – FHRC, Middlesex University, London. URL: http://caphaz-net.org/outcomes-results.

Tapsell, S. M., Penning-Rowsell, E.C., Tunstall, S.M., Wilson, T. (2002): Vulnerability to flooding: health and social dimensions. Philosophical Transactions of the Royal Society London A 360, 1511-1525.

Tedmanson, D. (2003): Whose capacity needs building? Open hearts and empty hands: Reflections on capacity building in remote communities. Paper given at the 4th International Critical Management Studies Conference, University of South Australia.

Terpstra, T. (2009): Flood preparedness: thoughts, feelings and intentions of the Dutch public. Thesis, University of Twente, The Netherlands.

Thompson, M. (1980): An outline of the cultural theory of risk. Working Paper of the International Institute for Applied Systems Analysis (IIASA), WP–80–177, IIASA: Laxenburg, Austria.

Thompson, M, Ellis, W, Wildavsky, A. Cultural Theory. Westview Press, Boulder, CO, 1990.

Thywissen, K. (2006): Core terminology of disaster reduction: A comparative glossary. In: Birkmann, J. (ed.): Measuring vulnerability to natural hazards: Towards disaster resilient societies. United Nations University Press: New York, 448-496.

Tierney, K. J., Lindell, M.K., Perry, R. W. (2001): Facing the Unexpected: Disaster Preparedness and Response in the United States. Joseph Henry Press: Washington, DC.

Timmerman, P. (1981): Vulnerability, Resilience and the Collapse of Society. Institute for Environmental Studies, University of Toronto: Toronto.

Tompkins, E., Carmen Lemos, M., Boyd, E. (2008): A less disastrous disaster: Managing response to climate-driven hazards in the Caymen Islands and NE Brazil. Global Environmental Change 18, 736-745.

Turner II, B.L., Kasperson, R.E., Matson, P.A., McCarthy, J.J., Corell, R.W., Christensen, L., Eckley, N., Kasperson, J.X., Luers, A., Martello, M.L., Polsky, C., Pulsipher, A., Schiller, A. (2003): A framework for vulnerability analysis in sustainability science. PNAS 100 (14), 8074-8079.

UN-ISDR [United Nations-International Strategy for Disaster Reduction] (2004): Living with risk. A global review of disaster reduction initiatives. United Nations-International Strategy for Disaster Reduction: Geneva. (consulted 21.12.2009). URL: http://www.unisdr.org/eng/about_isdr/bd-lwr-2004-eng.htm.

UN/ISDR [International Strategy for Disaster Reduction] (2006): Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters. World Conference on Disaster Reduction. Extract from the final report of the World Conference on Disaster Reduction, 18-22 January 2005, Kobe, Hyogo, Japan. United Nations-International Strategy for Disaster Reduction: Geneva. (consulted 21.12.2009). URL: http://www.unisdr.org.

UN/ISDR [United Nations-International Strategy for Disaster Reduction] (2006a) Disaster Risk Reduction begins at School. (consulted: 30.11.2010). URL: http://www.preventionweb.net/files/3914_VL108003.pdf.

UN/ISDR [United Nations-International Strategy for Disaster Reduction] (2009a) Towards a Culture of Prevention: Disaster Risk Reduction Begins at School – Good Practices and Lessons Learned/. 2007. United Nations-International Strategy for Disaster Reduction: Geneva. (consulted 29.06.2009). URL: http://www.unisdr.org/eng/about_isdr/isdr-publications/11-education-good-practices/education-good-practices.pdf.

UN/ISDR [United Nations-International Strategy for Disaster Reduction] (2009b): Terminology on Disaster Risk Reduction. United Nations: Geneva.

UN/ISDR (2010) Local governments and disaster risk reduction: Good practices and lessons learned. (consulted: 30.11.2010). URL: http://www.prevention2000.org/memorisks/docs/ISDR_2010_LocalGovernmentsandDisasterRiskReduction.pdf.

UN and World Bank (2010) Natural Hazards and UnNatural Disasters: The Economics of Effective Prevention. (consulted: 20.11.2010). URL: http://www.gfdrr.org/gfdrr/sites/gfdrr.org/files/nhud/files/NHUD-Report_Full.pdf.

Unnerstall, H. (2010): Legal Framework for Public Participation in Flood Risk Mapping. A comparative study of the responses of different European Member States to some requirements of the Floods Directive. Leipzig: Helmholtz Centre for Environmental Research – UFZ. UFZ Discussion Paper 13/2010. (consulted: 30.11.2010). URL: http://www.ufz.de/index.php?en=14487.

Urban habitat constructions under catastrophic events. Cost C 26. 2010. (consulted: 4.2.2010) http://www.civ.uth.gr/cost-c26.

van Dillen, S. (2002): A Measure of vulnerability. Geographica Helvetica 57(1), 64-77.

Villagran de Leon, J.C. (2006): Vulnerability. A Conceptual and Methodological Review, Studies of the University: Research, Counsel, Education, Publication Series of UNU-EHS 4/2006.

Vitek, D., Berta S.M. (1982): Improving risk perception of and response to natural hazards: The need for local education. Journal of Geography 81(6), 225-228.

Voss, M. (2008): The vulnerable can't speak. An integrative vulnerability approach to disaster and climate change research, Behemoth – A Journal on Civilisation 3(1), 39-71.

Wachinger, G., Renn, O. (2010): Risk perception and natural hazards. CapHaz-Net WP3 report: Stuttgart. URL: http://caphaz-net.org/outcomes-results.

Wagner, K. (2005): Wie sag ich's der Bevölkerung? Evaluation einer Ausstellung und eines Lehrpfades zum Thema ‚Alpine Naturgefahren'. Geographica Helvetica 60(1), 54-61.

Walker, B., Holling, C. S., Carpenter, S. R., Kinzig, A. (2004): Resilience, adaptability, and transformability in social-ecological systems, Ecology and Society 9(2), Art5. (consulted: 12.12.10). URL: http://www.ecologyandsociety.org/vol9/iss2/art5/.

Walker, G., Whittle, R., Medd, W., Watson, N. (2010): Risk governance and natural hazards. CapHaz-Net WP2 report. Lancaster. URL: http://caphaz-net.org/outcomes-results.

Watts, M., Bohle, H.-G. (1993): The space of vulnerability: The causal structure of hunger and famine. Progress in Human Geography 17(1), 43-67.

Watson, N., Deeming, H., Treffency, R. (2009): Beyond bureaucracy? Assessing institutional change in the governance of water in England, Water Alternatives 2(3), 448-460.

Weichselgartner, J. (2001): Disaster mitigation: the concept of vulnerability revisited, Disaster Prevention and Management 10(2), 85-94.

Weichselgartner, J. (2003): Toward a policy-relevant hazard geography: critical comments on geographic natural hazard research. Die Erde 134(2), 121-138.

Weichselgartner, J., Kasperson, R. (2010): Barriers in the science-policy-practice interface: Toward a knowledge-action-system in global environmental change research. Global Environmental Change 20 (2), 266-277.

Weichselgartner, J., Obersteiner, M. (2002): Knowing sufficient and applying more: challenges in hazards management. Global Environmental Change Part B: Environmental Hazards 4 (2-3), 73-77.

White, G. F., Kates, R. W., Burton, I. (2001): Knowing better and losing even more: the use of knowledge in hazards management. Environmental Hazards 3, 81-92.

White, G. F. (1974): Natural hazards research: concepts, methods, and policy implications. In: White, G. F.: Natural Hazards: Local, National, Global. Oxford University Press: New York, 3-16.

WHO [World Health Organization] (1998): The application of risk communication to food standards and safety matters. Report of a Joint FAO/WHO Expert Consultation, Rome, 2–6 February 1998: Rome. (consulted 31.10.2010). URL: http://www.who.int/foodsafety/micro/riskcommunication/en/index.html

Wilkinson, I. (2001): Social theories of risk perception at once indispensable and insufficient. Current Sociology 49(1), 1-22.

Wisner, B. (2005): Tracking Vulnerability: History, Use, Potential and Limitations of a Concept. Keynote Address. SIDA & Stockholm University Research Conference on Structures of Vulnerability: Mobilisation and Research, January 12-14: Stockholm.

Wisner, B. (2006): Risk reduction indicators: Social vulnerability. Annex B-6. In: TRIAMS Working Paper – Risk reduction indicators. (consulted 14.04.2009). URL: http://www.proventionconsortium.org/themes/default/pdfs/TRIAMS_social_vulnerability.pdf.

Wisner, B. (2006a): Let Our Children Teach Us! A Review of the Role of Education and Knowledge in Disaster Risk Reduction. ISDR System Thematic Cluster, Platform on Knowledge and Education: Bangalore.

Wisner, B. (2004): Assessment of capability and vulnerability. In: Bankoff G., Frerks G., Hilhorst D. (eds.): Mapping vulnerability: Disasters, development and people. Earthscan: London, 183-193.

Wisner, B., Blaikie, P., Cannon, T., Davis, I. (2004): At Risk: Natural Hazards, Peoples Vulnerability and Disasters, 2nd edition, Routledge: London.

Winchester, P. (1992): Power, Choice and Vulnerability: A Case Study in Disaster Mismanagement in South India. James & James Science Publishers: London.

Wynne, B. (2006): Public engagement as a means of restoring public trust in science – Hitting the notes, but missing the music? Community Genetics 9, 211-220.