

Introduction

Risk perception plays an important role in disaster risk management (DRM). In cases in which people have poor or no perception of a particular risk, their reaction might be inappropriate or even harmful (e.g. building houses in flood-prone areas). In other cases in which the perception of risk is framed by historical and social events, risk awareness and perception are high, and people and institutions show enhanced preparedness in order to reduce potential harms. Literature shows that **risk perception largely influences risk management** and therefore determines

whether risk management is successful in reducing vulnerability (e.g. Bubeck et al, 2012).

In the ENHANCE project, the goal has been to enhance multi-sector partnerships (MSPs) to manage catastrophic natural disasters in Europe. In order to enhance risk management, we need to understand what kind of risk management cultures exist, and identify and assess indicators that represent cultures of risk.

The project followed the following approach:

⁽¹⁾ We developed the basis for providing criteria to analyse the regionally and culturally embedded perception of natural hazards and (economic and human) resources, as well as to analyse the recent handling of risk events. These criteria might help other areas in Europe with similar contexts and risks to develop similar risk management strategies.

⁽²⁾ We developed and implemented a standardised online survey to find out how risk management practices are shaped by risk perceptions in MSPs. More specifically, we investigated experiences with past risk events and assumptions about future risks, how these relate to concrete policies and measures adopted within individual organisations and in the MSPs, and which risk management cultures can be identified. The survey targeted, particularly, representatives of organisations dealing with natural hazard risks.

Factors influencing risk perception

To understand how risk perceptions shape risk management, we follow the **Cultural Theory of Risk** by Douglas and Wildavsk (1982) and the **Protection Motivation Theory** by Rogers (1975). As a basis for determining the objective risk, the IPCC (2012) and UNISDR (2009) definitions of risk can be followed, which define risk as a combination of **hazard, vulnerability** and **exposure** (see also Chapter 2). However, these definitions fail to include the perception component, i.e. including **risk as a mental construction** (IRGC, 2005). A mental model is an individual's internal, personalised, intuitive and contextual understanding of how something works (Kearney, 1997), acquired over time through social interactions and experiences. When an event repeats, the model is used as a lens through which the individual arrives at perceptions or evaluates new information (Jungermann et al., 1988). This is related to the psychological side of risk and consequently to the perception of the risk.

Several factors determine how risk is seen by people and organisations. Individuals, institutions, communities or societies may perceive risks differently due to diverse cultures or beliefs. Risk can be seen as a **collective and cultural construction** (Douglas, 1982).

Perception of risk goes beyond the individual, and it is a social and cultural construct reflecting values, symbols, history, and ideology (Weinstein, 1989). This represents institutions in the sense of Ostrom (1990). In some cases in which the population is used to particular extreme events, they might have internalised them and might not consider the events as a risk. For these people, it is not risky to live with e.g. droughts: it is a situation that they are living

with for many years or centuries and which they have encapsulated in their daily lives. It is for this reason that we cannot only consider the natural hazards as a risk, but understand risk through **the perception and meaning given to it by the people living in a particular area**. Such consideration provides a useful perspective for developing risk management strategies that are tailored to the local needs of stakeholders.

Figure 3.1 shows factors determining the perception of risk, which is **a complex combination of innate biases and experience**, i.e. cultural-, socio-political- and emotional factors (Renn, 2000). These factors are both collective and individual. Although we focus on the collective dimension, it is important to know that the individual dimension influences the collective. Thus, the factors on the individual side are important for determining the global risk perception factors. Perception is our sensory experience of the world around us and involves both the recognition of environmental stimuli and actions in response to these stimuli. Cognitive psychologists state that factors underlying perceptions are, e.g., personal risk experience, social communication and cultural traditions (Aven, 2010).

Figure 3.1.

Factors determining risk perception (Source: Adapted from Renn and Rohrmann, 2000).

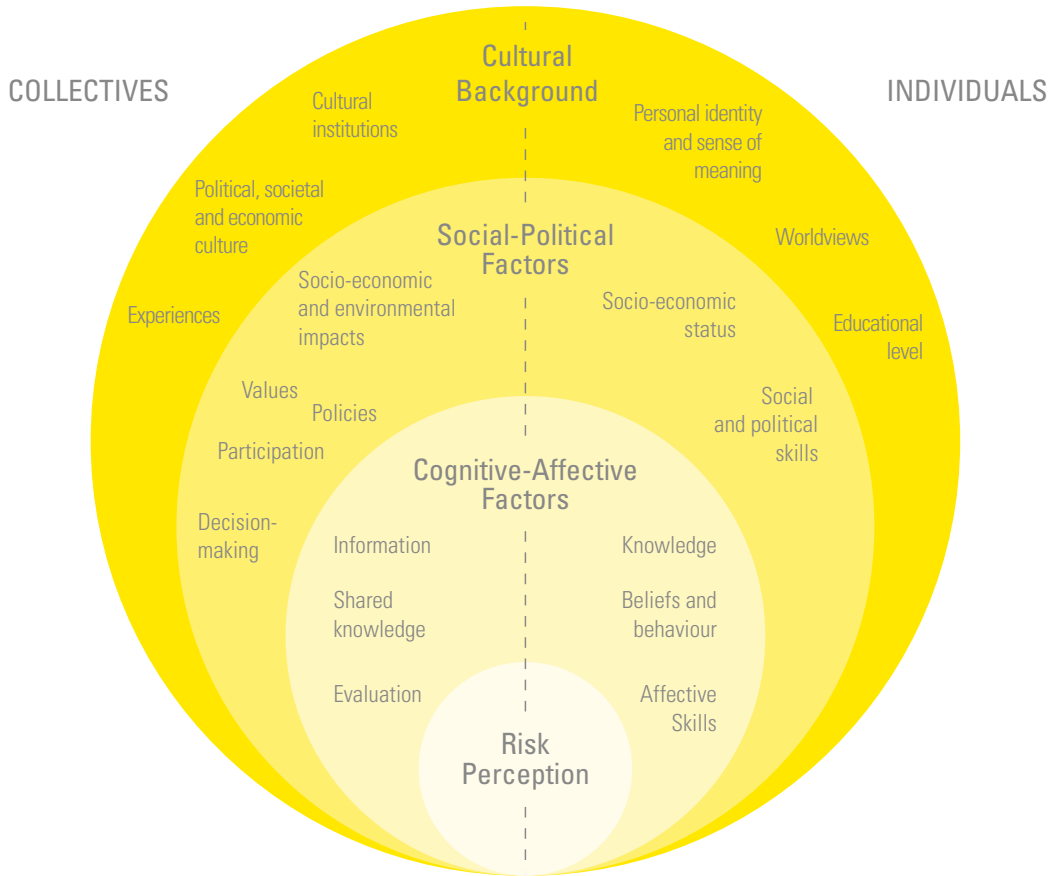


Figure 3.2.

Risk management and risk perception.



Risk management and risk perception

Risk management is a more or less systematic approach that includes the identification, assessment and understanding of a risk in order to define a collection of management actions. The aim of risk management is **to minimise the potential harm of a risk event by implementing strategies and actions to control and reduce risk** (UNISDR, 2009).

Risk management in the context of natural hazards has rapidly evolved over the last decades, from protective ex-ante strategies and ex-post focused strategies, such as insurance solutions, to a recently emerging, more holistic focus related to the concept of resilience (Ghesquiere et al., 2006). Approaching disaster risk management from a resilience perspective entails the integration of physical, social, financial, technological and human capitals (as we described in chapter 1) across all components of the risk management cycle (recovery, assessment, prevention and mitigation, preparedness).

Since risk is perceived differently by people, **risk management approaches are influenced by what people perceive as 'risky'**. If within an MSP a hazard is perceived as a potential risk, the respective actors will take action to manage it. Often preparedness in the face of a threat influences the degree of risk perceived, e.g., the higher the preparedness, the lower the perceived risk. This is also referred to as **the 'levee effect'** (Tobin, 1995). A good example is the Wadden Sea Region case study (Chapter 11), in which a high confidence in the preparedness measures (dykes) results in a low risk perception. Another important factor influencing risk perception is **past experiences of extreme events**. This can enhance risk perception for a

period of several years after the event, as was shown after the Hurricane Katrina in New Orleans, and is even capable of generating debate in risk management in other countries such as the Netherlands. On the other hand, a long-term high risk, such as the frequent periods of droughts in the Júcar River Basin in Spain, have lowered the perception of the risk faced. In this latter case, stakeholders might follow the previously used strategies to face the event and/or use existing knowledge and experiences from previous episodes to create new risk management strategies.

Even within one MSP or institution, we find an internal mix of cultures. Therefore, an MSP which shares the same goal of reducing risk and gaining mutual benefit could achieve this goal through very different views on how to do it. According to the **Protection Motivation Theory** (Rogers, 1975), people or MSPs follow the appraisal of the threat and coping strategies, and might first decide whether a threat in the area is relevant or not (**Figure 3.2**). If this is the case, they will determine which actions to take. In other words, risk management strategies adopted by MSPs are highly steered by the individual actors' subjective perceived probabilities of adverse extreme events, i.e. their risk perception and risk preferences. The subjective probability as the perceived risk is usually responsible for people's behaviour and shapes risk management (Wauters et al, 2014).

In our analysis we tried to capture: 1) the understanding of risk and the perceived probability of adverse extreme events; 2) social and cultural interpretations of risks as well as experiences and traditional strategies, and 3) the resulting management.

Assessing the relation between risk perception and risk management

Following two features, risk perception determining risk management and the consideration of risk as a natural hazard and its consequences, we used a qualitative research method to analyse and compare different case studies. **An online questionnaire** was made available to all MSPs in the ENHANCE project (see **Table 3.1**) for gathering data from organisations dealing with natural hazards. Furthermore, we have described the risk cultures of such organisations avoiding focussing on individuals. We were particularly interested in organisations that are creating alliances with other organisations and are pursuing a common objective. **We assessed which elements enhance risk management practices within the cooperative action of an MSP.**

The challenging aspect is that these common perceptions are shaped by different individuals with different points of view, but probably sharing a common risk culture. Through the questionnaire responses, it was possible to introduce an overall description of cultures of risk within different case studies. The questionnaire development was based on **Cultural Theory** (Douglas and Wildavsk, 1982), which asserts that structures of social organisation endow individuals with perceptions, reinforcing those structures in competition against alternative ones. Furthermore, we used a revised list of criteria obtained from the **Protection Motivation Theory** and the **Framing Theory** (Slovic et al. 2004).

Table 3.1 shows how information was categorised from the questionnaire. The ENHANCE case studies addressed floods, forest fires, droughts, earthquakes and their natural consequences (e.g. volcanic eruption).

Table 3.1.

Survey categories for assessing cultures of risk across European MSPs.

Section	Elements		Criteria
Characteristics of the institution	Information		Knowledge
			Pattern of behaviour
	Values		Experiences
			Trust
Political issues		Decision-making	
Natural Hazard (Risk description)	Hazard		Typology
	Impact		Socio-economic
			Environmental
	Event		Frequency
			Intensity
Data (observation/recorder)			
Management (Risk management)	Resources		Financial
			Skills
	Coping capacity	Policies	Assessment
			Prevention/mitigation
			Recovery
			Preparedness
Participation (Partnership)	Participation		Partners
			Cooperation
	Policy		Communication
			Regulation
Evaluation		Improvement/review	

Survey results

Most ENHANCE MSPs surveyed are generally voluntary. An exception were some partnerships focussing on civil protection, and almost 60% of the MSPs are regulated by official legislation.

The risk perception characteristics of the Wadden Sea Region and Júcar River Basin case studies are outlined below. **The analysis of risk perceptions across European MSPs showed important factors that brought the MSPs of ENHANCE to put risk management practices in place (see Figure 3.3).** Almost all respondents indicate that risk management would be enhanced following an increase in the frequency of disasters, mainly due to increase/decrease of precipitation (depending on the region and natural hazard observed); sea level rise; increase in climatology intensity; increase of human settlement in some areas and also human abandonment in others; deficiency in infrastructures; and climate change.

RISK PERCEPTION in the trilateral Wadden Sea Region

The Wadden Sea Forum (WSF) is an independent platform of stakeholders from different sectors (Agriculture, Energy, Fisheries, Industry and Harbour, Nature Protection, Tourism) as well as representatives of local and regional governments in Denmark, Germany and the Netherlands. Once established to foster sustainable development of the trilateral Wadden Sea Region (WSR), the ENHANCE project investigate the WSF's potential as a MSP in the trilateral coastal risk management processes, supporting the target to enhance risk management as people-centred, social processes.

Embanked foreland at Sönke-Nissen-Koog,
German Wadden Sea coast.
Photo by Birgit Gerkenmeier.

Stakeholders of the WSF perceive storm surge events as a major risk in the WSR. These perceptions correspond with scientific discussions in coastal research highlighting the need to enhance resilience against natural hazards, such as storm surges, along European coast lines. However, stakeholders' awareness of the currently applied storm surge risk management measures in the WSR does not correspond to this tenor: In fact, stakeholder discussions disclosed that storm surges represent a major risk – but this risk is currently well managed and therewith reduced to a societal tolerable degree in all the three countries. Much more important, however, for stakeholders of the WSF are risks deriving from socio-demographic changes –for these issues stakeholder express a most urgent need for action and improvement of risk management in the WSR. Furthermore, risks resulting from conflicting spatial uses between different user interests in the WSR are perceived as important risk in the area which is, following stakehold-

ers' awareness, of high priority for enhancing risk management activities.

This insight of stakeholders' risk perceptions and their awareness of management needs reveal that the WSR is facing a multitude of risks, including urgent need for improved risk management processes beyond storm surge risk management issues. Focusing on only one of these risks would not meet stakeholder expectations and risk management requirements. In practice, the necessary consequence is to include an expansion and adjustment of the risk management aims to the MSPs requirements, as it was done in the ENHANCE cases study. In this regard, the WSR findings underpinned the importance to acknowledge and to include stakeholders' (and societies') concerns and keep risk management processes flexible enough to adapt to changing or new conditions in the management process.



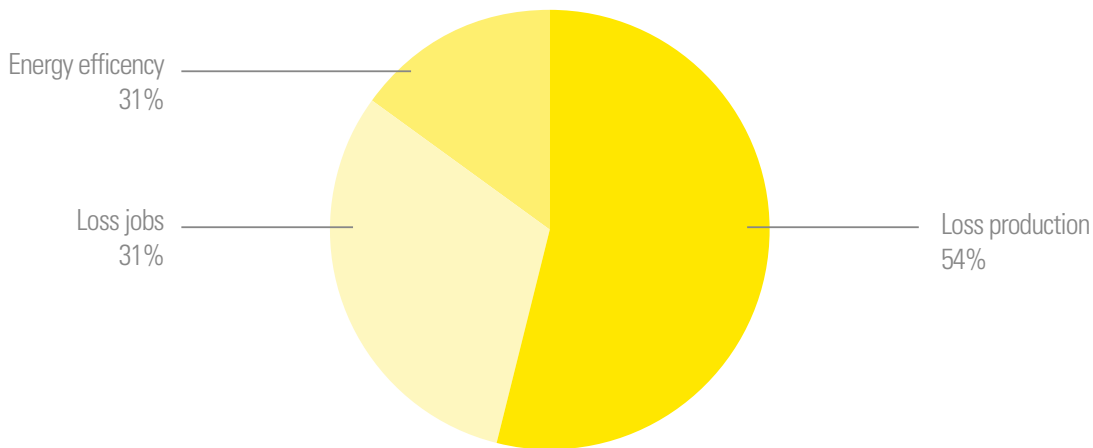
RISK PERCEPTION in the Júcar River Basin

The Júcar River Basin Partnership (JRBP) manages the water issues in the basin. The Permanent Drought Commission (PDC) is a MSP (apart from the JRBP) decreed by Royal Decree (Spanish legislation) when the drought special alarm system detects drought in the basin. The PDC is shape by governmental authorities, private enterprises, partnerships of water users, NGOs and union representatives.

Stakeholders' perceptions vary from one water use to another e.g. *agricultural associations for irrigators perceive the loss of production and jobs as risk due to the reducing water in irrigation during a drought episode while the drinking water supply enterprise considers risk the poor quality of the water for human consumption*. Also there are variations between the different regions in the JRB, e.g.

historical Royal Rights have determined the priorities to use the water of the river, building conflicts between territories and developing also perceptions. Those perceptions and the risk culture created during centuries in the basin make possible to have a consistent management to deal with risks. Stakeholders in JRB are not self-consider vulnerable in the face of droughts due to the high preparedness and planning to mitigate them. There are not droughts exactly the same but the long time dealing with them has developed scenarios well regulated, nevertheless one of the bigger uncertainties perceived by the stakeholders to face risk are the measures which imply economic expenses, if they will be able to face them, or the increase of drought episodes in short period due to climate change.

Socio-economic impacts perceived



Source: Risk perception assessment (D4.2. ENHANCE)



In addition, respondents gave their perceptions of **existing measures and their effectiveness**. The measures they considered most effective in regard to risk assessment are represented in **Figure 3.4a. Risk mapping and regular monitoring** are considered as the most effective and are mandatory in many cases. In some MSPs, measures are anchored as part of their risk culture, and examples of their use can be found already since the first half of the last century. Other measures are: knowledge and technology transfer, information and networking, and applying future climate scenarios and simulations. It is remarkable that economic monitoring of losses does not form part of their usual instruments for monitoring risk. This is most likely due to the fact that economic losses are normally accounted long after the catastrophic events have taken place. In addition, due to the continuous improvements in risk minimisation in many cases, economic losses vary from one event to the next both in quantity and location complicating the monitoring process.

Regarding the **measures implemented as part of risk preparedness plans**, most institutions have some form of risk management and risk emergency plans (**Figure 3.4b**). Most of these plans, however, are older than 10 years, and in 60% of the cases they are considered mandatory. Emergency plans are considered mandatory in all the cases (100% of the cases analysed).

Regarding **action to support prevention and mitigation (Figure 3.4c)**, awareness raising is implemented for more than 10 years in 50% of the cases. 92% of the analysed cases implement this measure. On the other hand, insurances are used only by 17% of the cases.

Long-term post-disaster policies and compensations funds are the most implemented **measures to ensure recovery after a disaster event (Figure 3.4d)**. 25% of the respondents considered the management of economic support out of the scope of their work.

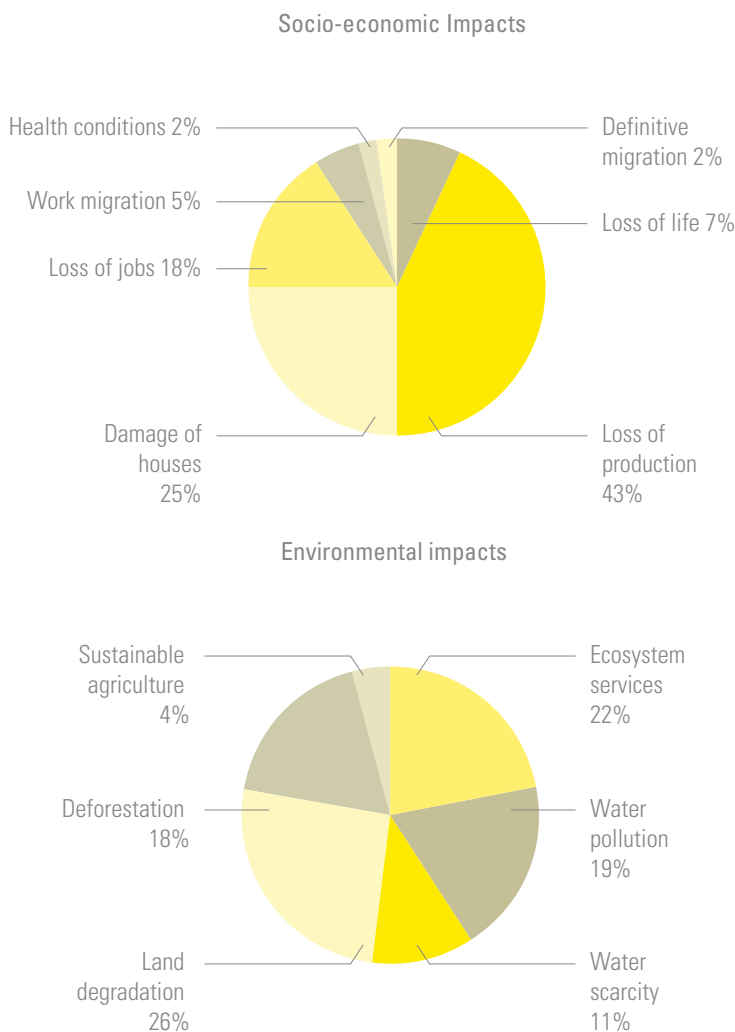


Figure 3.3. Socio-economic and environmental factors that drive risk management across the ENHANCE case studies.

Policies and programmes implemented to improve risk assessment (in %)

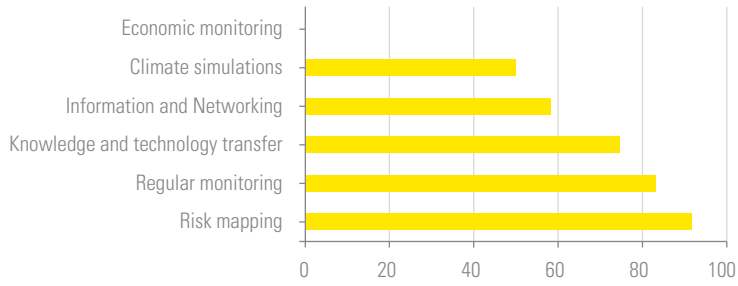


Figure 3.4.a.

Measures considered by MSPs as being effective for improving risk assessment.

Policies and programmes implemented to enhance risk preparedness (in %)

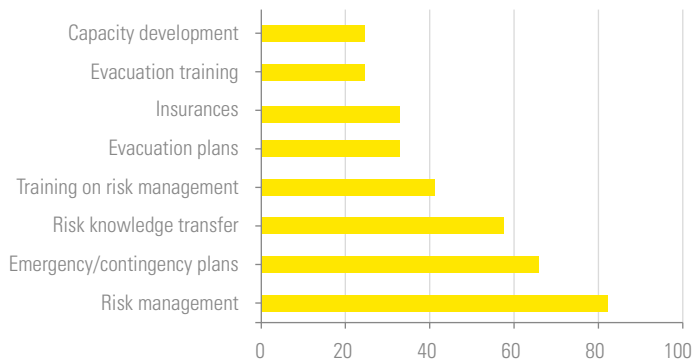


Figure 3.4.b.

Policies and programmes implemented to enhance risk preparedness.

Policies and programmes implemented to support prevention and mitigation (in %)

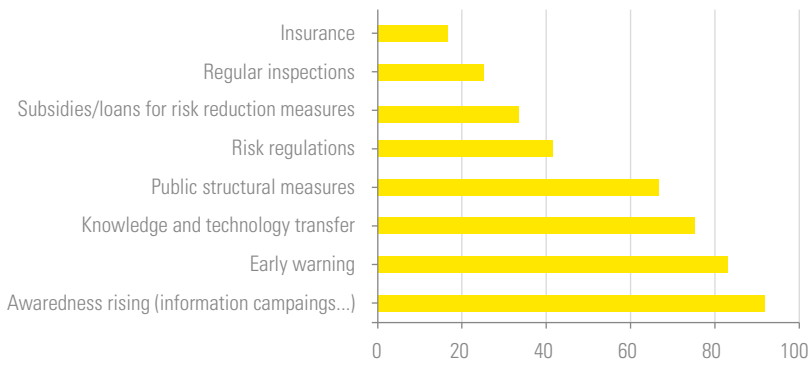


Figure 3.4.c.

Policies and programmes implemented to support prevention and mitigation.

Policies and programmes implemented to ensure recovery (in %)

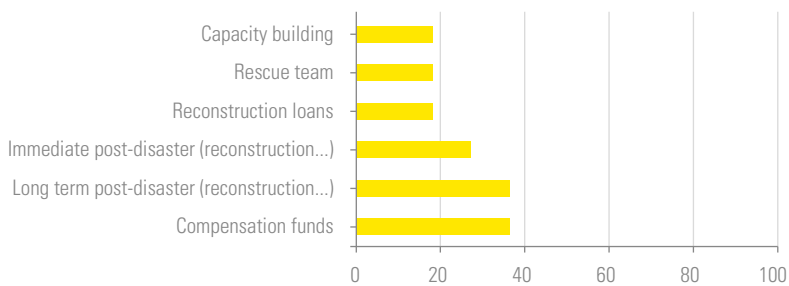


Figure 3.4.d.

Policies and programmes implemented to ensure recovery.

Together with UNISDR, ENHANCE provided input on the theme of risk perception at the European Forum for Disaster Risk Reduction 2015. During this conference, representatives of national platform for disaster risk reduction for different EU countries were also present. As a follow up, we asked our survey respondents on the activities of those national platforms. It appeared that 70% of the respondents confirm that they have a **national platform for disaster risk reduction** in their country, involving public and governmental entities, civil protection departments, universities, infrastructure businesses and environmental agencies, among others. These national platforms are responsible for the coordination of actions oriented to develop guidelines for monitoring and management, to foster agreements between stakeholders, elaborate information and its dissemination, and to provide financial support for the implementation of all tasks

at the regional and local level. This implementation process is usually done through conventions, project evaluation, monitoring committees, governmental funds and mandatory insurance of properties. Regional and local platforms are responsible for the identification of needs, definition of measures and distribution of the financial support for their implementation.

The survey showed the main characteristics of risk cultures being:

- Decision-making processes made on a consensus basis.
- Involvement of all members of the partnership in the risk management process.
- Expert knowledge as a predominant key value.
- Importance of historical knowledge: experiences in the past help with subsequent events. E.g. creation of risk management models, defence programs, etc.
- Activities to prepare for risk management: data collection and empirical analysis including systematic monitoring. E.g. warning systems, sensing networks and remote sensing, GIS, systems of indicators, etc.
- Key policies to improve risk assessment include risk mapping and regular monitoring.
- Most partnerships are involved in national platforms for disaster risk reduction carrying out coordination and being responsible for finance and information.
- Key measures to support prevention and mitigation are awareness raising (around 71%) and early-warning systems (around 80%).
- Long-term post-disaster policies and compensations funds to ensure recovery after a disaster event.

Policy implications

Multi-sector partnerships have proven to be a very effective mechanism for managing risk events. They have often evolved around a long-standing culture of risk management, tailored to particular locations suffering from recurring natural hazards. With the results of our analysis we can confirm the main characteristics of a risk culture that are beneficial to risk management. Those characteristics are partly shaped by the perception of risk of the people involved in the partnership.

There is a need to support these MSPs and governments should assist the creation of multi-sector partnerships to manage risks and take advantage of the synergies between stakeholders. This support should also be reflected in the legislative field, for example, through including guidelines and criteria for the creation of MSPs that will in turn help to further analyse the effectiveness of MSPs.

Nevertheless, we have to recognise that there is no 'one-size-fits-all' solution and that MSPs are shaped by the hazard they face and also by the social, political and historical background. For example, the creation of an MSP in areas facing the same hazard for many consecutive years will be easier than in areas where no tradition of a particular hazard's management exists. MSPs are very likely to occur even in an informal way in regions where a certain hazard has a recurrent nature (e.g. droughts in the Júcar River Basin District). Thus, it is important or even necessary that these informal MSPs are further legalised, stimulating a good governance structure to optimise the risk management process.

Another possibility is that risk management is done in a very local/individual basis. Our work shows that MSPs are the epitome for proper risk management, so there is an evolution from the individual to the partnership approach.