Driving Innovation in **Cr**isis Management for **E**uropean **R**esilience

D32.1 – Report on risk perception

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Lead Participant	USTUTT	Lead Author	Janina Hofer
Contributors	DRC, FHG-IAO	Reviewers	Laura Birkman (ECORYS)
			Monika Höglinger (ARC)

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Document Information

List of Contributors

Name	Partner
Janina Hofer	USTUTT
Alexander Karapidis	FHG-IAO
Karin Hamann	FHG-IAO
Bernd Dworschak	FHG-IAO
Cecilie Dinesen	DRC
Louise Vinther-Larsen	DRC

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List of Acronyms

Abbreviation / acronym	Description
IFRC	International Federation of Red Cross and Red Crescent Societies
SP3	Sub-project 3 on Civil Society Resilience (within DRIVER)
UNISDR	United Nations Office for Disaster Risk Reduction
NGO	Non-governmental organization
EU	European Union
US	United States

Project Description

DRIVER evaluates solutions in three key areas: civil society resilience, responder coordination as well as training and learning.

These solutions are evaluated using the DRIVER test-bed. Besides cost-effectiveness, DRIVER also considers societal impact and related regulatory frameworks and procedures. Evaluation results will be summarised in a roadmap for innovation in crisis management and societal resilience.

Finally, looking forward beyond the lifetime of the project, the benefits of DRIVER will materialize in enhanced crisis management practices, efficiency and through the DRIVER-promoted connection of existing networks.

DRIVER Step #1: Evaluation Framework

- Developing test-bed infrastructure and methodology to test and evaluate novel solutions, during the project and beyond. It provides guidelines on how to plan and perform experiments, as well as a framework for evaluation.
- Analysing regulatory frameworks and procedures relevant for the implementation of DRIVER-tested solutions including standardisation.
- Developing methodology for fostering societal values and avoiding negative side-effects to society as a whole from crisis management and societal resilience solutions.

DRIVER Step #2: Compiling and evaluating solutions

- Strengthening crisis communication and facilitating community engagement and self-organisation.
- Evaluating solutions for professional responders with a focus on improving the coordination of the response effort.
- Benefiting professionals across borders by sharing learning solutions, lessons learned and competencies.

DRIVER Step #3: Large scale experiments and demonstration

- Execution of large-scale experiments to integrate and evaluate crisis management solutions.
- Demonstrating improvements in enhanced crisis management practices and resilience through the DRIVER experiments.

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Executive Summary

The objective of "Report on risk perception" (D32.1) is to provide basic information about risk perception factors relevant to improve preparedness for the benefit of a resilient society. One of the main motivations for and challenges of this deliverable is that in contemporary approaches of organisations, officials and research there is still a shortage of answers to the question on how to enhance risk perception and preparedness by learning, training and resilience communication.

The project team investigated relevant concepts on risk perception and preparedness and analysed concepts that link risk perception, preparedness and resilience by desk research of research literature, articles in journals, and findings of projects. The results show that the link between risk perception, preparedness and resilience is still unclear but exists at least to some extent and has been conceptualized by different approaches. Second, the key factors that were identified to influence risk perception, preparedness and resilience have revealed numerous aspects to enhance learning, training and resilience communication that can be exploited to increase resilience in society. Based on these findings, the DRIVER risk perception framework has been constructed.

The findings in this deliverable can be used as a basis for individual and volunteer preparedness training and resilience communication activities in follow-up tasks of WP32 in DRIVER, the entire DRIVER consortium and – to some extent – organisations outside of the DRIVER consortium. They can be used by crisis management experts, governmental organisations and research organisations dealing with learning, training and resilience communication before, during and after a crisis. Crisis management experts can derive conclusions to strengthen and improve resilience, risk perception and preparedness by learning, training and communication activities. The results also aim to trigger new activities along the key factors of risk perception and preparedness identified in DRIVER. Governmental institutions can use the finding to evaluate existing activities and those carried out. Researchers could use the findings for further research by focussing their efforts on appropriate learning and training concepts or resilience communication concepts.

Summarizing, the key finding of this deliverable is the DRIVER risk perception framework including priorities of action for learning, training and resilience communication that should be followed to strengthen already existing activities to prepare individuals for the benefit of resilient societies to prevent or at least decrease the impact of crises and disasters.

For the entire task in total 12 PM were projected in the DoW of DRIVER. This includes not only D32.1 but also meetings with partners, discussions with experts and preparing activities for the entire topic to be implemented in the SP3 context. Figures of higher PM that emerged in some documents before have been re-distributed in the correct form in the SP3 relevant financial documents of DRIVER.

1 Introduction & Methodology

The objective of this report is to provide basic information on risk perception and preparedness by analysing literature. We identify factors that influence risk perception and preparedness in order to derive priorities of action for (re)arranging trainings and learning activities offered especially by civil protection actors. Furthermore, an extended insight into the connection of risk perception and preparedness should deliver a basis for developing adequate concepts how to communicate prevention and action plans within communities in case of crisis situations in a more effective and efficient way than today.

Resilience is not just the immediate ability to respond to a situation of adversity, but rather a process of adaptation before, during and after a crisis situation (International Federation of Red Cross and Red Crescent Societies, 2012; see for more details D31.21). Preparedness is therefore seen as an integral part of resilience. Thus, the ability of individuals to prepare for a disaster before it occurs is a logical starting point for understanding and enhancing resilience.

Risk perception is believed to affect people's preparedness for, responses to and recovery from different types of disasters (Grothmann and Reusswig, 2006; Bradford et al., 2012; Bubeck et al., 2013; Scolobig et al., 2012; Hernández-Moreno and Alcántara-Ayala, 2016). Risk perception can be understood as a process of collecting, selecting and interpreting signals about uncertain impacts of threats and crisis situations (Renn, 1990; Wachinger and Renn, 2010). The perception of risks depends on an assessment of threats which in turn depends on an estimation of the external stress cause (degree of the risk) as well as an analysis of available resources to cope with the threat adequately (Lazarus and Folkman, 1984).

There is, however, a general assumption that high risk perception leads to improved preparedness because people with a high risk perception usually have a better knowledge on appropriate behaviour in a crisis situation (Calvello et al., 2015). This report challenges the notion that high risk perception automatically leads to adequate preparedness and instead explores the complex relation between the two as well as the factors influencing them. Without an understanding of how people assess risks, well-intended policies and measures may be ineffective or even lead to undesired results.

The findings will feed into the remaining tasks in WP32, which focus on testing and validating existing training and learning activities for building resilient individuals, volunteers and communities. Furthermore, the findings of this report on how individuals perceive, process and act on risks should be taken into consideration when planning not only training and learning activities but also crisis communication, as well as more traditional "command and control" activities. The conclusions from the British Red Cross underlies the importance of the individual perspective when stating "principle recommendation that the needs of individuals affected by an emergency or disaster should be placed at the centre of each country's civil protection arrangement" (Reser and Morrissey, 2008). As such, the findings are relevant at SP3 level – in relation to community resilience (WP33) and crisis communication (WP35) as well as the other SPs within DRIVER.

The report is structured as follows: In the second chapter we outline the terms and concepts of risk perception, preparedness and resilience. In the third chapter the link and interdependencies of risk perception, preparedness and resilience are discussed. The fourth chapter outlines the factors influencing risk perception on disaster preparedness. Based on these findings, the DRIVER risk perception framework is described in chapter five. It includes priorities of action to enhance risk perception of individuals by learning and training activities in order to strengthen individual resilience as well as community resilience. Moreover, these recommendations build the link for the follow-up tasks in this DRIVER work package (like deriving and developing trainings for end-users) and for other SPs and WPs in DRIVER.

The four steps comprising the approach for this deliverable are summarized in Figure 1.

Step 1 • Investigation of relevant terms and concepts

Step 2 • Development of the link between risk perception, preparedness, and resilience

Step 3 • Exploration of factors of risk perception influencing preparedness

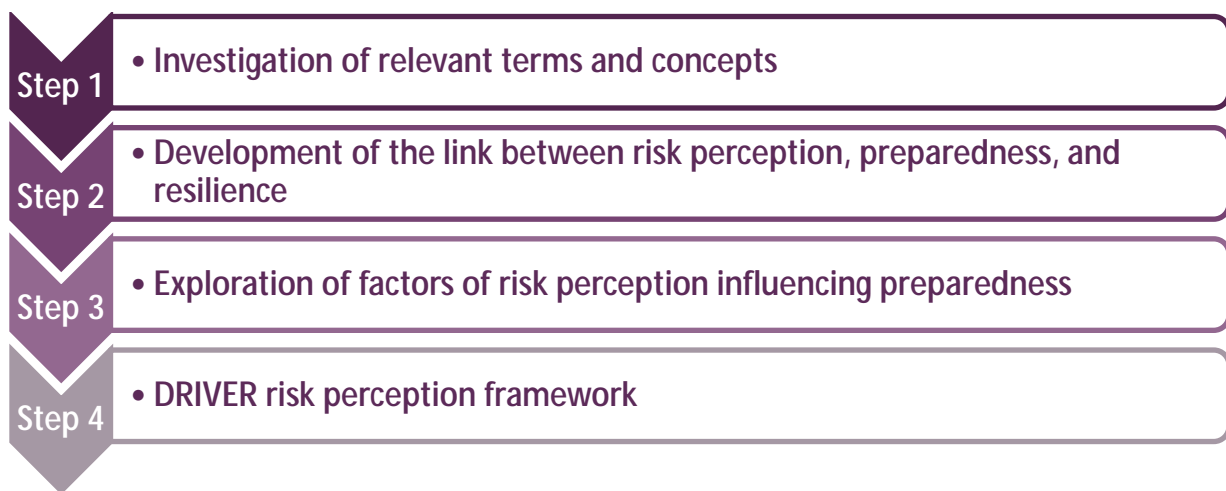**Step 4** • DRIVER risk perception framework

Figure 1: Approach of D32.1

The basis of our approach is the review and the analysis of publications addressing the assumption of a linkage supposed between risk perception and preparedness. Several scientific reports, investigations, surveys and case studies concerning risk perception, crisis management and communication as well as individual preparedness and resilience have been reviewed and analysed. Risk perception, preparedness and resilience are the terms and concepts we focused on. We analysed studies, documented findings in other EU-projects, research papers, journal contributions and similar publications. Google scholar, Fraunhofer databases and CORDIS are three major sources used to identify appropriate literature. A set of systematic queries to search relevant literature have been used. Based on the key words risk perception, crisis management, crisis communication, individual preparedness, resilience, risk tolerance, risk preparedness, individual behaviour.

Additionally combinations like risk perception & individual preparedness, risk perception & resilience, risk perception & individual behaviour, risk perception & risk tolerance & preparedness have been taken into account to reveal appropriate literature.

The research question is to identify key factors of risk perception on disasters and natural crisis as a basis for a risk perception framework. Besides contemporary academic literature also literature from the past (older than 10 years compare the section references) has been taken into account. Geographically, mainly European sources have been considered, however also Northern American

and Asian literature have been used. There is a multitude of studies listed in the reference list focusing to analyse the connection between risk perception, risk tolerance and preparedness and in which way such a connection has an impact on the individual behaviour and thus on the community and broader society.

Step 1

In Chapter 2 the terms, concepts and definitions of risk perception, preparedness and resilience in different disciplines are outlined, with a focus on the individual level. This chapter provides an overview on the current state of debate within the three research domains of risk perception, preparedness and resilience. Sources have been taken into account showing opportunities for learning and training activities for the preparedness of individuals. Being aware of the heterogeneity of the field and the partially contradictory research results, the main challenge in this step is to extract current streams of debate and findings.

Step 2

Chapter 3 illustrates the links and interdependencies of the three concepts risk perception, preparedness and resilience. Selected models, surveys and EC projects about linkages between risk perception and preparedness are presented to exemplarily explain the mechanism of their connection. We look at two existing preparedness models that explain the mechanism of risk perception in more detail.

Step 3

Chapter 4 explores factors of risk perception that influence preparedness intentions and behaviours as discussed in the literature. The overall objective thereby is to extract key factors for risk perception that lead to preparedness. There are specific factors that are typically relevant for different types of hazards or crisis situations. For this reason, we used keywords like "risk perception, preparedness, resilience, disaster and crisis" to focus and concentrate on a specific topic as well as follow-up searching of identified references in the studies, journals, handbooks and EC projects identified. Preference was given to studies with meta-analyses in these topics.

Step 4

Based on the findings of the previous steps, the DRIVER risk perception framework is described in chapter five, giving first priorities of action to enhance and strengthen the key elements' impact on the population of a country. So, organisations outside of the DRIVER consortium as well can use the framework recommendations as a starting point to increase and improve their specific activities on risk awareness and preparedness for the benefit of a more robust and resilient society.

2 Relevant concepts

2.1 Risk perception

According to the latest figures of the Eurobarometer, only just over half of the people (55%) feel that they are aware of the risk of disasters in their region – they describe themselves as aware - and only 14% feel that they are totally aware." (Eurobarometer, 2015). Most people have a basic understanding what disaster risk means. Nevertheless, the opinions differ on what is risk and what is a high-risk situation. So, risk appears to mean different things to different people (Brun, 1994).

Risk perception can be defined as the estimated probability people have that a specific type of accident could happen and how affected they are by the consequences (Sjöberg and Rundmo, 2004). The perception of a risk includes evaluations of the probability as well as the consequences of a negative outcome. Thus, risk perception involves the process of collecting, selecting and interpreting signals and information about impacts of events, activities or technologies in order to conduct that individual evaluation. Risk perception varies by type of environmental risk, previous experiences with specific disasters dependent on their frequency, the risk context, the personality of the individual, the social context as well as between different populations. The nature of the disaster, knowledge, experience, values, attitudes, feelings and trust in authorities as well as the wider social or cultural values people adopt: all these factors influence the thinking and judgment of people about the seriousness and acceptability of risks. Risk perception appears to be inherently multidimensional and much more context sensitive than formal one-dimensional measures of risk, such as 'loss of life' or 'loss of money' (Bostrom, 1997). Therefore, risk perception cannot be reduced to one measurement factor as it is far too complex. Neither is it a purely analytical process.

There are a number of approaches that can be used to investigate risk perception (Van Wassenhove et al., 2012) inspired by social psychology, cognitive psychology, anthropology or sociology. For example, Luhmann (1986) states that risk perception is the result of a process of social communication and Slovic (1992) argues that there is no such thing as 'real risk' or 'objective risk'. Risk appears to be a (social) construct in which communication plays an important role. Effective risk management and subsequent risk communication should be understandable by members of the public.

Effective risk management and subsequent risk communication creates trust in risk managers, who must reconstruct and respond to the general public's idea of what is perceived as risk (see chapter 4.5 Trust in authorities). Different groups have different perceptions of risk. Experts do not perceive risk in the same way as non-experts (laypeople). Experts are guided by the available scientific and technological knowledge base (the so-called facts) in evaluating a risk. The general public, on the other hand, are often only marginally aware of these facts to make this analytical assessment. These different bases for evaluation imply that risk perception by experts is usually termed risk assessment rather than risk perception (Renn and Benighaus, 2006). Last but not least, the media and especially the social media play a decisive role in what the general public perceives as risk. A 2006 study on Mad Cow Disease demonstrated that the populations of Germany, Finland, Italy and the UK have

different risk conceptualisations of Mad Cow Disease and that these differences are due to the influence of their national media (Bauer et al., 2006).

Several reasons for the difference between experts and the public can be found in the relevant literature (e.g. van Riper et al., 2016). One possible set of factors is background data such as gender, education and age. The age factor is dependent on the type of the disaster. The elderly often perceive technological hazards as risky whereas they see natural disasters as less risky, mostly due to their life experience (Lucini, 2014). Furthermore, the differences between experts (volunteers, first responders, engineers in a certain field) and the general public (consisting of civil persons without private or professional connection to crisis management) can be seen in the way how risks are evaluated, especially concerning trust in mastery and different knowledge about e.g. likelihood of the occurrence of a disaster or local infrastructure and resources for handling different kind of disasters' (Sjöberg, 1999; van Riper et al.; 2016). This results in a different assessment of the prevailing risk. Experts pay more attention to probability, the public looks to the consequences of a disaster. Plough and Krimsky (1987) found that the lay individual does not make rational choices about risky behaviours such as smoking and therefore the individual takes irresponsible risks. However, when it is about dramatic disasters the logic is reversed: The individual maintains an exaggerated fear of hazards which experts consider to be relatively safe. Experts tend to estimate risk in an objective, analytic and rational way, based on the real or actual risk, whereas civil population are more guided by subjective opinions. It can be assumed that experts perceive overarching and rather objective risks easily whereas civil population tend to perceive only their subjective risks and need support in classifying risks more realistically in order to understand the big picture (Botterill and Mazur, 2004).

Another explanation for the difference between civil population and experts is that experts feel they are more in control of the danger and thereby perceive less risk. Experts directly involved in a disaster context probably perceive that they have control over the risks and long experience may have habituated them to these risks. Imposed and not controllable risks are perceived as more dangerous than voluntary taken risks by experts and citizens. This provides a possible explanation why experts who are involved in a crisis context perceive less risk emerging from a hazard than civil population (Bostrom, 1997). The socialization of values like new ecological paradigm (NEP) and Schwartz's altruism and risk perception is different depending on the working network and context (Slimak, 2006); conformity pressure and economic/career interests may play a role.

Despite the above observations, it must be stated that expert risk perception cannot be generalized as there are still too many disagreements on how experts define a risk and risk perception. Experts usually measure a risk by the dimensions of 'probability' and 'magnitude of harm'. But the combination of these dimensions and the different focuses each expert has regarding risk perception results consequently in different assessments. For example, even if experts agree on the nature of the harms to be included and the probability distribution of those harms, experts who focus only on the worst outcome may reach different conclusions than those who calculate and use average expected loss (Bostrom, 1997). This points out that, whether being an expert in a certain field or not, each individual is embedded in different social contexts which frames risk perception differently. As with the general public, there is not a single, homogeneous definition for experts' risk perception either.

Regardless of the difficulty of establishing general definitions for risk perception, it is absolutely necessary to be aware of the differences in risk perception of experts and the general public in order to generate a better understanding of the different views. This is critical if we are to sustainably improve the risk preparedness levels of both groups. To realize this, both groups have to, first and foremost, effectively communicate with each other in order to develop a shared mental model and understanding of risk perception. Since trust is implicated as a determinant of perceived risk in the general public (Sjöberg, 1999; van Riper et al., 2016), it could also explain part of the variation between experts and the public.

Comparisons of expert risk assessment with lay risk perception can all too easily focus on differences in knowledge and expertise while ignoring equally real differences in individual contexts, motives and beliefs (Bostrom, 1997). But generally one can conclude that individuals with a higher educational level tend to perceive more own control over risks to their safety and higher trust in government and thus tend to generally perceive fewer risks in the world than individuals with a lower educational level.

Concluding, the social surrounding of each individual, be it an expert or a lay person, influences all above mentioned risk perception factors. The different lifestyles and integrations in different social surroundings determine whether to build up and establish knowledge about certain hazards as well as whether to trust official institutions, authorities and organizations, whether to engage in voluntary work and to what extent one wants to share individual experiences. Additionally, the perceptions of risk are likely to vary dependent upon what the formal news and social media report, what people choose to discuss (both personally and on social media), what cultural norms are viewed as important and what technical and legal opportunities exist for control and regulation of risk.

2.2 Preparedness

Preparedness in the context of disaster and crisis management is an important phase in the crisis management cycle. In fact, preparedness plays an important role to describe, plan and analyse the *other* crisis management phases (e.g. Coetzee and van Nierkerk, 2012; Coombs, 2014; Federal Emergency Management Agency, 2009).
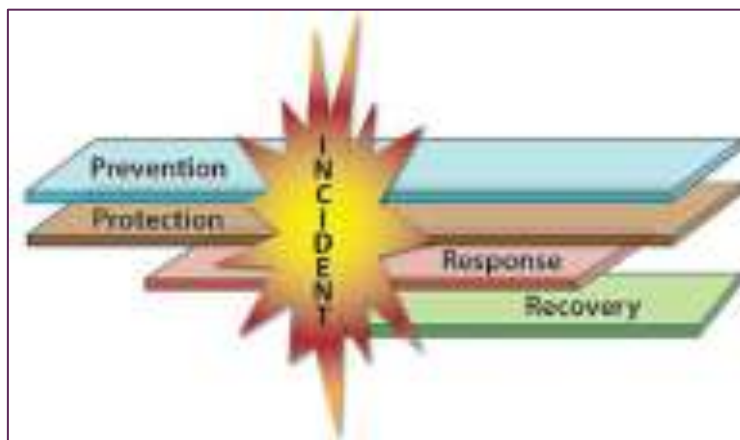

Figure 2: Homeland Security Mission Areas (Federal Emergency Management Agency, 2009)

In the last years several organizations and projects in crisis and disaster management took care about the preparedness definition because preparedness is not always defined explicitly (compare UNISDR 2007; Shreve and Fordham, 2014).

Preparedness can be defined as the development of activities to prepare the necessary measures to respond and cope with the effects of a disaster (MIAVITA, 2012). Knowledge about how the individual perceives a risk, how closely a risk is perceived to affect them as well as the amount of trust the public has in an organization or institution can all make a big difference in preparedness as well as in the behaviour in face of a disaster (Basolo et al., 2009).

Disaster preparedness refers to measures taken to prepare for and reduce the effects of disasters. That is, to predict and, where possible, prevent disasters, mitigate their impact on vulnerable populations, and finally, respond to and effectively cope with their consequences (Federal Emergency Agency FEMA, 2012).

Disaster preparedness activities combined with risk reduction measures can prevent disasters from happening and also result in saving lives, enabling the affected population to get back to normalcy within a short time period.[1] Most natural and technological or man-made hazards are difficult to predict. Their timing and development is rather uncertain. An exception is a severe storm/hurricane or a flooding, as a result of really bad weather: this might be predicted rather accurately although only a maximum of several days beforehand. This indicates the importance of community and individual hazard planning and preparedness. Preparedness can vary across disaster types and places, especially with differences in population characteristics and culture (Basolo et al., 2009; Jongejan et al., 2011). Public education and information are the most commonly used strategies to accomplish the mission to make a community and its members more prepared towards disasters. To facilitate preparedness, an alternative approach is required in a way that researchers, planners and emergency managers acknowledge heterogeneity in community characteristics and perceptual processes and develop models that accommodate contingent relationships between hazard effects and community, cultural, geographical and temporal factors within resilience models (Paton et al., 1999; UNISDR 2013). Today, this is the case in some regions and countries (e.g. in Germany at least to a certain extent) but it is still an open issue in Europe and world-wide.

2.3   Resilience

Resilience has been defined in many different ways but it is often described as the ability to "bounce back" after situations of shocks or crisis, using terminology from physics and ecology (Smith et al., 2008). In physics the term means the description of a system which moves towards stability. More concrete resilience is explained in material science as the ability of a material to absorb energy when it is deformed elastically, and releases that energy upon unloading.[2] In ecology, resilience is the capacity of an ecosystem to respond to a perturbation or disturbance by resisting damage and

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[1] Definition by IFRC on http://www.ifrc.org/en/what-we-do/disaster-management/preparing-for-disaster/
[2] https://en.wikipedia.org/wiki/Resilience_(materials_science). 23.11.2016

recovering quickly.[3] In literature often the definitions from C.S. Holling are quoted, which first introduced the concept of resilience in ecological systems "as a way of helping to understand the non-linear dynamics observed in ecosystems" (Gunderson, 2000).

The concept of resilience has become increasingly influential across various academic disciplines and policy sectors since the 1960s. Within the field of disaster risk reduction and crisis management in Europe and at global level, the concept of resilience has contributed to shaping policies, practice as well as academia. Consequently, "resilience building" is now widely integrated in global disaster risk reduction and crisis management policies (European Commission, 2014). This chapter outlines the definition of resilience and risk perception in different disciplines and with focus on the individual level[4].

Definitions of resilience differ over the last decades and according to the specialist disciplines. The term 'resilience', coming originally from the fields of physics and ecology (see above), was later introduced and brought into the field of psychology. According to the American Psychological Association, resilience is "the process of adapting well in the face of adversity, trauma, tragedy, threats or significant sources of stress — such as family and relationship problems, serious health problems or workplace and financial stressors. It means 'bouncing back' from difficult experiences." (American Psychological Association, n.d.). Ongoing research in the field of psychology focuses on the examination of post-traumatic stress reactions in the context of a globally growing number of natural disasters and as a consequence of war.

From a sociological point of view resilience has become established as a term "…for 'vulnerability' and society's ability for resistance and regeneration when facing modern and increasingly unforeseen risks" (Birkmann, 2008). The term resilience in this sense often includes three concepts: resilience, vulnerability and adaptation. Janssen (2007) found an enormous increase in the number of publications and definitions in these three knowledge domains between 1967 and 2007. Thus a generally accepted sociological definition is not expected to come. Timmermann (1981) addressed the challenge to distinguish the concepts already in the 1980s: "the terms 'vulnerability' and 'resilience' have come into use as important indicators (or 'buzz words') of a broad conceptual framework [….]. Not just in the discipline of climatic impact assessment of socio-climatology, but in many other fields as well. Nevertheless, although there are obviously terms with great latent explanatory significance [….] no real clarification of these terms exists" (p.3). Also later scientific work points to 'vulnerability' and 'resilience' as two core and interrelated constructs in natural disaster prevention and mitigation considerations (Gow and Paton, 2008).

To make matters more complicated, many definitions of resilience encompass several levels, such as the individual, community, organizational, regional and/or national level. Therefore, these levels are included in the definition of the International Federation of Red Cross and Red Crescent Societies (IFRC) defining resilience as "the ability of individuals, communities, organizations, or countries exposed to disasters and crises and underlying vulnerabilities to anticipate, reduce the impact of,

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[3] https://en.wikipedia.org/wiki/Ecological_resilience. 23.11.2016
[4] The focus on individual resilience is in line with the objectives of WP32 that focuses on individual and volunteer preparedness. Community- and local government resilience are addressed in WP33 and WP34 of DRIVER.

cope with and recover from the effects of adversity without compromising their long term prospects" (International Federation of Red Cross and Red Crescent Societies, 2012). The use of the word "anticipate" underlines the link to preparedness, which will be explored further in the next section. It is important to be aware that resilience includes equally the anticipation, coping and rebalancing after an event.

When examining resilience on the individual level, models from the academic fields of psychology and behavioural science play an essential role. The Social Learning Theory, developed from Albert Bandura in the 1970s, claimed a direct correlation between a person's perceived self-efficacy and behavioural change. The concept of self-efficacy is defined as one factor influencing the preparedness according to the model from Paton, explained below (see figure 3). The perception of self-efficacy in turn has an impact on the appraisal of coping with a crisis situation as explained in the Stress model from Lazarus. In this deliverable, the Stress model from Lazarus and Folkman will be used for a transfer of psychological factors influencing individual risk perception and risk preparedness (for more details, see chapter 4). The model of Lazarus and Folkman was chosen as it is one of the earliest and most famous models developed in the 60s, explaining detailed how humans face and deal with unexpected threatening situations and how they develop strategies to cope with them. This model serves as a basis for other concepts, amongst others it is referred to in the context of Paton's research work. There Lazarus and Folkman belong with other psychological frameworks to "the theoretical perspectives [that] are of particular importance in that they have made a substantial contribution to the interdisciplinary conceptualisation of human preparedness for, and response to, environmental hazards and disasters. They constitute a particularly valuable and much needed *psychological* contribution to disaster research and best practise" (Reser and Morrisey, 2008). However, while the model from Lazarus and Folkman is famous for its coping strategies, Paton is one of the leading researchers in the field of risk management, amongst others investigating the factors of risk perception and the relationship between risk and resilience, investigated in one of his latest books ('Working on High Risk Environments: Developing Sustained Resilience', 2011). That's why Paton's model is chosen as central for this deliverable (see next chapter).

Whether resilience is understood as a developmental outcome or an ability to adapt to stressful situations, there has been a change in the perception of resilience over time. Previously, resilience was seen as a fixed trait of a person. Today, there seems to be an increasing consensus around a more dynamic concept where resilience is seen as something that is developed in interaction with the individual's social context (Béné et al., 2012; Ungar, 2008). This underlines that resilience on the individual level is not possible to be fully comprehended in isolation from a wider community, societal and governmental dynamics (International Federation of Red Cross and Red Crescent Societies, 2012; Plough, 2013).

As mentioned, the psychological definition of resilience can be understood as the adaptive capacity of individuals to react or adapt positively to a difficult and challenging event or experience (Ungar, 2008). Each individual's response to a stressful situation is influenced by many factors including the nature and severity of the crisis event, personality, personal history and available support systems. From a resilience perspective it is argued that people do experience distress from crisis events, but that they are also able to anticipate, cope with and recover from stressful experiences using their available resources. Abilities such as the possibility of being active and exhibiting some kind of

control in a stressed or critical situation are the basis for empowerment and future individual resilience processes.

Hobfoll et al. (2007) identify five key principles to guide intervention and prevention efforts to restore social and behavioural functioning after disasters. The importance of having a sense of control over positive outcomes is one of the most well investigated constructs in psychology (Skinner, 1996). Self–efficacy is the sense an individual believes that his actions are likely to lead to generally positive outcomes (Bandura, 1997), principally through self–regulation of thought, emotions, and behaviour (Carver and Scheier, 1998). This can be extended to collective efficacy, which is the sense that one belongs to a group that is likely to experience positive outcomes (Antonovsky, 1979; Benight, 2004).

Even when considering an individual as a part of a social community, it has to be taken into account that each individual has its own protective factors influencing resilient behaviour. Examples of protective factors are belonging to a caring family or community, maintaining traditions and routines, and having a strong religious belief or political ideology. These are interacting social, psychological and biological factors and can reduce the likelihood that a person will develop severe or long-term psychosocial symptoms when encountering hardship or suffering.

3 Linking risk perception, preparedness and resilience

In this section the link and interdependencies of risk perception, preparedness and resilience is illustrated. It is not the objective of this WP to develop a new state of the art model of how risk perception can be interlinked with preparedness and resilience. However, we build a framework (chapter 5) giving first priorities of action to enhance and strengthen resilience by increased risk perception. The basis of the framework, namely the factors influencing risk perception will be described in chapter 4.

In the current chapter, we will look at two existing preparedness models that explain the mechanism of risk perception in more detail. The first (section 3.1) focuses on the relation with risk-reducing behaviour, while the second (section 3.2) focuses on risk-coping behaviour.

The next section explains the mechanism of individual risk perception in relation to disasters and other crises as a critical factor of preparedness (Burns and Sullivan, 2000). In this context, preparedness itself is a precondition for resilience (section 3.3). Furthermore, models, surveys and EC projects about linkages between risk perception and preparedness to exemplarily explain the mechanism of their connection are presented. This chapter ends with a short discussion of to risk perception and the link to preparedness (section 3.4).

3.1 Relation between risk perception and risk-reducing behavior

The connection between risk perception and risk-reducing behaviour (e.g. in order to take actions for preparedness) is pointed out in several models as illustrated in this section.

One model that explicitly brings together risk perception and preparedness behaviour was developed by Murphy and Bennet (1997). This model plays a prominent role in literature on risk behaviour, amongst others by the leading risk researcher Douglas Paton (Paton et al., 2006). The model is shown below.

In the figure, Murphy and Bennett (1997) describe a preparedness model linking risk perception and risk reducing behaviour, which was enhanced by Paton to a Social Predictor Model of Intentions to prepare for Natural Hazards by assessing the underlying social influences and by integrating the factor of Social Environment and thus community development process (Paton et al., 2006). This model describes that the perception of a risk (triggered by one or more hazards) is a precondition that determines individual preparedness. Other key factors are actions-outcome expectancies (consideration whether risk may be reduced by performing actions) and self-efficacy (whether the required actions are within the capabilities of the individual). Mostly, people make subconscious assumptions about the possible consequences of an action before considering to act in a specific way. The factor self-efficacy determines the amount of effort and perseverance an individual invests

in risk reduction behaviours. The number and quality of action plans are also strongly dependent on an individual's perceived competence and experience. Finally, this behaviour is even more sustained if supported by the social and structural environment. The latter in turn has an influence on individual attitudes and subjective norms, dependent on the level of involvement in community activities and functions (e.g. membership of clubs or social action groups, not necessarily risk reduction activities per se).The more someone is engaged and integrated in different social contexts, the more he shows the intention to behave in a risk reducing manner.
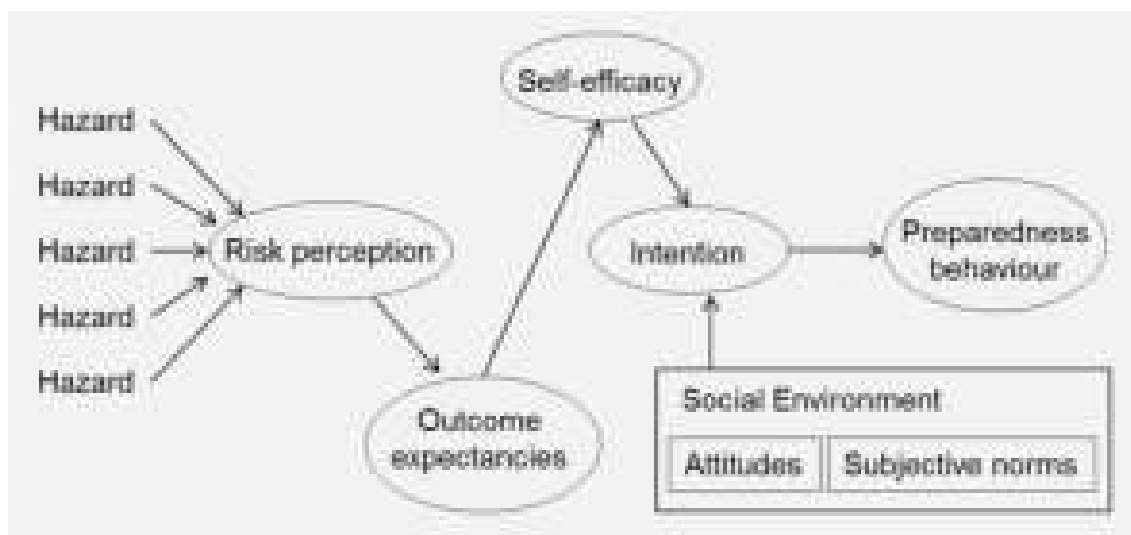

Figure 3: Model of risk perception showing factors with influence on increasing preparedness behaviour (adapted by Paton et al., 2006, from Murphy and Bennett, 1997)

When planning learning activities, the aim is to reduce risk behaviour and to increase preparedness behaviour. Paton's extended model helps to keep in mind the whole spectrum of factors that play an important role for Preparedness behaviour. With respect to the factor 'self-efficacy' – exercises in trainings should allow to stimulate feelings of achievement for each participant which in turn will increase the self-efficacy and thus increase the readiness to invest in preparedness behaviour which as a consequence will be perceived as worthwhile and rewarding. Another factor, that can be used as an 'adjusting screw' is the social environment, for example by motivating people to join non-profit associations or civil protection organizations, which in turn will influence their attitudes and subjective norms leading in the direction of increased preparedness behaviour and thus in turn to strengthen the individual and thus societal resilience.

3.2   Relation between risk perception and risk-coping behaviour

A wide range of expectancy-value, decision theories as well as stress theories deliver fundamental investigations on insights into motivational determinants of risk taking behaviour. Within this spectrum the Transactional Stress theory from Lazarus is a widely used model analysing the complex

interplay of factors influencing perception, ways of appraisal and judgment of stress resulting in specific coping strategies (Lazarus and Folkman, 1984). The stress model of Lazarus is the first approach in psychological stress research focusing on the individual and on the connection between the appraisal of external stressors and internal coping capacities. This model is also used in analysing strategies in crisis management as it explains the wide range of differences in individuals in crisis situations. The transactional stress model from Lazarus is useful in that it provides insight into the coping mechanisms people adopt when they face a risk.

Facing risks of a disaster causes stress. The theory of Lazarus and Folkman focuses on the subjectively perceived threat of a situation which can be interpreted as risk perception. Their model belongs to the classic cognitive theory on emotion regulation and postulates appraisal processes at different levels. The first level of appraisal is an estimation about the relevance of a (risk) situation to the personal situation (Is there a risk of harm, loss or threat?). If this is the case, the second appraisal follows by estimating the available coping strategies (do I have the necessary resources available to cope with the situation?). If this is the case, a problem-focused attempt to cope with the situation is used. If this is not the case, an emotion-focused attempt is used (if the external situation is not possible to change, I need to adapt my emotional reaction). Finally a re-appraisal will be done about the success of the coping strategies and eventually necessary adaptions for more adequate reactions (see figure below).
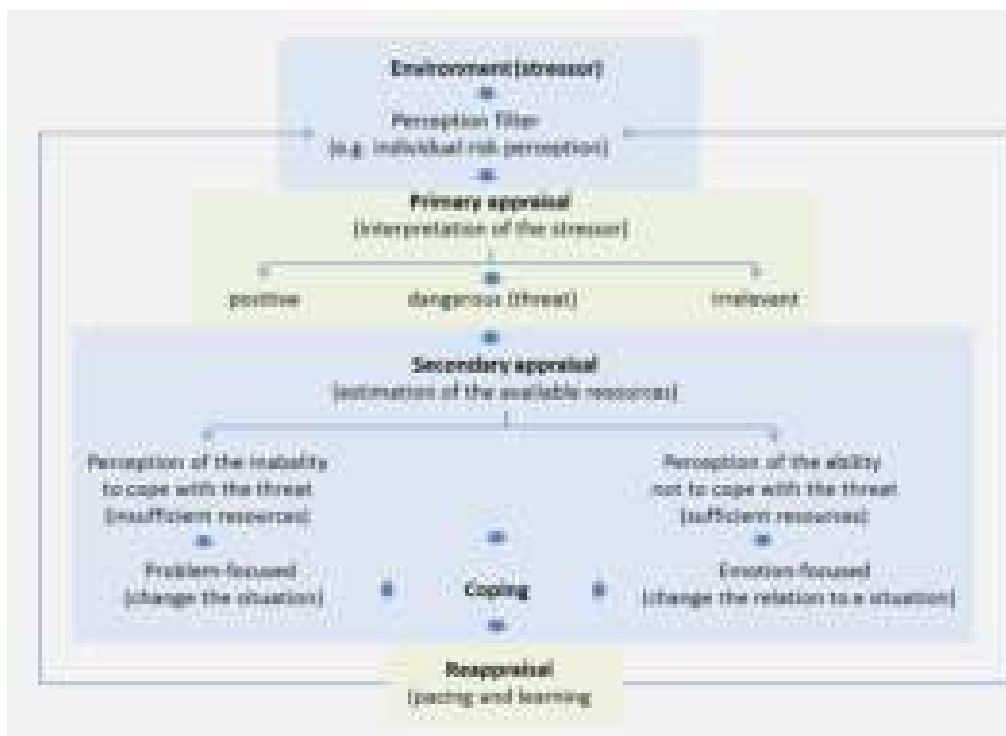

Figure 4: Transactional stress model, according to Lazarus and Folkman, 1984

Core assumptions and the key construct of the Transactional Stress Model are summarized in the following table (according to Glanz et al., 2002, p. 214):

Concept	Definition
Primary Appraisal	Evaluation of the significance of a stressor or threatening event.
Secondary Appraisal	Evaluation of the controllability of the stressor and a person's coping resources.
Coping efforts	Actual strategies used to mediate primary and secondary appraisals.
Problem management	Strategies directed at changing a stressful situation.
Emotional regulation	Strategies aimed at changing the way one thinks or feels about a stressful situation.
Meaning-based coping	Coping processes that induce positive emotion, which in turn sustains the coping process by allowing re-enactment of problem- or emotion focused coping.
Outcomes of coping	Emotional well-being, functional status, health behaviours.
Dispositional coping styles	Generalized ways of behaving that can affect a person's emotional or functional reaction to a stressor; relatively stable across time and situations.
Optimism	Tendency to have generalized positive expectancies for outcomes.
Information Seeking	Attentional styles that are vigilant (monitoring) versus those that involve avoidance (blunting)

Table 1: Core assumptions and the key construct of the Transactional Stress Model (Glanz et al., 2002, p. 214)

The perception of a stressful situation in the environment (a hazard) is dependent on selective awareness (individual experiences, traits of personality etc.). The interpretation of the stressor will be done according to the level of threat (primary appraisal) and according to the available resources. As a result an individual either develops problem-focused coping strategies (changing the situation itself) or emotional-oriented coping strategies (changing the reference to a situation). When developing learning activities, the benefit of this model is seen on two levels. First it contributes for all people involved in crisis management to become more aware of their own and of other people's reactions when facing a hazard. Secondly, it pushes the idea to design learning activities especially in double-checking the appraisal of risks and in providing individuals a wider range of coping strategies. In short, the transactional stress model from Lazarus and Folkman offers high potential on developing an approach for learning activities concerning individual preparedness for persons from different groups (as e.g. laypersons and experts) (Kinateder et al., 2014).

3.3 Research results linking risk perception, preparedness and resilience

A national household survey, conducted by Kano et al. (2008), revealed that individual preparedness and mitigation activities did not differ between high risk areas (e.g. New York City, Washington, etc.) and the rest of the United States, nor between ethnic groups. They did find, however, that a major predictor of preparedness is the information received and observed by an individual. This indicates that an adequate information distribution, respectively crisis communication, may increase individual preparedness. Crisis communication can be described as the intersection between managing information and managing meaning during all three stages of preparedness, response, and recovery (Coombs, 2012). The more types of information available, the more preparedness behaviour was reported by respondents of the household survey.

Other potential predictors are standard demographic variables, past experience in disasters, perceived future risk of terrorism, other man-made, and natural disasters, and perceived individual resilience and the confidence in federal, state, and local governments to protect and respond to these disasters. As a key finding, study results show that crisis communication can only be effective if citizens adopt preparedness strategies to their individual situation. The so-called "household preparedness" is influenced by typical household characteristics such as number, age and mobility of household members, perceptions of the risk, the ability to adjust to the risk and other factors (Basolo et al., 2009). One major aim of the concepts about risk perception and preparedness is to use their explanations to increase individual and community resilience (Wachinger et al., 2013).

Furthermore, EC funded projects addressing the linkage between risk perception and preparedness are analysed. The objective to focus on them is to reveal more robust answers about key factors influencing preparedness and resilience of individuals in different crisis situations. From the wealth of existing EC projects (DARWIN, SOTERIA, POP-ALERT, COBACORE, OPTI-ALERT, BeSeCu, CrisComScore, ...) the following three projects have been selected from the CORDIS database seeming to be most valuable sources of information with respect to linking risk perception, preparedness and resilience: Informed.Prepared.Together, TACTIC and CapHazNet.

Informed.Prepared.Together.

Within the EC funded project Informed.Prepared.Together[5], they came to the conclusion that individual and household preparedness increases by following the following preparedness actions (Red Cross / EU Office, n.d.):

- Preparing a personal emergency plan (Name, address, name of next kin, their addresses and contact details, meeting places etc.)
- Always being alert to potential hazards and safety plans, no matter where one is staying
- Agreement on contact arrangements and meeting places with family and friends
- Choosing a contact person living outside of the own area
- Being able to tune into the local radio and to turn off electricity, gas and water

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[5] www.informedprepared.eu

- Assembling an emergency bag ("grab and go bag") that is readily available in case of an emergency
- Fitting a smoke alarm and checking it regularly
- Learn First Aid

Further, it was observed that the above preparedness actions contribute to strengthen community resilience. This potentially makes the entire crisis management process more efficient as First Responders and volunteers are able to focus more on the vulnerable persons and groups.

TACTIC

The EC funded project TACTIC – Tools, methods and training for communities and society to better prepare for a crisis (EC 608058) aims to increase preparedness to disasters amongst communities and the societies in Europe. The activities in this project focused on the link between risk perception and behaviour including good practices for preparedness. Despite many studies reviewed are typically grounded in disciplinary findings different types of hazards are recognized and analysed according to most important risk perception factors and the challenges for preparedness. By summarizing their findings and links between risk perception and preparedness, risk perception is not seen by the authors of the report as a universal remedy to understand preparedness. But, based on their findings they conclude that risk perception plays a significant role in preparedness.

CapHaz-Net

The EC funded project CapHaz-Net – Social Capacity Building for Natural Hazards. Toward more resilient societies (EC 227073) made some conclusions about risk perception and the influence towards preparedness. The authors analysed how individuals perceive risks for different hazards in Europe and how individuals take over responsibility for protection and precautionary measures. From their review they conclude that there are still models missing on how individuals perceive and evaluate risks and which are suitable to use as a basis for preparedness activities. One finding is, that the more individuals have experienced natural disaster, the more experience shapes their perceptions. Furthermore, the higher the geographical distance of potential natural disasters from individuals, the more they judge risks according to the conveyed expertise in the media as well as according to their intuitions. The author's final conclusion points out that the way how individuals perceive risks, is an important factor to consider when steadily improving resilience in future.

3.4 Discussion

Despite the models outlined above it remains difficult to establish a scientifically validated link between risk perception and preparedness. Kirschenbaum (2005) came in his studies to the conclusion that the direct impact of risk perception on behavioural actions in the disaster risk literature can only be confirmed to some extent. Little efforts have been done by researchers to investigate the interdependencies between risk perception and actual disaster behaviours, especially

preparedness (Kirschenbaum, 2005). Paton's (2006) model of risk perception showing factors with influence on increasing preparedness behaviour. In the TACTIC report (Shreve and Fordham, 2014) no significant changes have been discovered in this respect. Similar to Kirschenbaum (2005) an empirical study from Basolo et al. (2009) has shown that the correlations between perceived preparedness and actual preparedness actions were in fact relatively weak. Furthermore, Wachinger and Renn (2010) and Wachinger et al. (2013) regarded this topic as a still open question for research.

4 Factors influencing risk perception

It is commonly accepted among experts in the field of risk perception that different social, environmental, and cultural factors influence risk perception to varying degrees. There are specific key factors that are typical for different types of hazards or crisis situations. This chapter of the report explores factors of risk perception that influence preparedness intentions and behaviours as outlined in existing literature. The purpose of this chapter is to identify key factors for risk perception that lead to preparedness, and ultimately to resilience.

We draw together key findings from several different disciplines engaged in risk perception factors research with respect to preparedness. Desk research using the keywords like "risk perception, preparedness, resilience, disaster and crisis" (compare chapter 1 in this deliverable) is used to concentrate on the specific topic as well as follow-up searching of identified references in the studies, journals, handbooks and EC projects identified. Preference was given to sources with meta-analyses in these topics.

Desk research revealed that the following sources provided the most useful information and thus provide the basis for identifying major factors for risk perception (see also listing in the literature references):

1. The report about the project TACTIC (Tools, methods and training for communities and society to better prepare for a crisis), Report on risk perception and preparedness (Shreve and Fordham, 2014)
2. The report about the project CapHaz-Net (Social Capacity Building for Natural Hazards. Toward more resilient Societies)
3. Report: Risk perception and natural hazards (Wachinger and Renn, 2010).
4. Study: Personality Correlates of Risk Perception (Bouyer et al., 2001). The study evidences the 10-factor risk perception structure proposed from Slovic (1992).
5. Literature review from the Campbell Institute: Risk perception: Theories, Strategies, And next steps. 2014 (the National Safety Council Research and Safety Management Solutions Group).
6. Analysis of the relation from factors and theories related to risk perception and risk tolerance concerning overlapping ideas and theories.

Although all disasters and hazard events are unique, and may differ dramatically from one another across several dimensions, the factors of risk perception of individuals are assumed to follow similar or at least comparable characteristics. Because of the variety of factors mentioned in different disciplines and complexity of their aggregation levels, the list of factors mentioned here does not claim to be exhaustive. Rather, the objective is to identify the main contributing factors to risk perception in relation to preparedness. The results are used to derive first priorities of action for training and learning activities and, finally, to strengthen the resilience of individuals.

Individual risk perception is characterized by several factors. As already pointed out in the previous section it is not possible to generalize individual risk perception. Risk perception is always closely

connected to the individual's identity and attitudes towards risks and hazards. In order to narrow the complex field of risk perception, we have therefore chosen to focus on those factors identified as being highly important according to research work in current EU projects and according to the research work from Paton and his colleagues. The risk perception factors we have identified include:

- Publicity, communication and media
- Experience with similar disasters
- Nature and features of the disaster
- Training and education
- Trust in authorities
- Social environment (attitudes and subjective norms as part in Paton's model)
- Personal factors (ability to cope with disasters according to Lazarus and Folkman)
- Experts vs. civil population

In the next sections, the abovementioned factors will be defined and described in more detail. The key factors identified are not listed in order of perceived importance. Each of them has its own importance according to the specific scientific view on them.

4.1 Publicity, communication and media

Communication and publicity is valuable to strengthen preparedness by raising the level of awareness of individuals and their capacities to take appropriate measures. Dissemination of environmental risk and preparedness information is a responsibility of government and civil protection organizations and represents a key element for individual preparedness (Kellens et al., 2013).

Risk communication can be defined as "an interactive process of exchange of information and opinion among individuals, groups, and institutions. It involves multiple messages about the nature of risks and other messages, not strictly about risk, that express concerns, opinions, or reactions to risk messages or to legal and institutional arrangements for risk management." (Commission on Risk Perception and Communication, 1989).

Authorities plan and prepare coping strategies and communicate the relevant information to individuals, groups and communities and the entire society. The focus lies mainly on an individual rather than collective (community) level of activities. The main objective is to modify risk perception and risk attitudes towards preparedness and protective risk behaviour (Rohrmann, 2007).

Radio, television, newspapers, wallpaper, face book, twitter and other channels can be used to transmit critical information to as many people as possible. Based on different analyses of crises and disasters there seems to be evidence that media has a strong effect on perception of risks (Hove et al., 2015; Larsen et al., 2011; Hughes et al., 2006).

Internet can speed up communication and awareness by allowing real-time communication (compare Thaler and Sunstein, 2008). To this end, communication on risk-related information has become a crucial element in risk governance for various stakeholders (Renn, 2008).

Kapuścińskia and Richards (2016) focussed their analysis on risk perception on disasters and terrorist attacks of tourists in travel destinations, and conclude that marketers can influence the way tourists attend to risks by specific information channels. Nevertheless, they plead for further research activities on the formats of presenting information to tourists, especially in the aftermath communication.

Social Media is playing a growing role in disaster management and response activities. Even numerous EC funded projects like Slandail (Security System for language and image analysis), BeSeCU (Human behaviour in crisis situations: a cross cultural investigation to tailor security related communication), A4A (Alert4All) or SECILE (Securing Europe through counter-terrorism-impact, legitimacy and effectiveness) have done research on this. For instance, a study about twitter usage concludes that twitter as a social media tool is seen as critical from a preparedness and early warning perspective in disaster management (Carley et al., 2016). Some reasons mentioned are, that a twitter usage will not reach the entire population with information, and furthermore messages are vague, incorrect or even unclear. Unfortunately, this information can be transferred to other social media sources like Facebook, Instagram as well.

Maidl and Buchecker (2015) came to the conclusion that in the large amount of literature of risk awareness and preparedness there is only little attention given to dependent risk communication variables and the need for further research is frequently pointed out (Kellens et al., 2013). Maidl and Buckecker (2015) concluded that individuals with a high level of awareness are more willing to collect information using different media. According to their measurement, (pre-) crisis communication seems to have the most positive effect on community and individual preparedness according to several studies regarding disaster risk reduction and preparedness. Older models of risk communication tend to define the general public as an essentially naïve audience. But the audience should and cannot be generalized; additionally this childlike treatment has negative effects on the citizen's trust in the announcer of information. This is why modern crisis communication has to include, but is not limited to, increasing public knowledge and should also seek to stimulate interest in risk issues, involve citizens in decisions, obtain information from them, acknowledge and respect their beliefs and opinions and establish interactive dialogues and partnerships. The consideration of these factors comes with the pleasant side effect of increased public confidence in the "official" information. As already mentioned in previous chapters, people are more likely to adopt protective measures when they trust the information source (Paton et al., 2006). In addition, a modern crisis communication strategy should include activities involving the public. These activities can take many forms but should be clearly structured with decision frameworks that focus on values, meaningful technical information, trade-offs and insights. Furthermore, a crisis management strategy needs to accommodate diversity in communities given the influence of gender, race, political worldviews, emotional affect and trust in risk judgments. Finally, a communication strategy should avoid at all cost any hierarchical categories or structures designating experts as more knowledgeable and wise, and civil population as subjective and foolish.

The dissemination of risk and preparedness information should be extended or transformed into an ongoing action that must be taken in everyday life and not only during or after a disaster. Information about the hazard risk and possible preparedness measures should be distributed several times through different media in order to motivate individuals to be pro-active about taking

preparedness measures. Empirical research within the EU funded project Alert4All[6] has shown that the alert preparedness of people can be improved by regular exposure of alerts to people. That can lead to more routine if an incident occurs and raises awareness for civil protection in general. Regular authority publications can additionally increase the citizens' behaviour in all phases of a crisis (Kluckner, 2011). Widely disseminated public information prompts residents to interact with others in their social community, which in turn helps people formulate their decisions about preparedness actions and develop a common knowledge and preparedness strategy (Mileti and O'Brien, 1992). Moreover, the more specifically information is formulated, the more effective is the communication strategy, as it respects the diversity of a community. The rather cost-efficient approach to disseminate generally formulated information among all different sub-communities (e.g. urban vs. suburban) is therefore not seen as a promising method to generate prepared behaviour among the entire community. Developing effective messages in this context would require: the identification of individual and community vulnerability factors; the definition of relationships between them and hazard effects; and, eventually, the adaption of information for each group (Ballantyne et al., 2000).

Risk perception and preparedness can also be influenced by the frequency of communication, how expert knowledge and partnerships are utilized, which strategies are chosen for message dissemination, and the ability to evaluate and provide feedback to enhance future effectiveness (European Commission, 2014). The communication effectiveness also depends on the beliefs regarding existing knowledge among the public. An empirical study by Ballantyne et al. (2000) revealed that 41 percent of people surveyed have stated to be able to recite the disseminated preparedness information but only 6 percent could actually recite this information. People overestimating their own knowledge process information less efficiently than people with adequate perception of their own knowledge. It is therefore important, that the evaluation of effectiveness in enhancing knowledge and preparedness should focus on assessing recall and behaviour. Diversity in the manner in which perceived risk is distributed throughout a community adds further complexity to the communication process.

The findings in this section highlight the importance of constructing communication strategies relative both to the community and each individual context within which they will be implemented. Furthermore, the incorporation of the social psychological factors that influence whether people assimilate the information provided and can act upon its recommendations need to be considered when developing communication processes.

4.2   Experience with similar disasters

This factor describes if an individual already experienced a similar or even the same disaster in the past. Distinctions can be made by several factors such as the frequency, the duration and/or the intensity of that experience.

A study conducted by Kouabenan (2002) set out to determine how hazards and car accidents were perceived by individuals whose relationships with road risks differed due to their experience. Risk

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[6] http://www.alert4all.eu/

perception was studied by means of three independent variables: the subject's occupation, driving experience and accident history. Opposite to the assumption, the individual's accident history was not found to have a notable effect on its risk perception. According to this finding it can be assumed that the experience with similar disasters (car accident) in the past cannot seamlessly be connected to a higher perception of risk and thus to a more prepared behaviour.

On the other hand, several studies revealed contrary results. Not only the personal and direct experience influences the risk perception but also the memorability of a devastating event impacts the risk perception of both directly and indirectly affected people. For example, extensive coverage by the media means that the disaster event is more likely to remain at the forefront of the public memory. An individual that passively or actively consumes the news through different channels and is exposed to the same message frequently automatically memorizes the disaster event in more detail and perceives the resulting risk as high, even if s/he is not directly affected. On top of that, negative events are more visible, have a greater impact and are perceived as more credible. Available literature shows (e.g. Margolis, 1996; Wharton, 1992) that high memorable events tend to be overestimated in terms of potential risk, even if the probability of reoccurrence or personal direct experience might be relatively low (e.g. Fukushima nuclear reactor accident in 2011 or Indian Ocean earthquake and tsunami in 2004). What should be underlined here is that a direct or indirect experience with a disaster and its consequences definitely influences the risk perception and the awareness for hazards in some extent. It can be assumed that as soon as a disaster, natural or man-made, draws wide circles in the media the risk is perceived as very high regardless of whether the individual is directly affected.

Another important point is the experience with crisis management response actions in past disasters (direct or indirect affected) and whether or not the provided preparedness and response measures were effective, efficient and trustworthy. If someone felt well cared for it can be assumed that this person's perception of risk towards that same disaster is relatively low because someone else (crisis managers) took over the responsibility to protect the person. That said, if the official management of the crisis or disaster failed and the individual had to take care for himself, his risk perception is probably higher. It can be concluded, therefore, that a healthy level of personal responsibility combined with confidence in crisis management professionals to take care of a crisis leads to adequate individual risk perception and preparedness. A role-specific division of responsibility during the preparedness and response phase of a crisis is necessary. The experiences made with official institutions before, during and after a disaster result in another important factor of risk perception: the trust in official crisis management (see Chapter 4.5). Additionally, experiences are always reflected consciously and subconsciously with the social environment. Depending on the individual's integration in different social contexts (church, sport club, family and friends, political party/stream) the made experience can generate different meanings for the person itself. This is also the case when it comes to an evaluation of the government's crisis management and thus the personal confidence in it.

Eventually, as already mentioned, it is always dependent on an individual's personality and attitudes whether a made experience increases or decreases the individual risk perception. Being self-confident or intimidated after experiencing a disaster makes a huge difference regarding individual risk perception. Keeping the behavioural component of an individual's attitude in mind, it can be

concluded that the more often a person has experienced and mastered a difficult situation the more his or her self-confidence will increase. At the same time he or she will perceive the hazard as being less frightening. With more experience, an individual is still aware of a potential risk but is usually better prepared, by means of not overreacting in a case of emergency and being equipped with several learned methods and tools that help the individual overcome the disaster. Such knowledge, which has been gathered by experience, about a risk that emanates from a certain hazard, could also be adapted and thus applied in similar emergency situation to a certain extent, depending also on the nature of the disaster.

4.3   Nature and features of the disaster

This factor describes the type of hazard and its effect on individual risk perception. A hazard can generally be described as a threatening event, or probability of occurrence of a potentially damaging phenomenon within a given time period and area[7]. Rough distinction can be made by the origin of the hazard, thus if it is a natural or technological respectively man-made hazard. Other distinguishing factors, such as the duration and the frequency, narrow down the hazardous event.

A disaster can be described as a sudden, calamitous event that seriously disrupts the functioning of a community or society and causes human, material, and economic or environmental losses that exceed the community's or society's ability to cope using its own resources. A disaster occurs when a hazard impacts on vulnerable people. The combination of hazards, vulnerability and inability to reduce the potential negative consequences of risk results in disaster.[8]

When it comes to a more detailed definition of a disaster, several differentiations can be made. The origin, the development as well as the consequences both for humanity, economy and environment differ from type to type. A rough and widely accepted distinction is the differentiation between natural hazards and technological or man-made hazards that can lead to a disaster. Different types of risk generate different reactions. For example, unknown risks are regarded differently from familiar hazards and natural hazards do not generate the same level of outrage as the type of technological or man-made hazards. Natural hazards can be e.g. geophysical (earthquake), climatological (drought) or biological (epidemics) events and occur naturally, caused either by rapid or slow onset events. Technological or man-made hazards are events that are caused by humans and occur in or close to human settlements and can include e.g. environmental degradation or industrial accidents (International Federation of Red Cross and Red Crescent Societies, n.d.).

Law and Singleton (2006) discuss in their scientific work early ideas and categorizations of disasters by the sociologist Kai Theodor Erikson. According to Erikson's investigations of several different disasters, technological risks may be seen as more dreadful than natural hazards. These dangers caused by technological hazards are mostly unbound and indirect, unlike natural hazards. Although some of the technological hazard are very perceptible (for example, a nuclear explosion is obviously

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[7] Definition by the Centre for Research on the Epidemiology of Disasters (CRED) on http://www.emdat.be/
[8] Definition by the International Federation of Red Cross and Red Crescent Societies (IFRC) on http://www.ifrc.org/en/what-we-do/disaster-management/about-disasters/what-is-a-disaster/

very clear to be perceived and recognized as such), the majority of these events are perceived as highly risky due to their combination of imperceptibility and the advanced knowledge required to understand their functioning, their development and their possible consequences. Additionally, technological hazards are usually linked with a group of visible and socially conceptualized items (smoking chimneys, barrels, radiation or biohazard symbols, etc.). These socially meaningful symbols act as a reminder of the presence of the hazards and their effects over the humanity, economy and environment. All these elements make the technologic hazards a dreadful category in terms of risk perception, even though they are easier to perceive and mostly preventable.

In contrast, natural hazards are often characterized by happening in a more direct way, mostly with no one to blame and often no way of preventing them from happening. As their impact is direct and usually also easy to perceive it could be assumed that risk perception is even higher when it comes to natural hazards. But despite these characteristics and their capabilities to cause devastation, natural hazards tend to rate lower in the risk perception scale than technological hazards: empirical results show that despite the immense damage they are capable of causing; natural hazards rate relatively low on the perceived risks structure and cause less fear compared with the technological hazards. According to these findings, natural hazards risk can be described as sensorial while the risks produced by technology are cognitive.

Another research by Sjöberg (2000) found, that the personal handling of risk mitigation was driven by the individual's personal risk in the case of technological or environmental hazards. This recaps that the assessment of personal consequences has the highest priority for each individual which makes it to a critical factor in individual risk perception. The need to adequately evaluate and assess the situation as well as the potential fatal consequences highlights the requirement of a certain level of education to empower the individual to understand or even to be aware of a technological or natural hazard (Wachinger and Renn, 2010).

4.4   Training and education

This factor describes the level of knowledge about a certain disaster and its possible consequences. The knowledge depends to some extent on the individual education level but also several other factors, such as experience with a certain disaster or the quality, quantity, diversity and frequency of (official) distributed disaster information. In addition, a generally higher level of education contributes to a better individual preparedness because it can be assumed that flexibility and awareness of options for action increases due to the higher education level.

As already mentioned in the previous section, a certain level of education and/r knowledge and awareness about hazards, especially technological, can be seen as a major factor that influences individual risk perception as well as individual behaviour in a positive and respectively more prepared way. However, the reviewed research literature revealed once again, that the factors knowledge and education do not always influence individual risk perception the same way. The already in Chapter 4.2 described study of Kouabenan (2002) investigated the influence of experience in and knowledge about road traffic on individual risk perception. The study found that more experienced drivers exhibited a higher level of risk-taking than drivers with lower experience, thus their risk perception is

relatively low. Based on this study, therefore, one could interpret that the more experienced the driver, the more s/he is likely to take greater risks than less experienced drivers who tend to have a higher risk perception.

Muttarak and Pothisiri (2013) stated that formal education can promote disaster preparedness. Based on a case study on the 2012 Indian ocean earthquakes on Thailand's Andaman Coast, 557 households were surveyed. The result is that the education level of household members is positively related to disaster preparedness. Furthermore, disaster-related training is most effective for individuals with high educational attainment which is crucial to mitigating disaster risks (Muttarak and Pothisiri, 2013). Furthermore, the authors of the case study suggest policies that ensure universal access to formal education can reduce vulnerability and mitigate disaster impact.

In general, concerning the factor knowledge about a hazard, it can be assumed that individuals with access to multiple sources of hazard information feel more knowledgeable about a certain hazard and the corresponding preparedness and response measures and thus are better prepared. Organizations such as the United Nations Office for Disaster Risk Reduction (UNISDR)[9] can be seen as one of many available information sources. They provide practical services and tools such as the risk reduction website PreventionWeb[10], publications on good practices, country profiles and the global assessment report on disaster risk reduction (an authoritative analysis of global disaster risks and trends) in order to inform and even more important, to connect the people with each other. Several organizations like the UNISDR take over the responsibility to educate the public in a continuous and integrated process, resulting from a wide range of risk reduction activities and resources rather than from a distinct sectorial activity by itself. The goal is to raise the awareness and to distribute knowledge about certain hazards and the corresponding preparedness measures before a disaster occurs in order to educate the public in how to avoid danger and to reduce a disaster's impact. Thus, one success factor for better preparedness is the continuous communication with the people.

Other information sources are located directly in the interpersonal networks of each individual. Knowledge arises not only through information consumption but even more through (social) interaction. Once again, the individual's personality and sociality influences the level of knowledge and education. The only option to gather information and feedback besides official announcements and mainstream news is to interact with the social community. The social interactions, the resulting knowledge distribution and sharing, as well as the formed opinions differ from community to community (Kasperson et al., 2003). For example, if someone is integrated in an organization as a volunteer (church associations, fire department) it can be assumed that he is equipped with more detailed knowledge about certain hazards, preparedness and response processes as well as with necessary tools and methods than someone who is embedded in other social contexts, such as an ordinary office team or a bowling group.

Furthermore, the more different information sources about potential risks and accordingly about good preparedness strategies are made available, the more the awareness concerning hazards can be raised among the public. Different people use different learning methods and consume different media. Thus, the more diverse the range of information is, the greater is the chance to reach the

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[9] http://www.unisdr.org/
[10] http://www.preventionweb.net/english/

majority of people, which is absolutely necessary to build and maintain resilience. Besides mentioned organizations, official institutions of the government are also responsible for the provision of important prevention as well as warning and alert information in a timely manner, shortly before and during a disaster. The exposure to risk and preparedness information is expected to positively influence the perceived as well as the actual preparedness, because well informed individuals can integrate their knowledge into their actual preparedness decision process (Basolo et al., 2009). Early predictions of hazards and early, transparent warning of the public is important regarding community and individual preparedness Another positive side effect of a transparent and ongoing (disaster-) communication with the citizens is the increasing public confidence in the government.

4.5   Trust in authorities

This factor describes how confident an individual is in the capacity of official crisis managers to generate and support resilience at both the community and individual level, as well as manage an effective and efficient response in case of a crisis. Wachinger and Renn (2010: 32ff.) understand trust as an even more important factor when the knowledge of an individual about a hazard or a disaster is low.

Trust was perceived by many researchers and practitioners as a factor of great importance in understanding risk perception and reactions to risks (Sjöberg, 2002). Trust in the government and crisis management professionals as well as the cultural context plays a key role in individual risk perception, independently from the socio-economic environment (Botterill and Mazur, 2004; Ungar, 2008; Williamson, 1993). The trust and confidence in government and its information distribution in times of a crisis is crucial for individual risk perception and the corresponding preparedness (Terpstra, 2011). Trust emerges slowly, is fragile and easily destroyed. And once lost, it may prove to be extremely difficult to recover. In order to be seen as trustworthy, the government and official crisis managers need to meet the expectations of the public. A variety of social and psychological research studies discuss and define the term trust and its characterizations since decades (e.g. Butler, 1991; Ruckelshaus, 1996). In this civil protection context the following characteristics are outlined as conditions for trust in government and official crisis managers:

- Empathy and care: the government and crisis managers are judged according to their behaviour and the concern they show for the well-being of the public. They have to be able to listen and be capable to see and comprehend other people's point of view.
- Honesty and openness: the government and crisis managers must show credibility, objectivity and sincerity. Making risks, possible measures and decision making processes transparent to the public is absolutely necessary to gain the public's trust.
- Commitment and dedication: the government and crisis managers are judged according to the commitment and availability they show in reaching a common goal. Providing accurate information and active participation in decision making processes are main contributions in order to show the public their commitment.

- **Competence and experience:** the government and crisis managers must show technical, methodical, tactical and strategic competences in their area of responsibility. More experienced crisis managers are generally met with more confidence.

As already mentioned before, trust influences the willingness to change the personal attitude towards risks and thus the willingness to take active preparedness measures. The above mentioned conditions describe the individual's requirements towards official crisis managers on the one hand, and serve as a reflection of their own and that of other citizen's disaster behaviour on the other hand. These trust conditions need to be met mutually in order to establish an efficient risk assessment among the community, consisting of citizens and governmental institutions (Kasperson et al., 2003). One can say that trust building, establishing and maintaining is a mutual responsibility by the government and the citizens. Ruckelshaus (1996) described this critical relationship as follows:

Mistrust engenders a vicious descending spiral. The more mistrust exists among the public, the less effective government becomes at delivering what people want and need; the more government bureaucrats in turn respond with enmity towards the citizens they serve, the more ineffective government becomes, the more people mistrust is, and so on, down and down (Ruckelshaus 1996, p. 2). Additionally, Griffin et al. (2004) concluded in their study, that apart from individual risk awareness, anger and a low level of trust in authorities increased active information seeking.

Moreover, effective inter-organizational relationships between institutions, organizations and their professional network are critical for developing and disseminating risk and preparedness messages and thus increase the trust among all affected people. A case-study (Chess and Clark, 2007) on anthrax attacks in 2001 New Jersey revealed, that pre-existing organizational and professional networks increased the internal trust among key decision makers and communicators in the midst of the crisis. This inner agreement among the decision makers and a stable relationship building prior to an event increase trust and improve communication throughout the network, which can in turn improve communication with more general, external public which in turn can result in more trust.

In fact, little is known about citizens' confidence level in government to manage a disaster (Jones and Ander, 2013). Many variables, such as the power distance, the culture, good and bad experiences etc. form the individual trust with the result that it is impossible to generalize the citizen's trust in their local government. The degree to which the trust in the government influences the individual's risk perception in a positive way is also dependent on the individual's interpersonal and social context.

4.6 Social and personal factors

The effect of social factors and personality factors are also crucial on risk perception with regard to preparedness.

Risks are changed by the way people perceive them. Wachinger and Renn (2010) summed up in their study that individuals over- or underestimate risks within their social environment. Social relations with family members, friends and other members of the society describe how integrated an individual is in different social communities and lifestyles. The level of integration, the strength of

bonds as well as quantity and quality of social interaction can influence an individual's social trust and knowledge level (Kasperson and Kasperson, 2001; Grothmann et al., 2013) and is at the same time characterized both by individual and community features (e.g. dimensions of the five-factor model by Digman (1990), emerged from Fiske's classical model (1949)). Eakin and Bojórquez-Tapia (2008) also stress in their analysis of the social context that this factor influence significantly perceptions of risk.

Several research projects and investigations on the human perception of risk have been conducted by various scientists from different fields over the past decades. These different approaches lead to different, seldom convergent results. These mentioned factors thus do not have the full commitment of all investigations but have been identified as the greatest common denominator to build a suitable base in our context.

The individual's identity and personal network is a remarkable and significant factor that influences individual risk perception. As already revealed in the previous chapters, the social context of an individual is the focal point regarding the individual risk perception. Each already mentioned factor that impacts the risk perception is influenced by and influences a person's social environment and interactions. The social context is either innate, such as the family and origin or selected actively or passively by the individual itself, such as friends, communities of interest, religious or political associations, NGO's, social media etc. All experiences an individual makes within the different social networks frame part of his identity, beliefs and attitudes. Several psychologists and sociologists, such as Fiske (1949), Digman (1988), etc., investigated individual personality and character traits over the past sixty years and developed a five factor model which is still valid today, even if it is constantly evolving and there exist different interpretations and nomenclatures (Digman, 1990). In the following, the five dimensions are described and set in the risk perception context:

1. **Extraversion (enthusiasm, social activity, self-disclosure)**

   This factor mainly indicates where most of the individual's energy is directed: in the inner world of thoughts and ideas (low level of extraversion) or in the outer world of events and actions (high level of extraversion). Extrovert people spend more time on "doing" than "reflecting", like introvert people do. Extrovert people tend to have a lower risk perception and thus do less worry about risky behaviour than introvert people.

2. **Agreeableness (sociability, empathy, affability)**
   This factor describes the way that each individual behaves with others and is related to the concepts of nonviolence and care for others and the environment. More agreeable individuals consider possible danger as more undesirable and hence as more risky than less agreeable persons. More agreeable individuals tend to engage less often than others in risky behaviours.

3. **Conscientiousness (self-control, will to achieve, rationality)**
   This factor relates to the organized, controlled, determined and effective manner with which the individual thinks and acts in his environment. This factor is related to the concepts of precaution, foresight and accuracy. More conscientious individuals tend to engage less in risky behaviour than other people. Individuals who score higher on conscientiousness are

more likely to perceive a hazard as riskier than people who score lower on conscientiousness.

4. **Emotional stability (impulse control, happiness, calmness)**

   This factor is related to the idea of fearlessness in many circumstances. Emotionally stable persons perceive less risk in any situation whereas less emotionally stable people (who seem to appear as less tranquil or less tough) may have the opposite reaction and evaluate these situations as riskier. Thus, higher levels of emotional stability are associated with lower levels of perceived risks.

5. **Openness to experience (intellect, competence, creativity)**

   This factor describes the way that the individual perceives the world and is largely related to the concepts of curiosity and intellectuality. For example, more open individuals view modern technologies in a different light than other people as they usually tend to educate themselves in order to understand scientific complexity. Thus, more open individuals perceive the risks that could emerge from especially technological hazards as relatively low.

Other personal factors discussed that determine or enhance preparedness in research are "worldviews" and (compare Dake, 1991) "anxiety" (compare Spielberger, 1966). These personal factors are analysed and evaluated in the study of Bouyer et al. (2001) on a 10-factor risk-perception structure. Bouyer et al. (2001) conclude from their own study that the link between anxiety and risk evaluation in different studies is weak and contradictory to some extent. Palmer (1996) showed that world views (e.g. fatalistic views, egalitarian views …) strongly influence the way in which way individuals perceive risks – at least in the financial domain. Bouyer et al. (2001) came to the same results with their studies.

Several of the above mentioned personality factors enable a person to interact with their social environment and network, at least to some extent, sometimes more, sometimes less. Different social communities of interest frame the individual's perspective on the world and respectively his perception of risks caused by natural or technological hazards. In the case of an extensive disaster with victims across the community, social cohesion can arise as a result of the shared experience. A common strength derived from community interaction can be observed in many cases. Those citizens affected by a disaster, such as a drought, may perceive a common threat and respond with communion: social bonding based on sentiment prompting collective action to combat the threat. For those collective social actions a critical mass is required. Thus, if the disaster forces too many people to move, social interactions come to a standstill (Stehlik, 1999).

In addition to the already discussed personal characteristics, more general distinguishing factors also affect individual preparedness. For example, different lifestyles, socioeconomic variables, or living in urban or suburban areas with accordingly different population densities; all influence the level of individual preparedness.

The threat of loss to human life and property increases with the higher population density found in urbanized areas (Basolo et al., 2009). A higher density of the population is usually found in large cities, where important governmental or political institutions are located. Accordingly, the risk of a terrorist attack or other technological or man-made hazards (such as power failure and its consequences) affecting the entire infrastructure (e.g. public transport, surveillance systems) is

higher within a more densely populated area. Based on this, a logical statement is that people living in urban areas are constantly exposed to especially technological risks and should be more prepared. However, the household study on public response to terrorism (Kano et al., 2008) did not find any significant differences between urban living and suburban living people regarding preparedness actions (e.g. duplicate documents, stockpile supplies, etc.). One could conclude therefore that urban residents, given the fact they live in a more risky area to technological hazards, are less prepared than suburban or rural living citizen. Other major factors contributing to this imbalance are on the one hand the different level of collectivism among the urban residents and on the other hand the different level of power distance. Suburban and rural areas are usually characterized by a higher level of collectivism and a lower level of power distance. This results in a higher degree of mutual support, both among residents and between residents and government (Kluckner, 2011). Additionally, citizens living in the suburbs tend to be engaged more often in social communities or activities of interest than urban residents. Finally, those people who reflect their ideas of preparedness with others are usually better prepared due to the more extensive exchange with other people.

Beliefs and attitudes, which partly build the personality of an individual, also influence preparedness behaviour. Some cultures and ethnic groups and so their members that are inclined rather fatalistic, thus they believe that the destructive effects of a hazard are inevitable, are less prepared compared to those who have a more positive and enthusiastic belief. The term fatalism is often linked to the locus of control. Rather fatalistic people tend to an external locus which means, they believe that circumstances reflect societal forces and chance factors such as fate. In contrast, less fatalistic people believe that circumstances reflect their own actions and thus exert more control over their circumstances. People with a tendency towards fatalism and external locus are usually not as well prepared as rather active and positive thinking people. Preparedness could be enhanced by changing people's locus of control beliefs towards a more internal perspective; because events may not be controllable but the consequences respectively the circumstances can be influenced. These beliefs are not simply reversed but can be modified when the contingency between mitigation actions and positive outcomes is demonstrated (Paton et al., 2006).

Two already mentioned US studies (Kano et al., 2008; US Environmental Protection Agency, 1993), the one addressing terrorism and the other one CBRNE, investigate preparedness at both the individual and household level and also considers differences among various ethnical and cultural groups. According to these studies, white and black respondents were the most likely to say they have learned more about terrorism and have become more vigilant; Hispanic respondents were the least likely to say so. Also regarding the awareness and knowledge about radon, minority groups are less aware of that risk than the majority group of white people. But on the contrary to these statements, especially the Hispanic people seem to act more precautionary. They stated they reduced airplane travel, avoided tall buildings and reduced the use of public transportation; the respondents of other racial/ethnic backgrounds did not. Based on these findings, it could be concluded that several identity patterns directly influence individual patterns of behaviour. But even when those patterns seem to be associated with different cultures and ethnics, no statistical or qualitative proof has been found that solely the membership of a particular culture or ethnic groups as major effects on individual preparedness.

Socioeconomic variables such as gender, age, income, education and profession also influence the individual preparedness to certain extent under certain circumstances. Gender plays a minor role in risk perception and derived preparedness measures. Women always seem to be more worried about several risks than men, especially when being a parent or living in rural or poor areas where fewer women have the possibility to educate themselves and are forced to trust in others recommendations (e.g. husband, community). But no scientific findings have proven so far that this generally higher risk perception among women leads to a significant increase of their preparedness. Older people tend to have a susceptibility to specific hazards and their effects, especially towards technological hazards they are not familiar with. Depending on their locus of control, they act either very prepared (internal locus) or not prepared at all and/or avoid unknown risks when possible (external locus), as they have no interest or ability to understand the complex risk and the associated preparedness measures. In comparison, younger people perceive risks associated with technologies as relatively low, but fear natural hazards more than older people (Wachinger and Renn, 2010). This assumption depends once again on the individual's social context and beliefs, experiences with that kind of hazard in the past, education level and/or profession.

The most important preparedness literature suggests that households with a higher socio-economic status, thus having a better education and more income, have a low risk perception but are better prepared for disaster than their financially less-well-off counterparts. Poorer people with less financial security have in general a higher risk perception but are yet worse prepared. They simply own fewer resources to devote to preparedness and have less access to information on hazard reduction, which does not automatically mean they have no intention to prepare. Thus, the higher preparedness among financially advantaged people simply emerges from their financial options even though they have less intention to be prepared (e.g. assuming rich people live in newer homes where smoke detectors are built in by default, they do not actively ensure this preparedness measurement like someone who lives in an older house/apartment and had to install the equipment). Nonetheless, both the intention to prepare and the actual preparedness behaviour appear to be related to perceived personal responsibility for taking action and the perceptions about the characteristics of different hazard adjustments (Tierney et al., 2001).

Finally, disaster response is no magic "black box". Organisations responsible for disaster management and disaster communication can take advantage of the opportunity for social change introduced by disasters (Congrave, 2008). But frankly spoken, a single disaster response cannot undo decades of underdevelopment.

While social and personal factors contribute to risk perception, the research that has been done over the past decades regarding distinguishing factors of individual preparedness cannot be considered cumulative because few attempts have been made to replicate and validate previous findings. Moreover, the fact that much of the work has been done in very different hazard contexts limits the generalizability of the results.

4.7 Experts vs. civil population and risk perception with regard to preparedness

In our context we understand an expert as an active member of a crisis-relevant organization, such as local emergency management agencies, fire, police and emergency medical service providers. Clearly, the same factors that constrain preparedness at the household level also exist at the organizational level, but crisis management professionals and other members of any of the abovementioned organizations have usually experienced disasters more frequently than non-professionals, thus they tend to demonstrate stronger competences in the preparedness, response and recovery phases of a crisis (Tierney et al., 2001). In this regard, they have a unique advantage over the civilian population. Using the example of Italy (Lucini, 2014), three quarters of the civil protection volunteers have a high level of education (high school or higher), which we have learned influences the individual preparedness, while only 56 percent of the civil population (adults aged 25-64) have earned the equivalent of a high school degree. Another important factor that makes a volunteering individual more stable and prepared is the development of a social behaviour through social reflection within the organization. Attributes such as collaborative behaviour, trust and/or reciprocal help by and among volunteers contributes to a prepared behaviour and a stable mind before and during disaster (Lucini, 2014). These attributes are not as strong for civil population, no matter what other social groups they belong to.

Several studies and surveys have concluded that crisis management organizations could enhance their own as well as the civil population's preparedness by focusing on three strategies and their associated activities:

1. Managing citizen volunteers
   The civil population should be involved in emergency planning and act before, during and after an event. Civil groups can help officials to decide in advance who gets scarce medical resources, give aid when the professionals cannot be there and comfort survivors over time. Thus, such volunteer-related preparedness activities (providing training and education) have some potential benefit but also require great effort.

2. Providing disaster information to the media
   The dissemination of disaster information is a responsible task for crisis management organizations that requires a certain level of media competence. The establishment of relationships with trustworthy and reliable media, which is an ongoing process, is the basis of this preparedness strategy. Nonetheless, this strategy is promising as long as the condition of a trustworthy relationship is fulfilled.

3. Improving inter-organizational coordination
   Finding and framing an adequate level of collaboration and autonomy is the key to success. Local emergency management agencies vary in a number of ways, including domains and responsibilities, relationships with other crisis-relevant organizations and resources available to manage disasters. A more or less clear separation of responsibilities is a promising factor, whereas the two latter factors, managing relationships and resources, could be improved by restructuring them towards more collaboration. The subsequent network effects result in a

more efficient inter-organizational work, thus each organization is better prepared. This strategy requires an ongoing maintenance process but has the best potential benefit for both the organizations and the civil population.

Those strategies that are seen as having a clear benefit and as involving relatively little effort and resources to implement are the most likely to be considered.

Finally, the adaption of expert knowledge is always connected to the trust the public has in experts, which in turn is dependent on the inner trust among the experts. Only when this condition is met, the public is willing to learn from experts and to adapt their preparedness behaviour to certain extent. The desire to educate oneself is always limited by the individual's perceived preparedness. Individuals who tend to overestimate their knowledge about a certain hazards show less intention to learn from crisis experts.

Summarizing, each individual, whether actively or passively or not at all engaged in crisis management, is differently prepared when it comes to handling a crisis. This preparedness behaviour is determined, inter alia, by personal characteristics and broader distinctions such as culture and ethnic background, living conditions and socio demographic aspects. Moreover, preparedness 'skills' can be stronger or weaker, depending on the social context of each individual. For this reason, crisis and preparedness communication with the public cannot be positioned generally. Depending on the hazard itself, the differences in the prevailing knowledge and trust among the public and other factors require a specific addressing. This strategy is more expensive but should lead to a more efficient risk perception and preparedness. Differences between experts and civil population regarding preparedness are definitely present but are, contrary to the assumptions of several older studies, not only caused by different knowledge levels but rather by the vast of experience of experts.

5 The DRIVER Risk Perception Framework

The main purpose of the deliverable has been to explore basic information about factors of risk perception of individuals. The added value to already existing research in the context of DRIVER is to develop first recommendations about needs and opportunities to enhance risk perception with regard to preparedness by learning and training activities as well as resilience communication.

Several factors influence risk perception, but models suggested for risk perception have failed to explain more than a rather small fraction of it. It is beyond the scope of the DRIVER project to offer a new model that explains behaviour of human beings according to disaster situations. Social behaviour seems to be too complex and unpredictable in a multi-dimensional construction to explain awareness behaviour with a certain probability for risk awareness including action for preparedness.

Rather, we decided to build a framework based on the key factors identified that give first priorities of action to enhance and strengthen resilience by increased risk perception. This framework can be used as a basis for individual and volunteer preparedness training and resilience communication activities in follow-up tasks of WP32 in DRIVER and the entire DRIVER consortium. Organisations outside of the DRIVER consortium can use the framework as a starting point to increase specific activities of their risk awareness and preparedness activities for the benefit of a more robust and resilient society.

DRIVER Risk Perception Framework

The present framework applies key elements of risk perception for disasters. It aims to guide crisis managers to use the key elements as key factors to enhance disaster preparedness.

Goal

Risk prevention by offering trainings and learning activities by addressing elements of risk perception

Targets

The main targets to be addressed by the risk perception framework are

- Increase the resilience against the growing threats of natural crisis and disasters
- Reduce global disaster mortality in societies
- Reduce damage caused by disasters and crises to critical infrastructure
- Enhance joint activities in the society for a collaborative preparedness
- Reduce economic loss caused by disasters and natural crisis
- Reduce the number of affected people of a crisis

Priorities for action

There is a need for focused action within a country to enhance risk perception enhancement opportunities for the benefit of a more resilient society. The following priority areas are derived from the key factors identified influencing risk perception and preparedness. Each priority addresses different aspects and measures that need to be taken into account that prevent and reduce disaster impacts to strengthen resilience.

Priority 1

Publicity, communication and media

The main objective for training and learning activities concerning communication is to modify risk perception and risk attitudes towards preparedness and protective risk behaviour. Learning content with respect to hazards and disasters can be conveyed by both social and traditional media.

Concerning professional and methodical competences, learning and training opportunities should be extended both for civil population and experts. The dissemination of risk and preparedness information should be extended or transformed into an ongoing action that must be taken in everyday life and not only during or after a disaster. Risk perception and preparedness can also be influenced by the frequency of communication, how expert knowledge and partnerships are utilized, which strategies are chosen for message dissemination and by the ability to evaluate and provide feedback to enhance future effectiveness.

Priority 2

Experience with similar disasters

In order to establish a repository of knowledge about past disasters and hazards, professional, methodical, social and personal competences needed for experts and civil population should be identified and analysed. This might serve as a basis for learning and training activities to enhance preparedness and resilience. In particular in the frame of debriefings of experts their awareness on required competences should be updated and enhanced.

Priority 3

Nature and features of the disasters

Each disaster is unique. This implies that different competence settings (professional, methodical, social, and personal) and their combination need unique training and learning opportunities to enhance awareness for preparedness and resilience. Both for civil population and experts training and learning should be provided to improve their preparedness and resilience towards hazards independently from their personal attitudes and involvement. The adaptation of general training approaches to specific regional situations can be supported by the resilience assessment approach (WP34).

Priority 4

Training and education

A higher level of education contributes to a better individual preparedness because it can be assumed that flexibility and awareness of options for action increase due to the higher education level. A certain level of education respectively knowledge and awareness about hazards, especially technological, can be seen as a major factor that influences individual risk perception as well as individual behaviour in a positive and respectively more prepared way. Policies that ensure universal

access to formal education can reduce vulnerability and mitigate disaster impact. In general, concerning the factor knowledge about a hazard, it can be assumed that individuals with access to multiple sources of hazard information feel more knowledgeable about a certain hazard and the corresponding preparedness and response measures and thus are better prepared.

Priority 5

Trust in authorities

Learning and training opportunities concerning trust in authorities as a major risk perception factor with regard to preparedness have to be directed towards stakeholders of crisis management. Learning objectives in this sense refer predominantly to social competences. Authorities and stakeholders of crisis management should learn to act, behave and communicate in a trustful way. As a consequence it might be assumed that the risk perception of civil population and expert leads to an increase of the willingness to prepare for hazards and disasters.

Priority 6

Social and personal factors

Due to the variety of characteristics of individuals in perceiving information, learning and training activities for individuals concerning risk perception with regard to preparedness should both be personalized to some extent. Due to the effects of social groups on individual risk perception, community-based learning and training activities should be taken into account. For both individuals and social groups all competence settings (professional, methodical, social, personal) should be addressed by learning and training. Learning objectives should address topics such as extraversion, agreeableness, conscientiousness, emotional stability, openness to experience, world views and anxiety.

Priority 7

Civil population and experts

As already mentioned in the previous passages there are differences in learning and training of risk perception with regard to preparedness between civil population and experts. Although the competence settings addressed seem to be quite similar for different risk factors discussed, the learning objectives for the two groups differ in many aspects. Different ways of learning, level of competences and content as well as duration of training have to be taken into account. According to the field of application (experts: professional; civil population: private) trainings have to be tailored in more formal respectively informal way. Also the solutions to involve non-crisis-management experts into the crisis management can benefit from the understanding of risk perception.

Based on the findings and conclusions drawn in this deliverable, the recommendations given in this chapter should serve as first valuable hints for learning and training activities with regard to risk perception and preparedness. Further research is necessary to condense the findings in terms of learning and training to support the applicability of these results to improve resilience of individuals.

Guiding Principles

Additionally, the following guiding principles should be taken into account when designing training and learning activities:

- It is important to construct communication strategies relative both to the community and each individual context within which they will be implemented.
- Being self-confident or intimidated after experiencing a disaster makes a huge difference regarding individual risk perception.
- Natural hazards risk can be described as sensorial while the risks produced by technology are cognitive.
- The more different information sources about potential risks and about good preparedness strategies are made available, the more the awareness concerning hazards can be raised among the public.
- The degree to which the trust in the government influences the individual's risk perception in a positive way is also dependent on the individual's **interpersonal and social context.**
- The intention to prepare and the actual preparedness behaviour appear to be related to perceived personal responsibility for taking action.
- The preparedness behaviour is determined by personal characteristics and culture and ethnic background, living conditions and socio demographic aspects.

6 Conclusions

This deliverable has investigated risk perception and preparedness in the overall context of disaster resilience. Individuals play an important role in establishing resilient communities and countries across Europe. Fostering resilient individuals is therefore a key function of a European Crisis Management system of systems. Perception of risk is a fundamental element of how the general public prepares and responds to disasters as well as how they recover from the effects of disasters. As such, an understanding of risk perception and how it links to preparedness of individuals is important for all activities within DRIVER. The objective of this deliverable is to provide this shared understanding.

Based on the results of the literature review, this chapter describes the implications for the DRIVER project. This includes that the priorities made in the DRIVER risk perception framework can be used in different DRIVER work packages. Within SP3: training and learning activities for resilient individuals and affiliated volunteers (WP32), resilience of communities (WP33) and local governments (WP34), resilience communication (WP35) as well as management of unaffiliated volunteers (WP36). The findings have indirect implications for a broader range of more traditional "command and control" activities in DRIVER as well (SP4), which are not outlined here in detail, and other direct implications for SP5 activities that will be elaborated on at the end of this chapter.

The following recommendations for resilience building activities in SP3 arise as a result of priorities distilled in the DRIVER risk perception framework:

- The finding that past experience with disasters influence risk perception has implications for the training and learning activities in WP32. When planning training and learning activities, the past experience of the group of trainees should be taken into consideration because past experience may influence both a) stress reaction to a particular disaster and b) likelihood of preparing for a particular disaster. This can be accommodated through an adaptation of the generic training material and through involving the trainees and their past experiences actively in the learning situation. As an example, the Danish Red Cross experiences have shown that it is easier to engage communities which had been affected by the tsunami (or other hazards), as they had a greater awareness of risks they face.

- The finding that the perceived risk of a disaster may be influenced by the extent of media coverage, regardless of whether the individual is directly involved or not, has important implications for the psychosocial support needs of a population that are the focus of the remaining tasks of WP32. This has, for example, been seen in the 2003 SARS outbreak, where frightened but physically healthy individuals overwhelmed the health care services in countries where very few or no cases had been detected (Smith, 2006). In such cases where perceived risk exceeds actual risk, it is important to acknowledge the perceived risk of the population. Furthermore, it may be necessary to combine effective crisis communication messages with psychosocial support services such as hotlines for people in distress or other activities.

- The community resilience enhancement activities in WP33 should take the findings on experience with similar disasters into consideration. Several community resilience activities take an all-hazard approach but there may be a need to adapt generic community resilience activities to a specific type of disaster: a community may be well prepared for a flooding based on previous experience but may not have specific preparedness measures for earthquakes in place. Furthermore, it is important for actors and agencies involved in community resilience activities to consider that experience with similar disasters does not automatically lead to increased risk perception and preparedness because this can be mediated by the experience with official crisis management operations in the past. This means that it cannot simply be assumed that a community with previous disaster experience will be resilient because the level of resilience will be mediated by their experience in past disasters.

- The finding that people are more likely to adopt preparedness behaviour if the message comes from a trust-worthy source has ramifications for both WP34 on resilience of local governments and WP35 on resilience communication. Official crisis management messages often come from local governments that should communicate in a trustworthy way to effectively engage communities and individuals. Risk perception and preparedness can also be influenced by the frequency of communication, how expert knowledge and partnerships are utilized, which strategies are chosen for message dissemination and by the ability to evaluate and provide feedback to enhance future effectiveness (see D35.1).

- As a consequence it might be assumed that the risk perception of lay people and expert leads to an increase of the willingness to prepare for hazards and disasters. Here resilience communication has a relevant role besides specific training activities (WP35).

- Addressing and involving unaffiliated volunteers (WP36) strongly depends on their risk perception and in particular in their willingness to support crisis management activities beyond their personal situation. Thus, in communicating with and tasking of such unaffiliated volunteers it is relevant to consider the factors influencing risk perception both in the preparedness and in the response phases.

In summary, the DRIVER risk perception framework contributes to the overall DRIVER civil society resilience framework (D31.21) with a practically-oriented approach to understand risk perception in the context of crisis management. This understanding is important throughout the disaster management cycle, including for resilience communication and resilience building activities at individual, community and local government level as well as more traditional "command and control" activities in crisis management.

In addition, the findings in this deliverable are relevant for SP5 as well, for the benefit of enhancing its activities, in particular WP52 Competence Framework and WP53 Lessons Learned Framework:

- WP52: Identifying a mechanism to cluster competences (DRIVER competence framework) seems to be a useful approach to align and communicate learning and training activities to the DRIVER risk perception framework. Competences in this sense are the demonstrated abilities to apply knowledge and skills to achieve intended results (see D52.1). It could be a beneficial approach to link competence clusters to the described risk perception factors.

- WP53 elaborates a repository of knowledge about past disasters and hazards, which might serve as a basis for learning and training activities to enhance preparedness and resilience (D53.1). In the frame of debriefings of experts their own risk perception as well as the probably differing risk perception of the affected population should be taken into account. This supports the quality of lessons learned in order to achieve more efficient and effective operations.

For the upcoming years, research on the link between risk perception and preparedness is still on top of the agenda in resilience research as demonstrated with this deliverable as well as many other topical publications on disaster and crisis management. The DRIVER risk perception framework is seen as a contribution to cluster existing findings in risk perception on a common practically-oriented basis. Future research activities are needed to strengthen the priorities identified and described in the DRIVER risk perception framework. Especially interdependencies of key factors within the priorities as well as the interdependencies between the key factors of different priorities should be targeted.

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