Risk perception and governance performance in Multi-Sector Partnerships

The case study of the Permanent Drought Commission of the Jucar River Basin

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Hiermit erkläre ich an Eides statt, dass ich die vorliegende Dissertationsschrift selbst verfasst und keine anderen als die angegebenen Quellen und Hilfsmittel benutzt habe.

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Abstract

The management of natural hazards includes the management of a multitude of impacts affecting different sectors. In recent years the need for management has increased and requires cooperative governance actions such as Multi-Sector Partnerships, i.e. a variety of stakeholders from different sectors working in close collaboration and providing common perspectives and assets to facilitate management.

The basis for management initiatives and their willingness of collaboration with others and unification of efforts is the perceptions that stakeholders have. However, these perceptions might be biased due to a lack of understanding of the multi-effects of hazards and the characteristics of their accompanying risks.

Particular group criteria are needed to support the proper functioning of a Multi-Sector Partnership threatened by a risk. These criteria describe the current risk culture and are in itself also a compendium of which criteria are compulsory to support the formation of partnerships. In this work the perception and the mental constructs of risk are examined using different case studies and their association with management practices. This examination is done using web-based questionnaires and expert interviews. In order to gain a more comprehensive picture of why and under which conditions stakeholders join each other to face a particular risk, the history of risk perception is analysed in a specific case study, the Jucar River Basin. This study highlights how a better understanding of groups' perception of risk, which in turn influences their attitudes towards risk management, is indispensable for supporting the formation of Multi-Sector Partnerships.

Once Multi-Sector Partnerships are shaped and decisions on risk management initiatives are made, an evaluation of their risk governance processes is required. In the current study, a framework based on capital approaches was developed and applied to assess Multi-Sector Partnerships' governance performance. This framework aims at analysing the governance capabilities of Multi-Sector Partnerships. Furthermore, this analytical framework detects weaknesses and strengths. This detection allows improving weak aspects and highlighting strengths, which might be transferred to subsequent risk events as examples of effective governance.

The case study in the Jucar River Basin, located in Eastern Spain, is used to apply the theoretical framework to an empirical case in order to obtain tangible results and show how the creation and institutionalisation of partnerships has supported an efficient risk management. The case study area is a drought prone area, characterized by climate variability and water scarcity with a long tradition of adaptation to droughts. For nearly one hundred years, the institutional and non-institutional strategies to face droughts have been successful through the development of institutions and partnerships around drought management. Over the last 30 years a Multi-Sector Partnership addresses the governance and the decision making processes during drought events, i.e. Permanent Drought Commission. This study analyses the governance performance of this Multi-Sector Partnership, not only as a steady-state study of this partnership, but also a dynamical analysis in time of the changes undergone by the Permanent Drought Commission, which has demonstrated its effectiveness in governance drought management.

Thus, this work contributes to an improved analysis of risk perceptions driving risk management and their related effectiveness in governance performance.

Zusammenfassung

Das Management von Naturgefahren beinhaltet auch das Management einer Vielzahl von ihren Auswirkungen auf unterschiedliche Sektoren. In den letzten Jahren hat die Notwendigkeit eines solchen Managements zugenommen. Es erfordert kooperative Governance-Ansätze wie Multisektorale Partnerschaften, also eine Vielzahl von Stakeholdern verschiedener Sektoren welche eng zusammenarbeiten und gemeinsame Perspektiven und Ansätze für Management entwickeln. Management Initiativen und die Bereitschaft zur Kooperation sowie der Vereinigung von Bemühungen basiert auf der Wahrnehmung der beteiligten Stakeholder. Diese Wahrnehmungen können jedoch durch mangelndes Verständnis der multiplen Effekte von Naturgefahren sowie der Characteristika begleitender Risiken beeinflusst sein. Ausgewählte Gruppenkriterien sind notwendig, um die Funktionalität einer durch ein Risiko bedrohten multisektionalen Partnerschaft zu gewährleisten.

Solche Kriterien beschreiben die derzeitige Risikokultur und sind selbst eine Zusammenfassung von Kriterien welche für die Formierung von Partnerschaften unerlässlich sind. In dieser Arbeit werden Wahrnehmungen und mentale Konstrukte in Verbindung mit Risiko sowie ihre Verbindung zu Managementpraktiken im Rahmen verschiedener Fallstudien untersucht. Die Untersuchung basiert auf web-basierten Interviews und Experteninterviews. Um besser zu verstehen, warum und unter welchen Bedingungen sich Stakeholder angesichts eines bestimmten Risikos zusammenschliessen, analysiert diese Arbeit die Geschichte von Risikiowahrnehmung anhand einer spezifischen Fallstudien, dem Flussgebiet des Jucar in Spanien. Die Arbeit zeigt, dass ein besseres Verständnis von Gruppenwahrnehmung sowie deren Einfluss auf die Einstellung der Gruppe zu Risikomanagement, unerlässlich für die Unterstützung der Bildung von multisektoralen Partnerschaften ist. Sobald sich multisektorale Partnerschaften formiert und Entscheidungen über Risikomanagementinitiativen getroffen werden, ist eine Evaluierung von Risikosteuerungsprozessen notwendig. In dieser Arbeit wurde ein auf „capital approaches“ basierender Theorierahmen entwickelt und zur Bewertung der Steuerungsleistung multisektoraler Partnerschaften angewendet. Das sogenannte „Capital Approach Framework“ analysiert die Fähigkeiten multisektoraler Partnerschaften durch fünf Kapitale. Dieser analytische Rahmen zeigt Schwächen und Stärken auf. Damit ist es möglich, schwache

Aspekte zu verbesseren und Stärken hervorzuheben. Die Ergebnisse können als Besipiele effektiver Steuerung auf nachfolgende Risiken übertragen werden.

Das Fallbeispiel des Jucar Flussgebietes wird benutzt, um den theoretischen Rahmen auf ein empirisches Beispiel anzuwenden und so konkret zu zeigen, wie die Schaffung und Instititialisierung von Partnerschaften ein effizientes Risikomanagement unterstützt hat. Das Fallbespiel ist ein durch Dürren gefährdetes Gebiet, charakterisiert durch Klimaschwankungen und Wasserknappheit, und mit einer langen Tradition von Anpassungen an Dürren. Durch die Entwicklung von Institutionen und Partnerschaften im Dürremanagement sind die dortigen institutionellen und nicht-institutionellen Strategien beim Umgang mit Dürre seit fast 100 Jahren erfolgreich. Während der letzten 30 Jahrewar es eine multisektorale Partnerschaft, welche die Steuerung und die Entscheidungsfindung während Dürreereignissen übernommen hat, durch die „Permanent Drought Commission“. Diese Arbeit analysiert die Steuerungsleistung dieser multisektoralen Partnerschaft, nicht nur als dauerhafte Studie der Partnerschaft selbst, sondern auch in Form einer dynamischen Analyse in Zeiten von Veränderungen der „Permanent Drought Commission“, welche ihre Effektivität bei der Steuerung von Dürremanagement bewiesen hat. Die Arbeit trägt somit zu einer verbesserten Analyse von Risikowahrnehmung bei, sowie zu dessen Einfluss auf Risikomanagement und der damit verbundenen Effektivität der Steuerungsleistung bei.

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María Carmona

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List of Abbreviations

CAF	Capital Approach Framework
CHJ	Confederación Hidrográfica del Júcar – in English: Jucar River Basin Partnership
DFID	Department for International Development in UK
DSC	Drought Steering Committee
DSPs	Drought Special Plans
EUSF	European Solidarity Fund
GERICS	Climate Service Center Germany
GIS	Geographical Information System
IRGC	International Risk Governance Council
JRB	Jucar River Basin
JRBP	Jucar River Basin Partnership
MSPs	Multi-Sector Partnerships
NGOs	Non-governmental organizations
ÖBB	Österreichische Bundesbahnen – in English: Austrian Federal Railway
PDC	Permanent Drought Commission
PMT	Protection Motivation Theory
PRBA	Po River Basin Authority
QCA	Qualitative-Comparative Analysis
TFS	Transient Flood Storage
WFD	European Water Framework Directive

'Thousands have lived without love, not one without water'

(Auden, 1957)

A mi Madrina

CHAPTER 1

Introduction

Risk perception plays an important role when reacting to hazards (Renn, 1990), which determines how people choose to mitigate the risk (Martin et al., 2009). However, perceived risk does not always correspond with scientific analysis views (Science Communication Unit, 2014), because risk perception is the combination of social, cultural, political and emotional factors as well as of innate influences (Renn and Rohrmann, 2000). Individual and social characteristics determine risk perception and influence the way we react (Schmidt, 2004). This means, the way people perceive directly correlates to the way they act. In cases in which people have a limited perception of risk, their reaction might be less appropriate, proportionate, or even harmful (*e.g. building houses in flood prone areas*). In other cases in which the perception of risk is shaped by historical and social events, the reaction to the hazards and disasters might be more appropriate to the event at hand and could reduce possible harm (*e.g. areas with institutions that have a long history of dealing with hazards*). Therefore, understanding risks and how they are perceived is crucial for creating management initiatives to promote awareness across groups dealing with natural hazards (Science Communication Unit, 2014).

Taking into account that risk is not managed by individuals but by heterogeneous groups, collective risk perception becomes more relevant in natural hazard management perceptions. Therefore the focus of this study is to understand how groups of stakeholders or partnerships from different sectors and backgrounds, with shared interests, develop common strategies to manage a risk.

The recently adopted Sendai Framework for Disaster Risk Reduction (UN, 2015, p.13) calls for '*responsibilities shared by central Governments and relevant national authorities, sectors and stakeholders'.* Normatively it is assumed that Disaster Risk Reduction *'requires all-of-society engagement and partnership. Management depends on coordination mechanisms*

within and across sectors and with relevant stakeholders at all levels, […] public and private stakeholders, […] to ensure mutual outreach, partnership, complementarity in roles and accountability and follow-up'.

Taking into account that single actors such as governments are unable to sufficiently cope single-handily with these risks (Evans, 2012), Multi-Sector Partnerships (MSPs) represent an alternative form of governance in order to manage the increasingly complex and demanding risk management strategies which are emerging throughout recent decades. MSPs are understood as '*voluntary but enforceable commitments between public authorities, private enterprises and civil society organizations across sectors. They can be temporary or long-lasting. They will be founded on principles of sharing the same goal in order to reduce risks and gain mutual benefit. In some cases, they might be enforced by law. Partnerships involve a shift in governance structures and the implied acquisition of competencies typically derived from governmental structure'* (Máñez Costa et al., 2014, p.13).

Considering, as mentioned, that risk perception has long been identified as an important driver of risk management practices (Renn, 1998), stakeholders mainly act if they perceive something as high-risk. Therefore, actions are taken according to the assumptions made by certain groups surrounding a risk. These actions cover all components of the risk management cycle (assessment, prevention and mitigation, preparedness and recovery).

This work explores how risk management practices are shaped by the predominant risk perceptions in MSPs. For that purpose, it is assumed that investigating how past events were managed in natural hazard prone areas, indicate how policies and measures adopted within MSPs in the area are influenced by risk perceptions. Furthermore, it also aims to identify risk management cultures. Culture is understood as the shared knowledge and behaviour patterns found within a MSP for interpreting and managing risks (Lederach, 1995).

It is hypothesised that MSPs are crucial for integrated risk management and risk governance. Thus, to understand the risk perceptions influencing the respective management cultures and ultimately the success of addressing risks through MSPs, is of key importance. Hence, this study aims to show how MSPs perceive the likelihood of a risk occurring and the influence that perception has had on previous policies that addressed risk.

In the context of MSPs, different understandings and risk perceptions may collide and there is a need to integrate these perceptions into joint strategies and measures. For that reason, the study also intends to analyse whether these common perceptions are integrated into management initiatives (*e.g. policies implemented*) and if there is effective governance performance within the MSPs.

As a contribution of this research, the Capital Approach Framework (CAF), which focuses and integrates, as well as synergizes, five capitals to analyse governance performance was developed. This generic framework can be adapted to different conditions to allow the analysis of governance performance in other contexts.

Pinkse and Kolk (2012, p.188) affirm that frequently MSPs are seen as '*the best way to deal with multifaceted problems in the current epoch*'. This study analyses the validity of this insight taking into account that MSPs should not be considered as the final remedy for all problems in natural risk management (Surminski and Leck, 2016). Therefore, this study investigates if MSPs are effective governance structures to manage risks and how they are influenced by their perceptions of risk in the management strategies and policies implemented by them.

This work is therefore divided into two fields of expertise. For this study they are called research pillars:

- *Risk perception research pillar,* related to the determination of risk perception as a driver of risk management in MSPs and
- *Governance research pillar*, dealing with the assessment of governance performance and its effectiveness.

This work is framed under the European Project ENHANCE, which aims to enhance risk management partnerships for catastrophic natural disasters in Europe. The ENHANCE project is embedded in the 7th Framework Programme and comprises the study of a range of natural hazards, i.e. climatic risks and their cascading effects.

1.1. Objectives

This work focuses on one main objective, divided into two parts with four specific objectives; two for each part of the main objective.

Main objective

This study pursues:

a) ***To determine risk perception as a driver of risk management in Multi-Sector Partnerships dealing with natural hazards, and***
b) ***To analyse whether their governance performance is effective, using the MSP 'Permanent Drought Commission' of the Jucar River Basin as an in-depth case study***

Specific Objectives

The four specific objectives correspond to the steps of research developed in this work, which are divided into two different pillars:

- The risk perception pillar includes:
  1) ***The identification of criteria for determining risk perception***
  2) ***the description of cultures of risk shaped by the influence of risk perception in risk management strategies and decision-making processes***
- The governance research pillar is divided into two tasks:
  3) ***the development of a tool to assess governance performance***
  4) ***to assess effectiveness in governance performance in a case study***

1.2. Overview of the study structure

As presented in the specific objectives, this study is structured along two large research pillars: the *risk perception research pillar* and the *governance research pillar*.

In chapter 2, the theoretical arguments are presented, differentiating between the risk perception arguments and the governance arguments. The reason for separating them is due to the clear distinction between both pillars' theoretical bases.

Chapter 3 focuses on concepts and frameworks used as the base for this research.

In chapter 4, the methodology is presented. Existing methods of analysis, together with the one developed for this study, are explained. Likewise, the methodology is presented separately for both research pillars. This includes the development of the questionnaire and the development of the Capital Approach Framework (CAF). This framework is part of the

methodology chapter due to the fact of it being an intentionally comprehensive and innovative approach developed as part of this study.

This study supports the hypothesis that the balance between capitals would be beneficial for successful governance performance in MSPs. Balance is understood here as the equal distribution of effectiveness among capitals. Therefore, successful governance in this case is characterized by efficiency in dealing with risks.

Chapter 5 presents the description of the case studies, splitting them into two sub-chapters. The case studies used for the risk perception research pillar are presented in the first sub-chapter and the in-depth case study of the governance research pillar is presented in the second sub-chapter.

The seven case studies (framed under the Enhance Project) used for the first pillar are briefly presented to provide an overview of their look as well as for better understand the analysis of the risk perception pillar. Even though the in-depth case study, the Jucar River Basin in Spain, is presented in a separate sub-chapter, it is also included as one of the cases analysed within the risk perception research pillar. The second sub-chapter of chapter 5 focuses on the in-depth case study and provides a more detailed research analysis of governance effectiveness. This in-depth case study is chosen because of its long-lasting cooperative experience in managing droughts. Stakeholders in this case study perceive water management in the basin as very successful (*e.g. well-prepared strategies to respond to drought events*). This work identifies effective as well as ineffective governance processes in the in-depth case study. Effective governance provides good outcomes and preserves group assets. At the other end, ineffective governance compromises the ability of risk management to succeed.

Chapter 6 presents results of the risk perception research pillar and chapter 7 of the governance research pillar. The reason of this continued separation resides in the need to have a general overview on risk perceptions driving risk management in order to continue to analyse the effectiveness in governance in one MSP.

After the presentation of results and the analysis, chapter 8 provides the discussion, and finally, chapter 9 presents the conclusions of this work.

CHAPTER 2

Theoretical arguments

As mentioned in the introduction, the theoretical basis of this work is separated into two interdependent research pillars, i.e. fields of expertise. Following this classification (see figure 2.1), on the one hand the background theories upon, which the *risk perception* research pillar has been based, are mainly the Protection Motivation Theory (Rogers, 1975; 1983) and the Cultural Theory (Douglas and Wildavsky, 1982), but with insights into the psychological perspective (Starr, 1969; Fischhoff et al., 1978) as well. On the other hand, with regard to the *governance* research pillar, the theoretical background stems from the Capital Theory Approach (Smith, 1776; Goodwin, 2003; Sen, 1983), the Capital Approach to Sustainability (Smith, 2008; de Wit and Blignaut, 2000; Atkinson, 2008) and the Capability Approach (Sen, 1983).

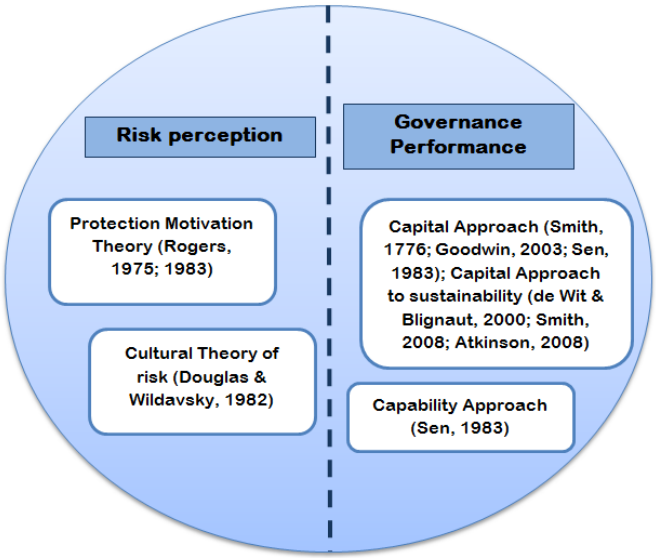


Figure 2.1 *Theories basis*

Nevertheless, it is important to note that the theoretical basis of this study is also based on concepts and frameworks (*e.g. risk perception concept, Sustainable Livelihood Framework*) explained in next chapter (see chapter 3).

2.1 Risk perception arguments

Risk has been defined as '*the combination of the probability of the occurrence of an event and its negative consequences*' (UNISDR, 2009, p.25). However, it is important to consider risk not only within the constraints of this combination. Risk differs among cultures, and their appraisals are related to different factors such as causes, benefits, context, circumstances or harm. The perception of risk changes according to how risk is defined by individuals and groups.

Risk perception is understood differently depending on diverse theoretical approaches. It has been defined as '*the subjective assessment of the probability of a specified type of accident happening and how concerned we are with the consequences*' (Sjöberg et al., 2004, p.8) or as '*the combined evaluation that is made by an individual of the livelihood that an adverse event will occur in the future and its probable consequence*' (Royal Society, 1983, p. 34). Perceptions constitute the different types of attitudes and judgments. In that line, '*risk means different things to different people*' (Slovic, 2000, p.223). Individuals and groups build their own interpretation of what they consider risk, based on their experiences, political ideologies, attitudes towards the risk, circumstances around the process of risk, the magnitude of the risk contemplated or the familiarity with the hazard (Renn, 1985), as well as the influence of individuals through the perception of others.

These factors can be expressed as situations already lived. Risk situations similar to those previously experienced make control of the current situation easier and also decrease the feeling of risk (Aven and Renn, 2010). If people have experiences with the same risk characteristics, they will be better prepared to manage the new event, and therefore the risk level will be perceived as lower.

Following these arguments, risk perception is addressed by three different perspectives, (1) cognitive/psychology perspective, (2) anthropology/sociology perspective and (3) interdisciplinary perspective.

(1) Psychological perspective

This perspective is related to the patterns of individual perceptions and the heuristics that manage risk perception.

The psychological perspective is shaped by the *psychometric paradigm*, which uses psychophysical scaling and multivariate analysis techniques to produce quantitative representations of risk perceptions. It is a classification used to comprehend and predict responses of risks, making quantitative judgments about diverse hazards (Slovic, 2000). This model has its origin in Starr (1969), and later it was further developed by Fischhoff and colleagues (1978). Risk under this paradigm has two categories: *dread* and *risk of the unknown*. The former is defined as the lack of control. That is the fear of risks and their fatal consequences. The latter refers to the new harmful impacts, the hazard that is as of yet unobservable (Slovic, 2000). Considering perceived risk as quantifiable and predictable, the psychometric paradigm techniques are useful for identifying similarities and differences in risk perception among groups.

The psychological perspective also pays attention to the *mental models*. These are the mental construction of risk. They focus on the individuals and their subjective assessments, as a result of different interpretations and responses depending on social, political, economic and cultural contexts and judgments (Luhmann, 1993; IRGC, 2005). Using only this paradigm it becomes difficult to define a common understanding of risk within a group, a culture of risk. Nevertheless, the insights of this perspective are given by the individual vision into the group perception, which is crucial for the development of a culture of risk. Human beings are social beings but firstly they are individuals. The influence of the different mental constructions as well as external agents shapes the group perception.

The Protection Motivation Theory (Rogers, 1975), whose characteristics such as fear appeals, and its emphasis on cognitive processes, can also be included under this perspective. This theory is based on the adoption of protective behaviours to face a hazard (Neuwirth et al., 2000). The principle of that theory falls on adaptive and maladaptive behaviour by means of two processes –*Threat appraisal and Coping appraisal*. This theory has been used for the current study and it is described in depth in section 2.1.1, pointing out its importance for social cultures of risk.

(2) Socio-cultural perspective

This perspective refers to the social context and the culture shaping perceptions. It is based on the idea that risk perception is a collective phenomenon. In this way, perceptions are socially constructed by institutions, cultural values, and ways of life. Social or cultural groups

respond to hazards according to their risk perception and not to scientific assessments of risk (Sjöberg et al., 2004).

The sociological perspective defines risk as an inherent characteristic of decisions in the light of hazardous events (Luhmann, 1993; Renn, 2008). The Cultural Theory of Risk developed by Douglas and Wildavsky (1982) is a clear example of the socio-cultural perspective (see section 2.1.2).

(3) *Interdisciplinary perspective*

This perspective represents the combination of different fields of knowledge such as sociology, psychology, or anthropology. Risk can be seen as a social construction or as a physical change, depending on the subject of framing. For this reason risk management needs a strategy that encompasses different disciplines. A pluralistic approach ensures that technical and social sides are considered together to best shape knowledge and reach a consensus (Aven and Renn, 2010). Several integrated perspectives could be included within this perspective, such as the framework of *Social Amplification of Risk* (Kasperson et al., 1988) which encompasses social structures, elements and processes of risk experience as well as the effects of these responses on individuals and group perceptions on society. Within this perspective, the research approach of this study is included as a pluralistic approach which includes psychological and socio-cultural perspectives.

Therefore, this study is focused on the cognitive perspective and the anthropology/sociology perspective, covering the two theories mentioned above: *Protection Motivation Theory* (Rogers, 1975) that is related to the cognitive side and the *Cultural Theory* (Douglas and Wildavsky, 1982) which highlights the culture and consequently the social context. The emphasis of this research is given to MSPs as groups that cooperatively manage risk. But these groups, shaped by individuals (individual members and stakeholders), are also fed by the individuals' perceptions. This also outlines the group perceptions. Thus, both perspectives contribute to the basis of this research. However, it is necessary to clarify that the insight of the cognitive perspective is only used for understanding how individuals' cognitions influence and shape group perceptions and the understanding of risk and its perception is mainly based on social construction. Nonetheless, most of the contributions of the theoretical risk perception arguments to this study are on the identification of risk perception criteria to define cultures of risk in MSPs.

2.1.1 Protection Motivation Theory (PMT)

The *Protection Motivation Theory* (PMT) was proposed by Rogers (1975) to clarify the understanding of fear appeals and how people cope with them. It has been used more commonly for health studies to understand how people perceive and react to illness. The reason to include this theory here is to consider the cognitive processes in place for the developing of risk cultures.

Rogers's theory was based in part on Lazarus (1966) and Leventhal work (1970). Lazarus distinguished between stopping dangerous behaviour and initiating preventive behaviour. Leventhal focused on the importance of differentiating emotional responses (fear control) from cognitive responses (danger control). In his thinking, protective actions result from the intention to control the danger, not the fear itself.

Years later, in 1983, the PMT was revised also by Rogers and extended to a more general theory of persuasive communication. Rogers tried to elaborate cognitive mediating processes to link them to previous communication stimuli. These communication stimuli are considered as perceptions about the risks in this study. The revision of Rogers added a fourth factor in the cognitive mediating processes that he proposed in 1975, providing a more comprehensive model through this addition.

Originally, PMT was proposed to provide conceptual clarity to the understanding of fear appeals, which are understood as strategies used for motivating people to take a particular action to prevent any harm (Maddux and Rogers, 1983). Fear appeals have been used to try and change behaviours within different issues. Behaviour results from expected consequences and perceived values (Levental, 1970).

The behavioural changes to protect ourselves from harm start with the decision that a threat or a hazard is relevant for us, and later determine how to act to address the hazard (Neuwirth et al., 2000). The PMT describes adaptive and maladaptive behaviour by means of two cognitive processes – *threat appraisal and coping appraisal*. These two appraisals are successive. Firstly, people decide if the threat concerns them (threat appraisal), and then they choose which actions to take in responce (coping appraisal). Those cognitive processes allow for the adoption of protective behaviour to face the threat. For this study the threat appraisal is represented by the MSP's perceptions of natural hazards. These MSPs cope with those natural hazards. Natural hazards are perceived in this case by the members that shape

the MSPs. If the hazard is perceived, the MSPs will react and initiate protective behaviour to cope with it. In this study, the coping appraisal is considered as the management carried out by the MSPs.

An appraisal of threat, as Lazarus (1966) wrote, is related to starting preventive behaviour. People, perceiving the threat, start to protect themselves in the face of that threat. In the case of MSPs, they start to prepare themselves for dealing with the natural hazard through perceptions that allow the initiation of management strategies or as the PMT says, starting preventive behaviour. This behaviour is the sum of the cognitive process experienced by the collective that shapes MSPs. Therefore, the influence of several individual cognitive processes determines the behaviour of the MSP.

In the original formulation of PMT, a fear appeal communication initiates cognitive appraisal processes concerning the *severity or magnitude* of a threatened event, the *likelihood of occurrence* of the event (vulnerability), and at the end the efficacy of a recommended *coping response*. These three cognitive processes or factors were considered by Rogers (1975) for mediating between the persuasive effects of fear appeal by developing protection motivation in the face of risk. The PMT assumed that these three processes have facilitated the negative effects of threat being translated in attitudes and intentions through the adoption of protection motivation (Mulilis and Lippa, 1990).

The revision of the theory in 1983 by Rogers incorporated a fourth cognitive process. This addition was based on Bandura's *Self-Efficacy theory* (1977) and attempts to provide a more comprehensive model on protection motivation by incorporating *self-efficacy* expectancy. The self-efficacy expectancy refers to the perceived ability of the individual concerning the performance of the adopted behaviour. The combination of the protection model and the self-efficacy theory was tested through an experiment of the effects of fear appeals in the persuasive communication paradigm (Maddux and Rogers, 1983). The experiment was based on reduction or elimination of cigarette smoking. The experiment outcomes lent support to the importance of the fourth factor, affirming that the self-efficacy expectancy is the most powerful predictor of behavioural intentions. Moreover, that factor influences the effect of the probability of occurrence and the efficacy of the recommended preventive behaviour.

Thus, the PMT, after revision, affirms that we protect ourselves based on the following four factors, in which the first two factors are part of the *Threat appraisal* and the latter two are part of the *Coping appraisal* (see figure 2.2):

a) perceived severity of a threatening event (magnitude),

b) perceived probability of the occurrence (vulnerability),

c) efficacy of the recommended preventive behaviour (response efficacy), and

d) perceived self- efficacy (level of confidence).

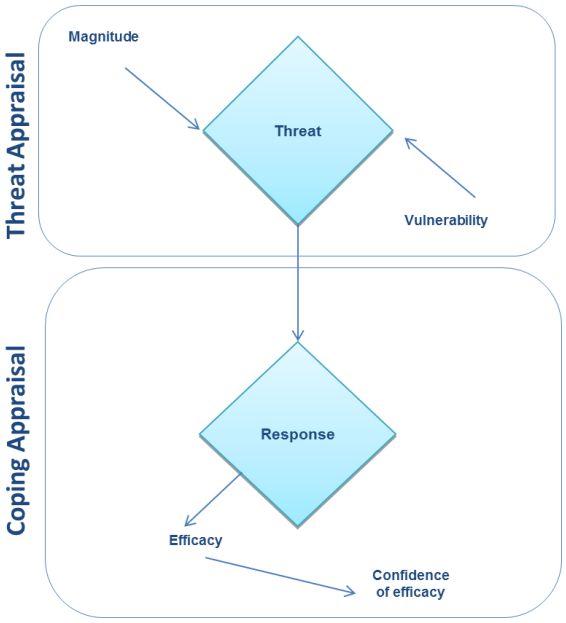


Figure 2.2 *Cognitive processes of the Protection Motivation Theory*

In the threat appraisal, the person considers that a hazard is impacting on himself/herself and evaluates the usefulness of introducing protective behaviours, changing undesired behaviour, and decreasing its vulnerability. On the other hand, the coping appraisal is the consequence of seeking possible coping strategies in the face of threat likelihood and perceived hazard severity as well as the level of confidence of those coping strategies.

The increase of the adoption and the increase in performance effectiveness of the preventive behaviour are facilitated by these two factors: perceived severity of a threatening event and perceived probability of the occurrence. The *threat appraisal*, determined by the sum of these two factors, defines protective behaviour. But there are also extrinsic and intrinsic incentives that decrease the adoption of behaviour. In line with this, MSPs should

estimate if the natural hazard affects them (perceived probability) and estimate the gravity of the hazard (perceived severity), avoiding maladaptive behaviour determined by the incentives received. Once the threat is believed to be real (threat appraisal), the coping appraisal reacts to adopt the protective behaviour. The coping appraisal consists in turn of three judgments (see figure 2.3), two of them directly related to the PMT. In these cognitive processes, MSPs consider preventive behaviour through response effectiveness. That is the efficacy of the recommended preventive behaviour. The self-efficacy, namely the level of confidence, responds to the question as to whether it is going to work and if they are able to adopt this behaviour.

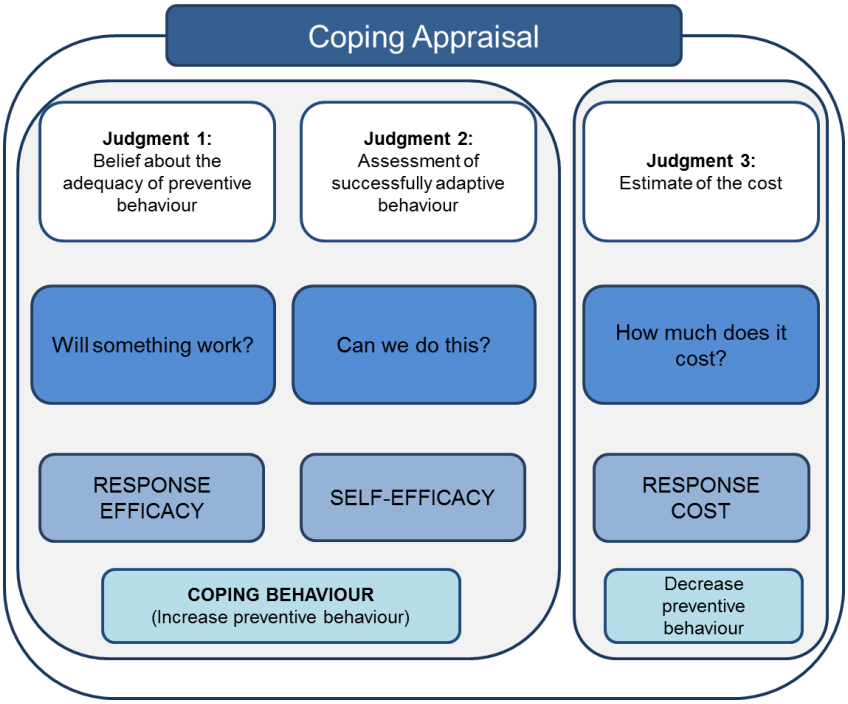


Figure 2.3 *Coping appraisal*

(Based on Neuwirth et al., 2000)

Broadly speaking, this study differentiates between the threat appraisal as the *risk perceived* and the coping appraisal as the *management strategies and policies* utilised.

Protection Motivation Theory in Multi-Sector Partnerships

This section goes in depth as to how MSPs deal with natural hazards, through a hypothetical example.

Talking about natural hazards, Mulilis and Lippa (1990) cite four components of the PMT as the following: (1) probability of occurrence, (2) severity of damage, (3) effectiveness of preparation, and (4) capacity of preparation.

These processes are followed by individuals or groups to cope with a threat. For instance, imagining a river basin in a region with high climate variability and demand/resource ratio close to 1, the most common natural hazard will be droughts (see table 2.1).

Table 2.1 *Example of a cognitive process to adopt a protective behaviour*

Example of risk event: Likelihood of suffering a decrease in the amount of supply water for irrigating the crops after a dry period in a hypothetical river basin with high climate variability and demand/resource ratio close to 1.		
Appraisals of PMT	Cognitive processes	Hypothetical example
Threat appraisal	Severity of damage	Likelihood of not having enough water for irrigating the current crops.
	Probability of occurrence	Likelihood of losing part of, or the whole, production as a consequence of an extension of this dry spell.
Coping appraisal	Effectiveness of preparation	Changing the farming methods to one that needs less water.
	Capacity of preparation	Confidence to take this measure, taking into account a possible future drought.

Within an institution there is a mix of cultures, as will be explained further in the *Cultural Theory of Risk* (see section 2.1.2). Therefore, a MSP, which should share the same goal to reduce risk and gain mutual benefits, could achieve this goal through very different views on how to do it.

According to the PMT, people and in this case MSPs might first decide whether a threat in the area in which they are involved is relevant or not. In the case that the threat is relevant, they could determine which actions they might take by following the threat appraisal and coping appraisal provided by the PMT (for an example see table 2.1.).

Taking into account that the PMT describes adaptive and maladaptive behaviour through two processes (threat and coping appraisal), it is suitable for a MSP to use this theory to cope with future risk events. Hinging on this theory, current MSPs can be analysed for determining their risk perception. Based on this, the response MSPs take to handle the coming risk events properly, provides insights into their culture of risk.

A culture of risk in MSPs is understood in this study as the values and shared knowledge present in MSPs as well as the strategies used by them to deal with risks. The culture of risk influences the ways to act and react to address natural hazards, which constitutes the decisions made for the managing of the situation.

2.1.2 Cultural Theory

Diverse cultures and beliefs influence different perceptions made by individuals, institutions, communities or societies. Culture is defined as '*the shared knowledge and schemes created by a set of people for perceiving, interpreting, expressing, and responding to the social realities around them*' at a particular time (Lederach, 1995, p.9). Culture thus involves the ways of life, i.e. the general customs and beliefs. In this study, beliefs are understood as the cognitive images people have of an object given (Renn, 1985). They are the ideas of the knowledge or experience around them, considering them true. The variety of beliefs becomes a challenge. In the MSPs, it is difficult to separate individuals from their own beliefs related to risk. This also interferes with the perceptions. Thus, there are different perceptions within the MSPs.

Fischhoff and colleagues (1978) identify several factors that help determine risk perceptions within a group. Here some of them are highlighted: (1) hazard duration, which provides the degree of harm; (2) acceptability of risk or recognition of impacts; (3) economic losses or fatalities; (4) studies on return periods; (5) access to existing information about risk; (6) education programmes; (7) vulnerability; and/or (8) absence of preparedness. These mentioned factors are part of the psychometric paradigm. This perspective, however, ignores social influences on risk perception. The opinion of others in the group changes and shapes perceptions. Therefore, people perceive and consequently act depending on sociocultural context.

In 1982, Mary Douglas, anthropologist, and Aaron Wildavsky, political scientist, developed the *Cultural Theory of Risk*, also known simply as Cultural Theory. This theory explains perceptions of risk from the social perspective and their consequential societal conflicts. Cultural Theory affirms that structures of social organisation, as in this case the MSPs, are shaped by individuals with particular perceptions that in turn shape those structures. In that way, members of MSPs share a common worldview which shapes the common culture.

In the work of Douglas and Wildavsky (1982), they affirm that cultural '*ways of life*' can be characterised along two dimensions: *group* and *grid*. The group and grid model analyses the types of sociocultural control exercised to structure relations. These relations are determined by beliefs, values, emotions, perceptions, and interests. In that sense, this model defines the ways of life in society.

In the group and grid model, on the one hand, the group dimension describes the degree to which people join together (group cohesiveness). In the words of Douglas, '*the group itself is defined in terms of the claims it makes over its constituent members, the boundary it draws around them, the rights it confers on them to use its name and other protections, and the levies and constraints it applies'* (Douglas, 1978, p. 8).

On the other hand, the grid dimension refers to the variety of rules prescribing social roles (regulation) (Thompson and Verweij, 2004). Douglas wrote, '*The term grid suggests the cross-hatch of rules to which individuals are subject in the course of their interaction'* (Douglas, 1978, p.8).

Depending on the degree of both dimensions (high and low; weak and strong) and the combination of them, the social structures are classified into four kinds of culture bias: *Hierarchy, Egalitarianism, Fatalism,* and *Individualism* (see figure 2.4).

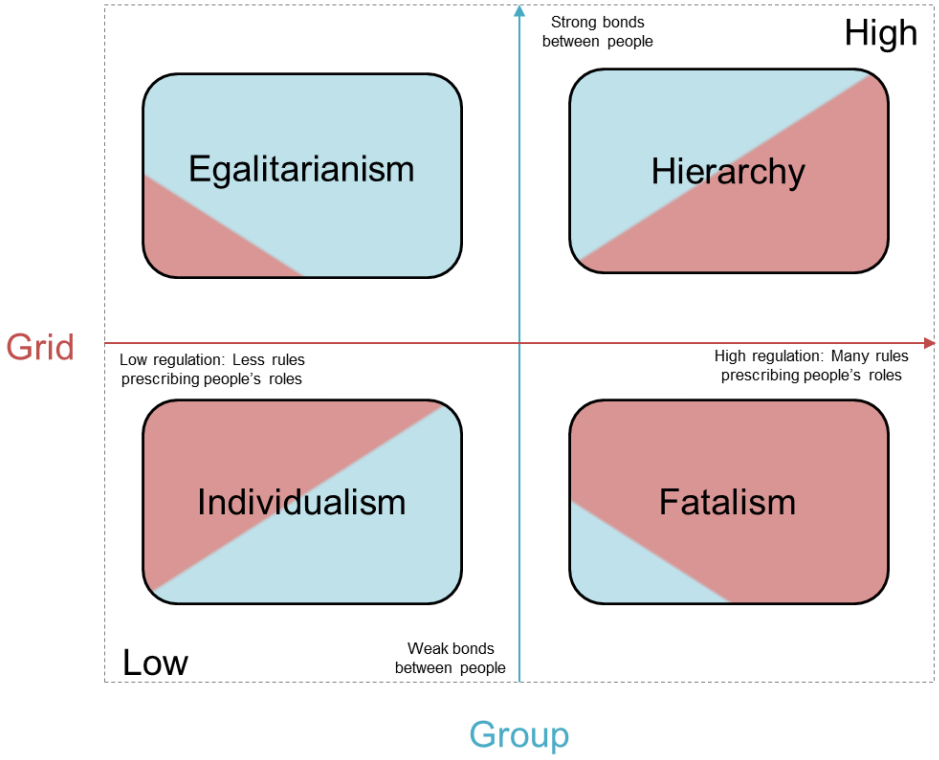


Figure 2.4 *Group and grid model of the Cultural Theory*

The colour blue in the boxes and the blue arrow represent the GROUP dimension, while the colour red in the boxes and the red arrow refers to the GRID dimension. The portion of both colours in the boxes determines the degree of group and grid for each kind of culture. The degree is also observable in the direction of the arrow

Therefore, if the group is high and the grid is also high, the cultural bias is *Hierarchy*. When the group is high and the grid is low, we are in the dominion of *Egalitarianism*. If the group is low and the grid is high, the culture type is *Fatalism*. And in the case that the group is low and the grid is also low, the culture is that of *Individualism* (see table 2.2).

Thus, taking into account that group dimension describes the degree to which people join together, that dimension arranges the beliefs from the high judgment of hierarchy to the lack of it. In other words, this dimension represents the beliefs of the people concerning the way to organise themselves in a group. In that sense, a high group dimension represents the higher link between members. However, it is important to consider that there are individuals in the group with common reasons to be together but with no sense of unity. These people represent the opposite end of the group dimension.

The grid dimension refers to the individual choice of rules used to prescribe roles. In that line, the grid dimension runs from independency of rules and roles in the society to inter-dependence of people regarding regulations. These extremes determine the different roles taken by the members within the group. Hence, at one end of this dimension, people are less dependent on one another.

Table 2.2 *Cultural biases description*

(based on Douglas,1978; Thompson et al., 1990; and Oltedal et al., 2004)

	CULTURE			
	HIERARCHY	**EGALITARIANISM**	**INDIVIDUALISM**	**FATALISM**
LINK	Strong	Strong	Weak	Weak
Regulation	High	Low	Self-regulation (low)	High
Risk perception	Risk can be easily managed (Controllable).	Risk perceived as catastrophic. Nature is considered fragile and vulnerable. They are aware of pollution, economic growth and new technologies.	Risk seen as an opportunity (personal reward). Nature is seen as resilient for them.	Risk seen as a danger.
Description	Characterised by central rules and is related to the development of organisations, in which hierarchies and laws regulate the individual action. They support tradition and order.	There is less central rule than in hierarchy, but the voluntary support of others is crucial for this. In that bias, the regulation is low but the importance of the values and boundaries is high. People here are similar, that allows for the agreement and adoption of similar	Individualists are relatively similar among them but have few responsibilities to one another. They avoid dominant authority and prefer the differences to the similarities between them. They believe that taking advantage of	Fatalists have differences between them and rarely bond. The responsibilities to one another is also little, like individualists, and they are considered culturally

	CULTURE			
	HIERARCHY	EGALITARIANISM	INDIVIDUALISM	FATALISM
		values. It is a utopic culture that only exists in small groups far from the national spheres.	others provides power differences and starts the fatalistic culture.	isolated.
Examples	Hierarchical organisations	Communal groups	Markets, Neo-liberals	The poor, prisoners.

A high group-low grid way of life reveals a high degree of collective control, characterised by obvious and durable forms of stratification in roles and authority compared to a low group-low grid way of life, which shows individual self-sufficiency. A high group-low grid way of life reflects a more egalitarian ordering, while low group-high grid way of life represents isolation. Figure 2.4 shows the previously mentioned cultural categories: hierarchy, egalitarianism, individualism and fatalism, also shown in graphic form in figure 2.5 below.

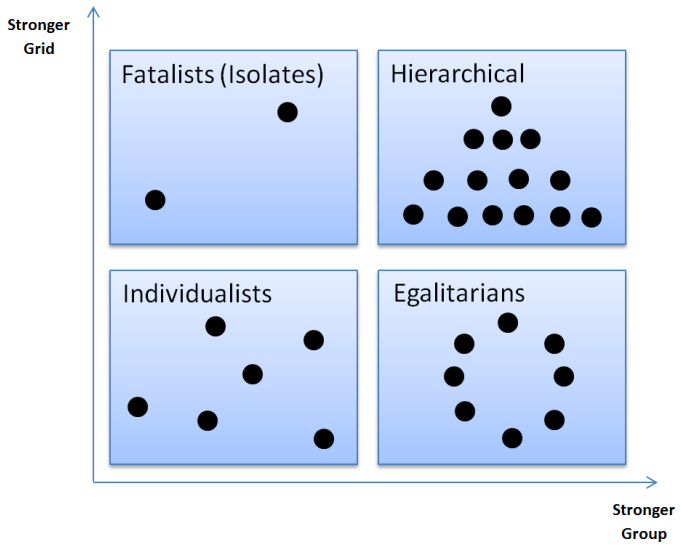


Figure 2.5 *Grid and group visualisation of people within cultures biases (Based on Praytellblog, 2013)*

Organisations depending on cultural biases (Cultural Theory)

Individuals associated to one of the four cultures (hierarchy, egalitarianism, individualism and fatalism) perceive risks differently depending on their preferences.

Hierarchical organisations are characterised by unequal social relations and thrive on controlling nature through rules and regulations. Hierarchical organisations are there to assure that a system lies within its limits. Persons with hierarchical orientation (or those adopting the discourse of hierarchical organisations) tend to trust that organisations and

their experts are responsible for controlling the risk, and because of this trust tend to view risks as manageable and not threatening.

Individualists and their organisations, alternatively, have little sympathy for hierarchical structures or group attachments and view nature as benevolent and resilient. They support market organisation and are opposed to regulations, except if the rules serve to help market failures. In contrast to hierarchical organisations with their procedural rationality, individual organisations display what might be viewed as outcome rationality, where costs, benefits and trade-offs are part of their discourse. Individualists are greatly sceptical of being controlled by institutions, and they rely more comfortably on individual ingenuity. From that perspective is up to each person to decide for him or herself how to cope with risk situations, and with this self-assurance, risk can become opportunity.

On the other hand, the third cultural bias, egalitarian organisations also reject hierarchical structures, but having high identification regarding group relations, they establish their solidarity with a commitment to equality of opportunity and outcome, and view nature as fragile, intricately interconnected and ephemeral. Egalitarian organisations tend to justify their policy stances on moral grounds, and typically support holistic policy solutions. Persons with egalitarian orientation are distrustful of both hierarchy and markets (individualism). They tend to perceive risks, especially those created or amplified by anthropogenic causes, as catastrophic and often irreversible.

The fourth kind of culture, fatalism, represents isolation (no part of any organisation). They consider nature random and capricious and are generally absent from policy discourses.

Even though organisations typically have a dominant or hegemonic perspective (cultural bias), they typically show a mix of cultures internally. Risk cultures within organisations are not completely black or white. Almost all organisations have two risk cultures or even the four identified cultures within their members (Underwood and Ingram, 2013).

The existence of multiple cultures in an organization can also be extrapolated to MSPs as organizations managing risk of natural hazards. In that case, this consideration can give critical insights of the functioning of MSPs. In the definition of MSPs, authorities, enterprises and civil society organisations may share the same goal to reduce risk and gain mutual benefits, but it could be that they have very different views on how to achieve this goal. That

does not mean that partnerships are not practicable if they are shared by different cultures, but in that case they cannot be founded on the idea of reaching a common view of the 'best' policy path. MSPs shaped by a mix of cultures will be considered as 'clumsy' partnerships based on compromise but opposed to consensus views. '*Compromise'* is understood as compensating interests and valued outcomes for the purpose of arriving at a common recommendation for policy action. Making decisions on consensus is meant to change members' preferences and values in such a way that a common outcome is reached without significant adjustments. Outcomes are legitimised if they lead to a motivated consensus and members attempt to harmonise individual and collective interests and values. However, Douglas and Wildavsky (1982), amongst other researchers, argue that reaching a consensus by transforming preferences and values through communication and argumentation is neither sustainable nor desirable for reaching a robust policy recommendation (De Marchi, 2003; Rescher, 1995; Thompson et al., 1990).

According to the premises of Cultural Theory, partnerships will be most feasible among organisations with a similar dominating or hegemonic risk perception and management performance. For example, a partnership might be realistic among responsible government agencies and hierarchically organised environmental groups. However, they will be far more difficult among persons and organisations with strongly contending cultures. An important principle to form partnerships is mutual respect for the conflicting views and risk perceptions (without trying to change the partner) and a commitment to a compromised policy path. Members negotiate among the cultural options to eventually reach a compromise, which was not exclusively acceptable to any one stakeholder, but acceptable enough to inspire a compromised agreement for the sake of policy performance.

2.2 Governance arguments

This sub-chapter on governance arguments encompasses the different theories used to develop the analytical framework explained in sub-chapter 4.2. Those theories are not strictly governance theories, but help the framework to pursue the given aim. This analytical framework uses mainly capitals and capabilities. Nevertheless, the term governance is central for this study since one of the objectives is to assess effectiveness in governance performance.

Governance, understood as '*the sum of many ways individuals and institutions, public and private, manage their common affairs'* (Commission on Global Governance, 1995 p.1), has gained importance within the management of multi-dimensional situations (for more information about governance see section 3.1.5). Those situations become complicated to handle by governments simply due to the many aspects involved and the great number of actors participating. Circumstances, such as the increase of natural impacts caused by climate change and its cascading effects on a global scale, demand a strong performance of governance structures and governance processes at every level. There is then a need for multi-actor processes and multi-actor partnerships to handle such situations (Watson et al., 2009).

The second research pillar of this study used the Capital Theory Approach (Smith, 1776; Goodwin, 2003; Sen, 1983) as a theoretical background, the Capital Approach to Sustainable Development (Smith, 2008; de Wit and Blignaut, 2000; Atkinson, 2008) and the Capability Approach (Sen, 1983). However, it is important to mention that this research pillar was more based on frameworks than on theory (for the frameworks see chapter 3).

2.2.1 Capital Theory Approach

The term capital has its original use in the field of economics. Capital in the economy context describes a certain stock of goods (tools, assets, etc.), which allows the production of new goods and the generation of incomes. Those stocks of goods have the capacity to produce flows of economically desirable outputs. In this previous explanation, stock is defined as the '*quantity identified at a particular point in time'* (Goodwin, 2003, p.2). By contrast, flows are measured over a period of time (Schmalwasser and Schidlowsk, 2006). Flows are understood as '*the creation, transformation, exchange, transfer or extinction of economic value'. They involve changes in the value of [...] assets or liabilities'* (WGNA, 1993, p.84). Flows can either increase stocks or decrease them. But Capitals are not only stocks that over a certain time are increased or decreased by flows. Capitals also have the function of constituting an instrument to achieve something. This instrument allows people to engage more with the world and most importantly has the capability to change the world. Thus they are not just stocks that facilitate the production process but also represent a basis to act and to bring change in society (Morse and Mc Namara, 2013).

The first author that spoke about capitals in this context was Adam Smith in 1776. He advocated that every single person attempts to maximise their income, within the limits of morally defensible positions in society. However, Smith's economic theory should not be seen as isolated from the moral concept and the world view of every single person. The neoclassical economic approach is supposed to be seen as a consequence of each person's world view (Rutz, 2008).

The Capital Approach started in economics, but equally important to the maintenance and expansion of income, was the capability of people to adopt competences, the 'Know-How' and the information about functioning and achievements (Sen, 1983). It became apparent that this was necessary to consider different forms of capitals. For this purpose, a conceptual subdivision has emerged over several decades. Physical capital, human capital, social capital and natural capital (in the course of the sustainability debate at the beginning of the 1990´s) were identified amongst other emerging capitals (for capitals definitions see section 3.1.6).

Coming back to the capacity of stocks to produce economically desirable outputs (Goodwin, 2003), that consideration differs when other capitals comes into play (*e.g. social capital, natural capital*). The supposition that every capital produces something 'economically desirable' is questionable in the case of the behaviour of human beings or biodiversity, for example. Depending on the different forms of capital a stock can have various characteristics. In the cases of natural or human capital, nature and human beings are important as productive resources (Goodwin, 2003). But in those cases in which the determination of a certain value can be done with concrete mathematical terms (*e.g. natural capital and financial capital*), the capital can be calculated very precisely by fixed variables. However, the quantification process of human and social capital cannot be undertaken that easily. The worth of a relationship, the significance of trust, or the competence of intercultural knowledge are stocks which can not necessarily be determined by numbers. Rather the subjective cognition of individuals enables the identification of the value of these capitals. Nevertheless, there are a lot of connecting points between economic growth and capitals.

The major strength of the Capital Theory Approach is the change of complex structures to a more concrete object. The Capital Theory Approach gives an individual examination of different forms of capital which build the basis of wealth and well-being. The great

attractiveness of this new approach is that it suggests relatively simple rules to ensure sustainability and relatively simple indicators for sustainability (Stern, 1997).

2.2.2 Capital Theory Approach to Sustainable Development

The principle of sustainability was supposed to permanently ensure the essential characteristics of a regenerative and natural system (WCED, 1987). The concept of sustainability consists of three pillars: economics, society and ecology. All of them individually play a significant role, but only considered together can sustainability be reached. Wealth, capital and assets become the object of the sustainable development paradigm (Ruta and Hamiltion, 2007), in which wealth is defined as the value of the capital assets accumulation over time (Smith, 2008).

The capital approach related to sustainability is in turn based on the idea of maintaining capital stocks over time as a prerequisite for sustainable development[1] (de Wit and Blignaut, 2000). Considering that sustainability means providing future generations with at least the same opportunities as we have today, a way to achieving this is by transferring enhanced capitals to future generations, compared to ours today (Atkinson, 2008). But here the question is raised as to what should be sustained for future generations?, i.e. capital priorities. For example, there is no sustainability if equity is enhanced while natural resources are lost, as in this case the three pillars of sustainability would be not taken into account. Thus, the terms 'enhancing' and 'losing' are referring to 'flows' and not to 'stocks'. What the Capital Approach can offer to sustainable development is an examination of the 'stocks' of certain forms of capitals.

2.2.3 Capability Approach

Sen´s Capability Approach (1983) deals with the opportunities that actors have to gain access to specific capital forms. Sen asserts that people and societies have different capabilities to convert a particular asset into something more valuable and useful for their livelihood and well-being (Clark, 2005).

In the last 40 years Sen has made several contributions in economics and development studies. Among others he focused on poverty research in the context of famine, growth theory, social choice, and opportunity and inequality. The researches of Sen significantly

[1] *Sustainable development* was defined by Brundtland as the "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987, p.43).

succeeded to the development of further concepts in the context of livelihood and vulnerability research. He criticised the predominant approach of growth and welfare economics and focused on the human well-being, agency and freedom (Clark, 2005).

Sen (1983) emphasises, similarly to Adam Smith, that '*economic growth and the expansion of goods and services are necessary for human development*' (cited in Clark, 2006, p.33). Sen´s approach claims to be a combination of the findings in economics and ethics of human beings. Thus, his ideas within the Capability Approach are defined as an '*economy for people*' (Eiffe, 2010, p.6).

In his Capability Approach Sen tries to connect his ideas about human well-being in order to build a theoretical framework. For Sen, humans are complex beings with a multidimensional decision-making structure (Sen, 1977). He puts emphasis on the ability of humans to make decisions. The approach introduces the differentiation of 'freedom' and 'achievement'. These terms correspond to the dualism of 'capability" and 'functioning'. People functioning reveal the 'beings' and 'doings' a person achieves in reality (achievement). People capabilities represent the alternatives functioning that are possible to achieve by a person (freedom) (Clark, 2005). The capability then reflects the freedom applied by people to decide which way of living they prefer (Nussbaum and Sen, 1993). In Sen's Approach there is not a specific list of capabilities. The selection of the capabilities depends on the individual values and on their environments.

Sen (2000) affirms capabilities alone do not provide a path on how to achieve human 'well-being' and development, so it is necessary to include other helpful concepts, such as economic growth, efficiency and personal liberty. In his opinion, the Capability Approach gives proposals and offers a new means in understanding the 'well-being' of humans and human development, but it does not provide the whole theory.

However, one of the major strengths of Sen´s Approach is its flexibility. This allows developing and applying the approach in many contexts (Alkire, 2002).

CHAPTER 3

Theoretical concepts and frameworks

Different concepts and frameworks from the literature act as the basis for the development of the research approach of this work. It has been differentiated between these two areas (concepts and frameworks) to facilitate and clarify in which aspect they are essential for this work. As well as it **is** done in next chapter with the methodology. Contrary to the theoretical chapter 2, the current chapter is more concise and describes briefly the most relevant aspects considered for this research.

The first sub-chapter (3.1) focuses on concepts. The six principal concepts are 'Multi-Sector Partnerships (MSPs)', 'risk perception', 'risk management', 'institutional fit', 'governance', and 'capitals'.

The second sub-chapter (3.2) is centred on the different conceptual frameworks which incorporate key ideas and elements into the research approach. The three different frameworks are grouped into the two research pillars. One framework is grouped in risk perception pillar, and two are grouped in the governance research pillar. As already noted in chapter 2, the research pillar referring to governance is related more to the frameworks mentioned in this chapter than to the theories presented in chapter two.

The content of the governance research pillar is mainly influenced by the interrelation between capitals (sections 2.2.2 and 3.1.6) and sustainability (sub-section 3.2.2.2). Additionally, the risk governance framework plays an important role in the development of the research approach.

The risk perception research pillar, even though more centred around theories, also makes use of the integrative risk perception model, a relevant framework for the integration of different perspectives on risk perception.

3.1 Concepts

Some concepts are crucial for analysing risk perception as a driver for risk management in MSPs, as well as for assessing MSPs governance performance and its effectiveness (see figure 3.1).

- 'MSPs', as already introduced in chapter 1, are partnerships based on the principles of cooperative work and shaped by different sectors, which pursue the reduction of risks. MSPs share similar perceptions and knowledge about risk.
- 'Risk perception' encompasses the experiences, cultural tradition and emotions among other factors that influence their views of risk. These views of risk determine the chosen management approach.
- 'Risk management' from this perspective is shaped by the perceptions of risk with the aim of reducing harm. Additionally through the work within a MSP, the exchange of risk knowledge consolidates the social construction of the risk.
- 'Institutional fit', as a concept, plays also an important role. The fitting of different institutions (organisations as institutions and institutions as behaviours) with their governance structures supports the MSP creation and so its risk management performance.
- 'Governance' is described as the self-organisation process following a system of rules to control collective actions and pursuing common goals.
- 'Capitals' represent stocks, capabilities and resources that determine the effective functioning of a particular partnership. In this study, five capitals serve to assess the effectiveness of governance performance.

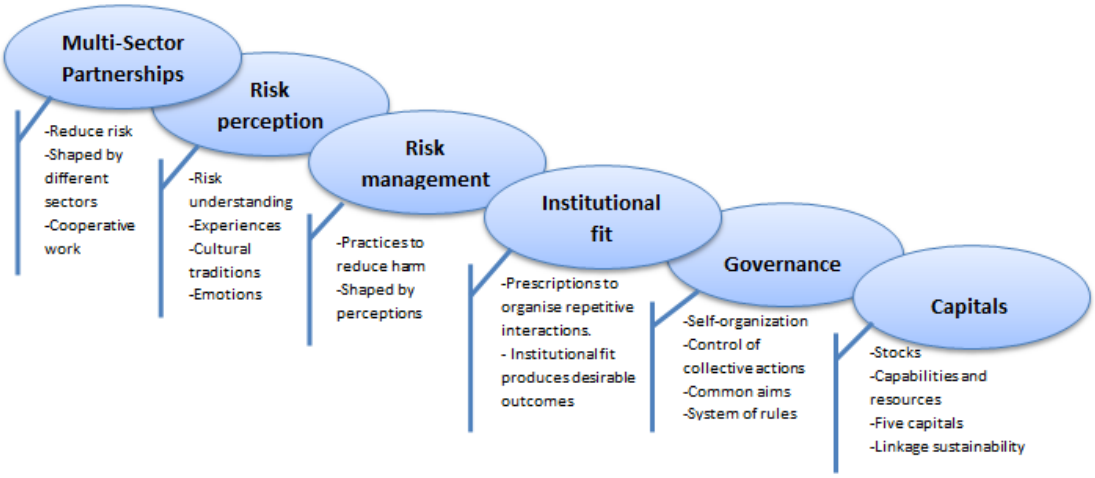


Figure 3.1 *Conceptual basis*

3.1.1 Multi-Sector Partnerships (MSPs)

The increased exposure to complex and multidimensional risks resulting from natural hazards is a key challenge in risk management. Single actors as well as multi-actors are involved in the process of risk consideration. This process is driven by human actions resulting from the formation of risk perceptions which derive from a mental construct and the knowledge on risk developed, maintained and transmitted as a social construct (IRGC, 2005). Therefore, it is important to include different mental constructs of risk into successful risk management processes. Depending on the perceptions of risk, the society and partnerships dealing with natural hazards will identify, or not, a need to act in the face of the hazards.

The impacts and consequences resulting from natural hazards affect different sectors in a different way. These trans-sector impacts and consequences are not manageable by a single actor, such as the government (Evans, 2012). This results in the need to have new governance structures for risk management including multi-sector actions. This change refers to the move from 'government' to 'governance' (see the concept of governance in section 3.1.5). In the cases in which governmental structures are not able to react properly to particular changes, the creation of partnerships might allow newly developed capabilities to act effectively. But it is not enough to have single partnerships (*e.g. farmers' association*), which are focused only on one area of interest. Multi-Sector Partnerships take into account the needs of different sectors in the face of risk events, including different perspectives of risk management. MSPs serve then as the response to institutional weaknesses to face those challenges.

The necessity of more inclusive forms of governance and regulations fosters the idea of co-involvement and cooperation of public and private multi-actors with different interests (*e.g. stakeholders*, *sectors*) (Fairclough, 2005). Thus, MSPs provide a variety of partners, ideas and resources for a better response that one organisation alone could (Máñez Costa et al., 2014).

As a part of the study carried out by the European project ENHANCE[2], MSP are defined as voluntary or enforced mechanisms with strong governance structures shaped by actors from several sectors, i.e. public-private and productive sectors, which are sharing a same goal in order to tackle risks.

[2] EU-project: 'Enhancing risk management partnerships for catastrophic natural disasters in Europe'. Grant agreement no: 308438.

Within the project ENHANCE, the definition of MSP was broken down into a list of characteristics (see table 3.1). These characteristics were applied to the case studies of the project in order to analyse if that definition could be generalised and considered appropriate as a reliable definition (see Appendix A).

Table 3.1 *MSPs characteristics*

No.	MSP Characteristics	Insights of the ENHANCE case studies	
1	Voluntary commitment	In some cases the voluntary commitment appears to achieve specific aims (*e.g. information campaigns among citizens*).	Therefore, these two characteristics are complementary and it does not mean that MSPs are better off if they are either voluntary or mandatory.
2	Enforced by law (mandatory)[3]	In other cases, the mandatory commitment does not emerge until the government intervenes and enacts particular aspects by law.	
3a	Only public	The MSP identified in one case study is only public	These three characteristics are incompatible. They can be or only public or only private or have the combination or both.
3b	Only private	----	
3c	Public-private	From the ten case studies, nine are public-private MSPs.	
4	Civil society participation	The inclusion of civil society (*e.g. NGOs representing part of the society*) as a part of MSPs is a characteristic remarked by the evaluation but not all MSPs include civil society.	
5	Enforceable commitment (workable)	Not all the MSP recognised to have workable commitments. That involves unreasonable expectations.	
6	Temporary	Only one case study has a temporary MSP (created only when an emergency scenario appears). This does not have a negative meaning (*e.g. a MSP to cope with specific hazard events*).	
7	Long-lasting	MSPs are generally long-lasting and well established (historically rooted or work cooperatively for more than 10 years).	
8	Sharing same goals (mutual benefit)	All cases affirmed that MSPs principles pursue the same goal.	
9	Reducing risk (Emergency measures…)	All cases affirmed to intend to reduce risk by implementing emergency measures, preparedness strategies, policy actions, etc.	
10	Include different productive sectors	All partnerships are multi-sector, with specific differences: in some cases, this means sectors as public and private and in others, the productive sectors (*e.g. agriculture, industry, services*).	
11	Strong governance structures (Coordination, supported by a system of rules, norms, conventions…)	Eight of those MSPs have strong governance structures, supported by rules and norms that emphasis cooperative work.	

[3] In some cases, the voluntary commitment for some aspects of the MSP does not determine that others aspects are mandatory by official legislation.

The cultures and tradition of risk management and stakeholder involvement facilitate the capability of forming partnerships (Máñez Costa et al, 2014). Therefore, identifying in advance cultures of risk - *perceptions, interpretations, experiences, beliefs, etc.* - (see sub-chapter 2.1), and defining how stakeholders involvement is very important for the formation of MSPs.

3.1.2 Risk perception

Risk is a mental model of how a threat is understood depending on the internal, personalised, intuitive and contextual understanding of individuals (Kearney, 1997), acquired over time through social interactions and experiences. This psychological side of risk provides the perception. Perception is the way people interpret experiences, that is, the sensory experience of the world. Human beings understand the world in such a way that they recognise the environmental stimuli and response to those through actions (Otara, 2011). Cognitive psychologists consider that perceptions are formed by common sense reasoning, personal experience, social communication and cultural traditions (Aven and Renn, 2010).

The mental model that people have about risk works as a lens used to see how new information is evaluated and perceived (Jungermann et al., 1988). All these mental models are influenced by communication processes as well as cultural backgrounds (Morgan et al., 1992). Factors such as knowledge, experience, values, attitudes and feelings influence the judgement of people about the significance of risks (Slovic, 1987). Those factors give the means to perceive risk differently depending on the culture, which encompasses all of these stated factors.

As defined in chapter 2, risk perception is the particular evaluation of the likelihood of a harmful event happening and how people are concerned with the consequences (Sjöberg et al., 2004). But this particular evaluation is also transformed and reshaped based on the group, that is, the culture in which people are involved. The group perception about risk, or in other words the risk culture, also plays a role.

Risks perceptions are mental constructions that result from the perception of each affected person as well as their interpretations and responses, which depends on social, political, economic and cultural contexts and judgments (Luhmann, 1993; IRGC 2005).

There are then two dimensions of risk perception: the individual dimension based on the strictly cognitive processes and heuristics from each person and the collective dimension in which social context and cultural backgrounds influence the perception shaping the mental model of what is risk and how to manage it.

The individual dimension of risk perception

Risk is often seen as the likelihood that an individual will experience the effect of danger (Short, 1984). Individuals perceive risk from two points of view:

1) Analytical view - is normative and requires a conscious control bringing logic, reason and scientific deliberation to deal with the hazard.
2) Experiential view - refers to the intuitive reactions to danger.

The latter is currently considered the most common way to respond to risks (Slovic et al., 2004). The experiences determine in many cases the responses to current and futures risks. These experiences provide the perceptions of risk.

The collective dimension of risk perception

Risk perception is also considered to be a collective and cultural construction (Douglas and Wildavsky, 1982). Perception of risk goes beyond the individual and it is a social and cultural construct reflecting values, symbols, history, and ideology (Weinstein, 1980). Human beings are social beings. Hence, perception should be contemplated as a social phenomenon. Contrary, in the research of risk perception there is still a lack of the consideration of risk as a social experience. These approaches of the social context represent a mix of different perspectives (Renn and Rohrmann, 2000; see also section 3.2.1).

Factors determining the perception of risk respond to a complex combination between innate biases and learned ones. Included in this combination are cultural, socio-political and emotional factors (Renn and Rohrmann, 2000). These factors are individual as well as collective. Although this research is focused on the collective dimension, it is important to understand that the individual dimension influences the collective, thus the factors on the individual side are also important to the collective risk perception factors (see figure 3.5 in section 3.2.1).

The perceived risk creates a social construct and shared understanding of risk according to societies' beliefs and experiences. Following this argument, the natural hazards internalised by the inhabitants of a certain area, which deal with a specific hazard, might be not considered as a risk. The reason of that resides in the experiences. Groups of people that have handled similar situations before will feel confident in managing the hazard again. And that confidence would change the perceptions. Thus, it is depending on the experiences that the perceptions are going to be determined. The perception of people living in a particular area is influenced by their culture. Their beliefs, experiences and legacy, which has been inherited generation after generation, belong to the culture. And the culture determines the risk consideration as a product of shared beliefs and values (Douglas and Wildavsky, 1982). Concluding, risk perception is then the recognition and acceptability of the social dimension of risk (collective dimension).

This collective dimension provides the culture of risk of such groups. Culture of risk is shaped by the way decision-making processes are made and how these decisions determine management strategies and actions. Besides it includes the knowledge, capabilities, rules, patterns of behaviours, and beliefs of a group of people.

3.1.3 Risk management

Strictly defined, risk management is '*the systematic approach and practice of managing uncertainty to minimize potential harm and loss*' (UNISDR, 2009, p.26). But, how is risk management achieved? How do groups of people (*e.g. MSPs*) start to determine which actions to take to reduce potential harm?

Risk, as mental construction regarding possible dangerous natural events, is perceived based on interpretations, experiences, knowledge, preparedness strategies, responses and beliefs, which find the strategies for managing the risk through implementation of measures to reduce and regulate the hazard. The combination of these three elements shapes the risk management for identifying, assessing, responding, monitoring and reporting the risk (see figure 3.2). Therefore, risk management responds to the perceived subjective probability of risk and based on that it pursues the minimisation of potential harm, implementing strategies and actions to control and reduce risk (UNISDR, 2009). The way an event is perceived determines the way people act.

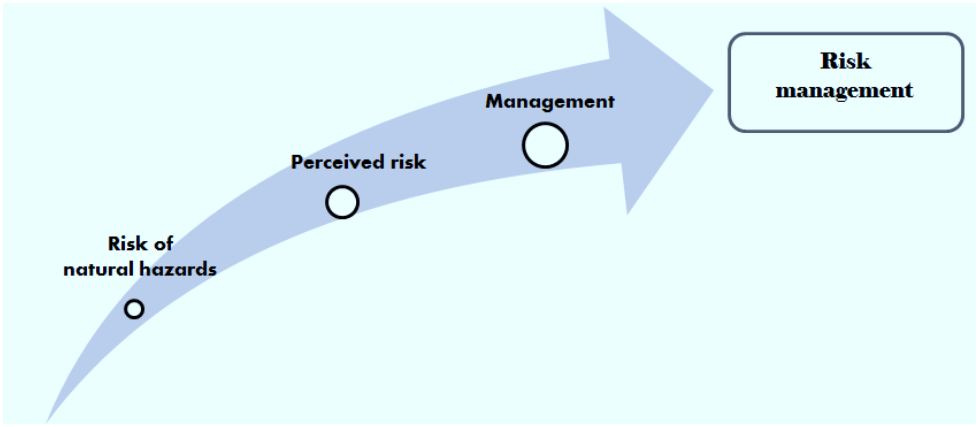


Figure 3.2 *Risk management shaping process*
(based on UNISDR, 2009)

Taking into account the object of study of this research, the collective dimension of risk management is the dimension that becomes important. The assumption made here is that the cooperative work in MSPs promotes more effective risk management performance because the risk management strategies implemented by MSPs are based on actors' behaviours facing risks, perception of adverse extreme events and their risk preferences (Wauters et al., 2014).

Following this line of thinking, within MSPs the hazards that are considered as a potential risk will be the ones that will have strategies for action developed. But this is like a vicious circle (see figure 3.3), the preparedness (management) influences the degree of risk perceived, the higher preparedness the lower perceived risk.

Figure 3.3 *Risk perception and management circle*

In cases in which there is high confidence in preparedness strategies (*e.g. dykes*) the risk perceived is low. That also occurs in those cases with recurrent hazards in which the historical management, and consequently the risk culture, make that the risk perception decrease. The feeling of confidence is also high due to the experiences in dealing with it, as well as the preparedness capacities also being higher. Although that does not mean that the improvement and adaptation to new conditions (*e.g. climate change*) are not needed.

3.1.4 Institutional fit

The study of an institution makes it possible to understand its social, political and economic behaviours. Institutions, as defined by Ostrom (2005, p.3), are the '*prescriptions that humans use to organise all forms of repetitive and structured interactions*'.

A proper assessment of institutions acting together should include the institutional fit of the participating institutions to better align the rules and behaviours of the different partners and successfully fulfil the arrangements previously agreed. According to Cox (2012), if two institutions fit, they will produce desirable outcomes. If there is a misfit, the result will be an undesirable outcome.

Institutional fit has three dimensions that are important for an efficient governance performance (Epstein et al., 2015), which they have been used for the analytical framework explained in sub-chapter 4.2:

1) **Ecological fit** looks at the match between institutions and governance structures and the environmental and/or climate problems they want to solve.

2) **Social fit** takes the institutional setting between the organisation and their perceptions towards the risk to be managed.

3) **Social–ecological system fit** seeks to uncover the institutional norms and its particular organisational systems and structures that will provide stability to the governance structure

The concept of institutional fit supports the key idea that different environmental problems should be treated differently and similar problems should be treated similarly (Young, 2002).

3.1.5 Governance

The concept of governance is in recent years broadly used, especially in policy, planning and management contexts. Governance is influenced by the culture that provides different understanding, depending on each case but especially depending on the different disciplinary fields.

The current concept of governance has its origin in the 1980s, when it became necessary to explain the shift from state-centred and bureaucratic forms of administration (government) to broader and more inclusive forms of governing (governance) in the national context, the international context (Haward and Vince, 2006), as well as in the local context. That shift was aroused under the pressure of neo-liberal reforms and globalisation. The shift moved the decision-making from 'government' as a central, hierarchical and exclusive form of administration to 'governance', which includes networks of multi-actors for bottom-up decision-making (Bellamy and Palumbo, 2010). The failure of governments together with the increasing activities of non-governmental actors (including markets) made it clear that the act of governing needed not only to be assumed by governments and top-down decision-making, but also by multi-actors decision-making processes (bottom-up) (Ostrom, 1990; Haward and Vince, 2006; Evans, 2012). Nevertheless, the definition of governance still refers to the government and the maintenance of a legal and regulatory framework. Thus, governments and governing structures are not necessarily completely separated under the governance definition. In that sense, governance might be considered as what a 'governing body' does, including management and decision-making for a given area of responsibility.

In social science governance is interpreted as *'…all forms and mechanisms of co-ordination between more or less autonomous actors whose actions are interdependent and which can therefore help or hinder one another*' (Benz et al., 2007 p.9). Governance describes different forms of coordinating action, including the participation of civil society, political control and markets (Mayntz, 2004), and not only focuses exclusively on government (hierarchical management). In other words, governance is seen as the opposite of that hierarchical management (Bruns, 2010). The conception of government in the understanding of governance refers to a sub-form of governance, which does not directly lead to the creation of 'traditional' government infrastructure (Young, 1999), although government is still one of the most effective institutions implementing policy and ensuring compliance. The term

governance is particularly useful to refer to those forms of control that are not strongly institutionalised, such as networks, round tables, regional conferences, etc. (Fürst, 2003).

Governance is the '*the control of the process of collective action, where actors/organizations are linked to one another and coordinated in their action in such a way that commonly held or developed aims and objectives can effectively be pursued*' (Fürst, 2003, p.252), but also '*a form of self-organisation based on the interdependence and resource dependencies of actors, which manifest themselves in political systems of action, supported by a system of rules, norms, conventions, etc., which can be of formal or informal nature*' (Rhodes, 1997, p.15). This study shares the definition of Fürst (2003) and Rhodes (1997).

Governance as a decentralised form of governing is carried out at three levels: the local level, national level and global or international level. The latter is known as the level of *'governing without government'*. On the local scale, governance is focused on a geographical region or community and includes the actors in decision-making processes and the social and societal structures within these defined areas. At the national level, governance describes structures and processes for collective decision-making involving governmental and non-governmental actors (Nye and Donahue, 2000). At the third level, global governance in general terms, defined by James Rosenau (1992, p.7) is '*an order that lacks a centralized authority with the capacity to enforce decisions on a global scale*'. At this level, non-governmental organizations (NGOs), citizens' movements, multinational corporations, and the global capital market are also involved (Commission on Global Governance, 1995). Problems on a broader scale, such as economic rises, increased activities of supranational institutions (*e.g. the European Union*), the diffusion of information technology (Bevir and Trentmann, 2007) as well as new natural impacts including climate change and its cascading effects on a global scale, especially require new forms of governance. They cannot be managed only by national governments within national borders. Here resides the purpose for the inclusion of multi-actor processes and partnerships (Watson et al., 2009), but not only at the global scale, also at local and regional scales. That means the need of multi-sector partnerships for managing risk situations where only the government in these areas cannot manage alone.

Governance might be considered as a conceptual support which can help to '*make clear who does what, when and where in order to enable collective action*' (Fürst 2003 p. 252).

Therefore, those partnerships of multi-actors in a natural risk event context perform governance processes to manage these events. And this governance performance makes the decisions for collective actions.

3.1.6 Capitals

As mentioned in section 2.2.1, the term 'capital' was first used with an economic meaning by Smith (1776) in his work 'An Inquiry into the Nature and Causes of the Wealth of Nations'. He defines capital as gaining enough stock from income so that an individual can afford for his/her consumption. But going further back in history, the meaning of the term 'capital' comes from the Latin word '*Capitalis*' and means 'the head' or 'concerning life'.

Capitals can be also understood as stocks that have the capacity to produce flows of economically desirable outputs in order to favour sustainable development (Bebbington, 1999; Goodwin, 2003; Sen, 1983; Sen, 2000). The terms '*capital*' and '*sustainable development*' are related one to another for this study.

Generally, capital can be considered as the capabilities, resources, properties or other valuables used to reach good performance. In economics, 'capital' describes a certain stock of goods which allows producing new goods and generates income. However, this stock does not necessarily have to be of material nature. In this word, the term capital is compared to the term asset.

It is apparent that there are different forms of capitals. In old economics literature, two capitals have dominated. They were the financial capital together with the physical capital. Physical capital was later divided into two kinds of capitals, natural and man-made (Goodwin, 2003). Another capital is the human, although this concept was largely developed over the last century, the origin is based on the 17th century (Kiker, 1966). Later, in the 1960´s and 1970´s, inspired by a socio-economic debate, the social capital was identified. The access to a high social capital lies in the use of values, moral concepts, the handling of stakeholders and the capability of human beings to put oneself in the someone´s else situation and to understand others, as Adam Smith (1776) pointed out. In 1994, Serageldin and Steer, edited 'Making development sustainable: from concepts to action' which affirms that we need to recognise at least four categories of stocks (human-made or fabricated, natural, human and social). Bebbington (1999) proposed five capitals (produced, natural,

social, cultural and human). The term cultural capital was first used in the '*Cultural Reproduction and Social Reproduction*' by Pierre Bourdieu (1977). In the work of Goodwin (2003), he differentiates also between five capitals, which their maintenance produces the desirable outputs. These five capitals are different to Bebbington's and include financial, social, human, natural and man-made. The same five capitals are considered by the OCDE (2008) as well, in the report for '*Measuring sustainable development'*. The later were used for this study with some modifications.

These five capitals are defined as follow:

- **Financial capital** is *'what allows all the productive activities to get going, in a money economy, in advance of the returns that will flow from them*' (Goodwin, 2003, p.3); '*These include currency and other forms of bank deposits, stocks and bonds*' (OECD, 2008, p.48).
- **Social capital** refers to '*the stock of trust, mutual understanding, shared values, and socially held knowledge that facilitates the social coordination of economic activity'* (Goodwin, 2003, p.6); '*Networks together with shared norms, values and understandings that facilitate co-operation within or among groups*' (OECD, 2001, p.41).
- **Human capital** represents '*stock of capabilities, which can yield a flow of services. […] These capabilities depend not only on your knowledge, education, training, and skills; they also include useful behavioural habits as well as your level of energy and your physical and mental health'* (Goodwin, 2003, p.5). Those knowledges, skills and competencies *'facilitate the creation of personal, social and economic well-being*' (OECD, 2001, p.18).
- **Natural capital** encompasses '*those aspects of nature that humans were actually using, […] growing awareness of the […] balance of the relationship between the natural environment and human economies*' (Goodwin, 2003, p.4); it is '*the earth's natural resources, land and the ecological systems that provide goods and services necessary for the economy, society and all living things*' (OECD, 2008, p.49).
- **Man-made capital** includes '*physical assets that are generated by applying human productive activities [...] whether in the business sector, in homes or communities, or in the public purpose sector of governments and non-profits*' (Goodwin, 2003, p.4);

they are '*fixed assets that are used repeatedly or continuously in production processes for more than one year. Fixed assets can be tangible and intangible*' (OECD, 2008, p.49).

3.2 Frameworks

The conceptual frameworks below are divided into a risk perception research pillar and a governance research pillar (see figure 3.4).

On the one hand, for the first research pillar of this study is has been used the integrative model of risk perception for a comprehensive overview of the risk perception, even though the Cultural Theory and the Protection Motivation Theory were presented in chapter two as a theoretical basis of this research pillar. The relevant insights of the integrative model of risk perception allow the enriching of the research pillar and thus the elements that shape it.

On the other hand, the governance research pillar has been anchored by two frameworks. These two frameworks are very different one from each other. Each of them focuses on one aspect that helps the development of the whole research pillar. As mentioned before, the governance research pillar has a part that purely concerns to governance, but it also has a capitals dimension that has helped the development of a framework to analyse effectiveness in governance performance. Following this argument, one of the frameworks of this research pillar on governance is related to risk governance, and the other two capitals and the linkage to sustainability defined as synonymous of 'good'. The term denotes self-sufficiency and refers to the ability to maintain and improve processes while maintaining and enhancing assets and capabilities at all levels (Chambers and Conway, 1991). These two frameworks are the Integrative Risk Governance Approach or Framework (IRGC, 2005) and the Sustainable Livelihood framework (Scoones, 1998; DFID, 1999). The first framework mentioned encompasses the different perspectives of risk governance (scientific, economic, social and cultural). The second framework refers to the available provision of sustainable capitals for the next generation. This latter framework helps to relate to the maintenance and enhancement of assets or capitals through strategies that achieve outcomes.

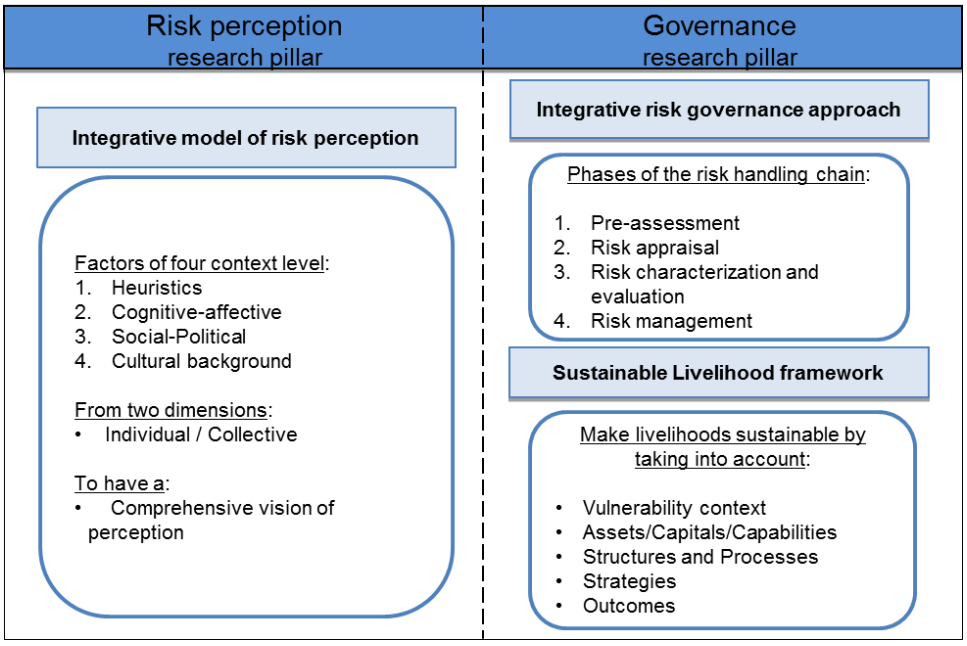


Figure 3.4 *Framework basis*

3.2.1 Risk perception framework: Integrative model of risk perception

In relation to the concept of 'risk perception' (see section 3.1.2), this model includes the different factors influencing risk perception as well as the two worldview dimensions. These two dimensions refer to the perceptions of the group (collective) and the single perceptions (individual). These dimensions were already described in more detail in section 3.1.2.

The basis of this framework is grounded in the idea of the inclusion of the different psychological, social and cultural factors that have influenced risk perception. Within this, the factors should only be investigated from the view point of their own fields, and not compared to each other (Wachinger and Renn, 2010).

The integrative model of risk perception is an integrative and systematic perspective on risk perception. This structured framework of factors tries to help the analysis of risk perception in order to understand the empirical results on risk perception (Renn and Rohrmann, 2000). The presented framework shows the factors which influence the four context levels in risk perception, i.e. heuristics of information processing; cognitive-affective factors; social-political factors; cultural background. The four context levels are influenced as well by the two dimensions cited above (see section 3.1.2) and each level is in turn inserted at the higher level.

The four context levels are described as follows (see figure 3.5):

- **First context level** (smaller circle in the figure 3.5) comprises the heuristics used to form judgments of risks. The heuristics of processing the information are not related to the risk in itself or to the individual cultures; they represent strategies of common-sense. These strategies have grown over a long evolution of human behaviour to cope with uncertainty (Renn and Benighaus, 2013); and they are different depending on the group culture.

  This context refers then to the processing of the information received, based on common-sense for the sake of drawing interpretations.

- **Second context level** refers to the cognitive and affecting factors influencing the perceptions. The knowledge about the risk and the feelings and emotions derived from the risk help to create perceptions. Knowledge about risk determines characteristics but this knowledge is not in every place the same, this makes differentiations between cognitive factors and universal risk characteristics (Renn and Rohrmann, 2000). Contrarily, affective factors influence risk appraisals and balance benefits and risks more universally. Affective factors are crucial to make decisions when there is a certain ambiguity about the better response to take. Nonetheless, cognitive and affective factors are related (Zwick and Renn, 1998); cognitive beliefs influence affective instincts or vice versa. Individuals, independent of the culture, are able to choose between different cognitive maps to determine risk perceptions distinct from the first level in which common-sense decides.
- **Third context level** is referring to the social and political arena in which individuals and groups manage the risk. These socio-political factors shape individual and collective responses to risk. Trust, media, social groups and institutions play an important role at this level shaping the experience of risk (Renn and Rohrmann, 2000).
- **Fourth context level** encompasses the cultural factors which manage the 3 lower levels in the figure. Several authors (Slovic, 1987; Renn and Rohrmann, 2000; Sjöberg et al., 2004) affirm that specific culture preferences are crucial in risk perception. The categorisation of these preferences is not clear for such authors, and they disagree with Douglas and Wildavsky (1982) and their four kind of cultures.

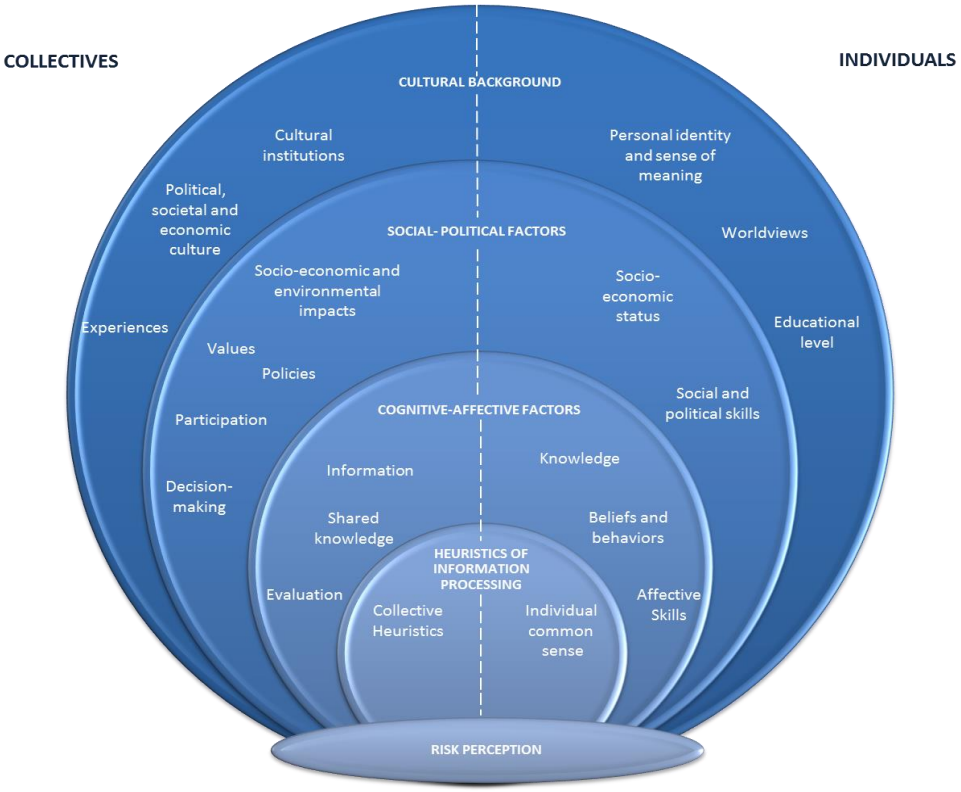


Figure 3.5 *Four context levels of risk perception*

(based on Renn and Rohrmann, 2000, p.221)

Each circle represents one context level as well as the dashed line in the middle separates the collective and individual dimensions

All four context levels are relevant for understanding risk perception from an accurate point of view. Risk cannot be consider simply as the probability of an event happening and its negative consequences (UNISDR, 2004), since this notion plays down intuitive judgements about risk made by people.

This study has been focused on these factors to develop criteria that help the creation of a questionnaire which helped to analyse the perception of risk in MSPs.

3.2.2 Governance frameworks

This sub-chapter focuses on the frameworks related to the governance research pillar which is split in two frameworks: The Risk Governance Framework that is more related to governance in itself, and the Sustainable Livelihood Framework which helps the development of the Capital Approach Framework (CAF) presented in the methodology chapter (see sub-section 4.2). This last framework is centred in capitals and their link to sustainability.

3.2.2.1. Risk Governance Framework

One part of this study looks for effective and successful risk governance through the development of governance indicators to analyse the effectiveness of governance performance in MSPs. To develop those indicators and the framework in which they act as an instrument to obtain data, the risk governance framework is used as base of the governance research pillar. Taking into account that this study lies in risks, the part of governance that become important for it resides in risk governance.

Governance as a concept has been already defined in section 3.1.5, however this section is focused on the Integrated Risk Governance Framework: a comprehensive work in order to handle the increased challenges in risk management. It was carried out in 2005 by the International Risk Governance Council (IRGC), in which Renn was the lead author. From the perspective of Renn, risk governance provides a framework to analyse and cope with systemic risks. Systemic risks comprise a multitude of causal agents and a multitude of consequences. Because of this, risk governance provides a framework to include a multitude of actors and stakeholders in a multidimensional context, including socio-economic perspectives.

Risk governance has been developed within the field of risk management, providing a systemic approach for decision-making processes. Risk governance represents a comprehensive way to understand different kinds of risks and manage them (Wanczura et al., 2007), as well as including all actors and stakeholders dealing with the effects and impacts of the respective risks (Greiving and Glade, 2013). In general, the framework of risk governance includes principles of governance with regard to risk-related decision-making (Renn, 2008), such as '*rules, conventions, processes, and mechanisms concerned with how relevant risk information is collected, analysed and communicated, and management decision are taken'* (IRGC, 2005, p. 22). This framework provides guidance for a comprehensive assessment and the development of management strategies to cope with risk at global scale.

The Integrated Risk Governance Framework includes scientific, economic, social and cultural aspects as well as the variety of stakeholders. It intends to enhance risk governance strategies. For that, it includes many aspects needed to reach a comprehensive overview of risk. As well as encompassing the existing approaches on risk governance, its integrative

framework has new additions: the incorporation of the societal context and the risk-related knowledge. Further, it also includes three principles: (1) the physical dimension and socio-cultural dimension (the first represents the combination of the likelihood of an event occurring and its positive and negative consequences. The latter includes perceptions based on values and emotions of a particular risk); (2) the stakeholders involvement; and (3) the implementation of good governance premises (*e.g. transparency, sustainability, equity and fairness, effectiveness and efficiency, accountability, ethics, etc.*) (IRGC, 2005).

This framework proposed a risk handling chain. It is shaped by three main elements or phases: 'pre-assessment', 'appraisal' and 'management'. However, most risks require more analysis phases in order for them to be handled properly. For that reason one new phase is added to the process. This fourth phase, called 'tolerability and acceptability judgement', focuses on knowledge and value-based issues. It is divided into risk characterisation (scientific data based on the results from the risk appraisal, that is the knowledge) and risk evaluation (assessment of the values that influence the judgement). Apart from these four phases a last phase is included in the chain: risk communication, which is bidirectional and transversal.

Therefore, within this enhanced and integrative context, risk governance is represented by the following five phases (IRGC, 2005):

1) **Pre-assessment phase** to frame the issue. It consists of the achievement of a common understanding of the risk among the different actors as well as the existences of risk signals, pre-screening and determination of rules for assessing the risk.
2) **Risk appraisal phase** is shaped by risk assessment and concern assessment. Risk assessment includes hazard identification, exposure and vulnerability, and risk estimation, which encompasses the results of the two previous steps. Due to the fact that understanding causes and effects is difficult, the risk appraisal phase includes a second component. The concern assessment complements the previous results aggregating insights from risk perception studies and socio-economic analysis. This phase provides knowledge for deciding if a risk should be considered and the possibilities for reducing the risk.

3) **Risk evaluation and characterisation phase** decides whether or not to deal with the risk. It is based on judging if the risk is acceptable or tolerable. This judgement is determined by the risk characterisation (knowledge) and the risk evaluation (values). Both elements are placed between the risk appraisal and the risk management, to be assigned to the phase that is more convenient to perform the task depending on their relation to the assessment or to the management.
4) **Risk management phase** handles prevention and reduction of risks, and offers changes in the consequences through implementing appropriate actions. Risk management is comprised of six steps, related to implementation and decision-making.
5) **Risk communication phase** increases the capability of actors to make informed choices in the face of risks (Renn, 2008). The risk communication is the component that allows proper intermediation between expert judgments, population perceptions and actors dealing with the risk (Aven and Renn, 2010; Morgan et al., 1992; Renn et al., 2002).

These five phases represent the risk process of the Integrated Risk Governance Framework (see figure 3.6). Applications of this framework have taken place in a multitude of research activities dealing with different risks.

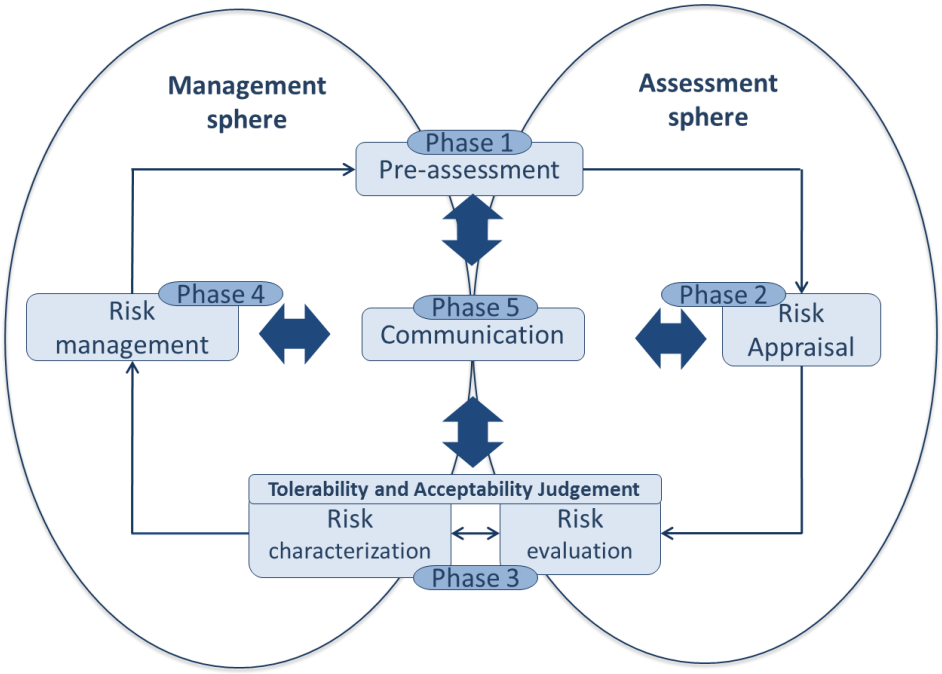


Figure 3.6 *Risk governance framework*

(based on the International Risk Governance Council, 2005, p.13)

The implementation of risk governance takes place at different levels. On the one hand, the risk governance framework provides the theoretical background to develop risk governance approaches, which can be applied to handle specific risks and their consequences on regional or national level (*e.g. droughts in a river basin*). On the other hand, risk governance framework provides a general concept to cope with increased risks and strengthen societal resilience on transnational level (*e.g. climate change*). Risk governance constitutes therefore a theoretical framework for analysing governance processes in MSPs, in which stakeholder manage risk.

Successful risk governance depends on participation, trust factors and communication of all actors (Renn 2008; IRGC, 2005). Moreover, aspects as respect, tolerance, transparency, efficiency and education are important to generate, improve and spread knowledge about existing risks between actors, and stablish the basis for successful cooperative processes.

3.2.2.2. Sustainable Livelihood Framework

The linkage of capitals to sustainability has the aim '*to leave the next generation the same amount and composition of capitals we found*' (Serageldin and Steer, 1994, p. 31). Sustainability links the actions of the past with the actions in the present and consequently that will influence the available options and outcomes of the future (OECD, 2008). In 1998 Scoones, and later in 1999 the Department for International Development in UK (DFID), presented a linkage of capitals or assets to sustainability.

In this sub-section the Sustainable Livelihoods Framework, defined by Scoones (1998) is described. This framework focuses on people and the features that affect individual's livelihoods and their relationships (DFID, 1999). The term sustainable livelihood used by Scoones (1998) is related to the relationships between poverty and environment.

The Sustainable Livelihoods Framework includes the vulnerability context, the livelihood assets and the institutional processes and structures, as well as the livelihood strategies and outcomes (see figure 3.7).

The vulnerability context refers to the external environment. It represents the factors over which the people have limited control. The focus must be on understanding the impact of these factors and to minimize the negative ones. The vulnerability context is framed by the

influence in trends of assets (*e.g. unemployment rate*), shocks (*e.g. droughts*) and seasonal shifts (*e.g. food availability*) (DFID, 1999).

The second element of this framework is the livelihood assets, which include the different capitals. The Sustainable Livelihoods framework is based on the idea that people require a sort of assets to achieve positive outcomes and it is not enough to possess a unique asset (*e.g. only social capital*). This framework also supports the belief of maintaining or enhancing capabilities in order to cope with threats. Structural and procedural elements encompass the sectors organisations (public/private/civil society). Those elements represent policies and legislation and shapes livelihoods. Structures are related to governance and make processes possible. Processes allow structures to operate and to interact; they make access of the assets possible, the communication and cooperation between people and facilitate making choices. The livelihood strategies element refers to the strategies adopted to achieve the livelihoods outcomes. These strategies promote choice, opportunity and diversity. They strength the positive aspects and mitigate the weaknesses in order to improve opportunities and services. The livelihood outcomes element represents the seeking of people assets (DFID, 1999).

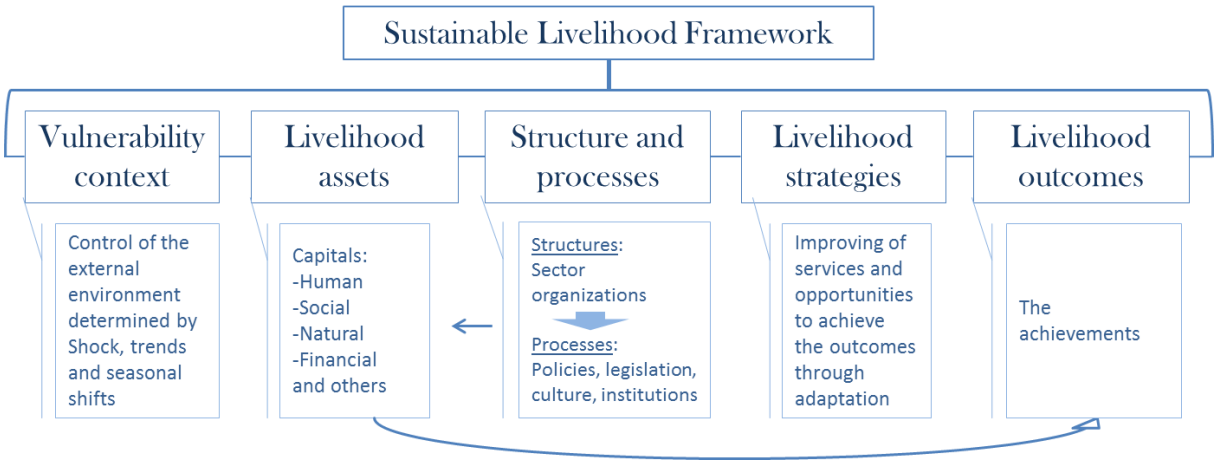


Figure 3.7 *Sustainable Livelihood framework*

(based on Scoones, 1998, p.4)

Capabilities, assets (capitals) as well as the activities required for living, comprise livelihoods. Livelihoods are sustainable when they maintain or enhance its capabilities and assets and provide opportunities for the next generation for coping with and recovering from stresses and shocks (Chambers and Conway, 1991).

The Sustainable Livelihoods Framework seeks to be an adaptable tool for use in planning and management. Also this framework makes clear which factors affect livelihoods.

For Scoones (1998) the framework is shaped by five indicators of sustainability:

1) **Creation of working day** relates to the ability of a particular combination of livelihood strategies to create gainful employment for a certain portion of the year.
2) **Poverty reduction**: The poverty level is a key criterion in the assessment of livelihoods.
3) **Well-being and capabilities**: The notions of 'well-being' (Chambers, 1997) and 'capability' (Sen, 1984) influence the livelihoods concept.

Livelihoods

4) **Livelihood adaptation, vulnerability and resilience**: sustainable livelihood are highly connected to coping and adaptation. These abilities favours resilience and increase the likely to achieve sustainable livelihoods.
5) **Natural resources**: ability of a system to maintain productivity when stress or shocks appear.

Sustainability

The last three are the more related to the (CAF). In order to create livelihoods, people must combine the 'capital' legacies so that they have access and control over them.

CHAPTER 4

Development of a methodological framework

In this chapter, the methodology of the study will be presented. Methodology here refers to the methods used for the analysis (data collection and assessment) as well as the procedures applied for the whole research. These procedures include analytical methods and tools used to obtain data. Some of these are based on existing methods of analysis while others are based on the frameworks and theories explained before, as well as those that have been especially developed further for this research (see figure 4.1).

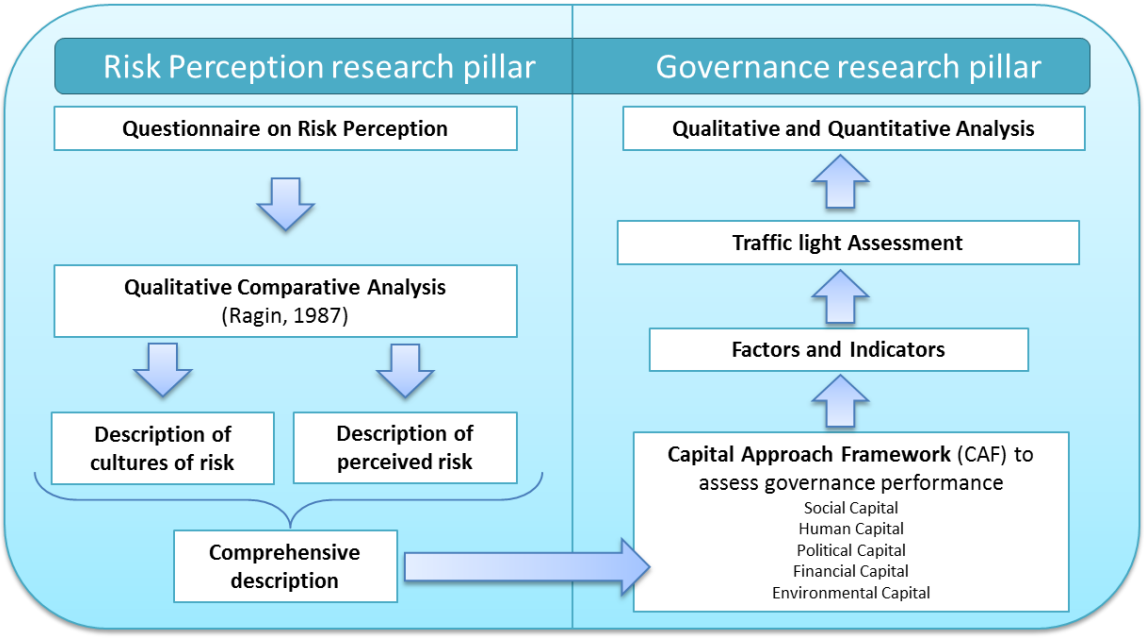


Figure 4.1 *Methodology basis*

The presentation of the methodology starts by introducing the risk perception methods taking the differences between the risk perception research pillar and the governance research pillar into account. The risk perception methods sub-chapter (4.1) encompasses the method used to obtain the data, i.e. questionnaires on risk perception, and the method used to analyse the data, i.e. Qualitative Comparative Analysis (Ragin, 1987), including the Boolean algebra (Boole and Corcoran, 2003).

Sub-chapter 4.2 presents the Capital Approach Framework (CAF) and the indicators developed for assessing governance performance. These are not only instruments for analysis but also for collecting data. The guidelines for analysing the data set, i.e. Traffic Light Assessment, are also presented. The CAF has not been presented previously in the framework sub-chapter (3.2) as it is a new approach developed especially for this study and is considered a contribution from the study of governance.

Finally, the research approach, which represents the comprehensive framework of this study is described (see sub-chapter 4.3). That includes all the theories, theoretical concepts, frameworks and methods already presented, and how they are interrelated to allow the procedural development of the research.

4.1. Risk perception methods

The method used for the risk perception research pillar is a questionnaire which allows the retrieval of information from different partnerships on their risk perception. The aim is to grasp an overview of their cultures of risk. A questionnaire, which addresses an identified criteria list on risk perception, was developed for this study. These criteria have mainly been based on the Integrative Model on Risk Perception (Renn and Rohrmann, 2000). This adaptation has been influenced by the Protection Motivation Theory (Rogers, 1975) and the Cultural Theory (Douglas and Wildavsky, 1982) already described in chapter 3.

To complete the risk perception methodology, the Qualitative Comparative Analysis (Ragin, 1987) serves as a data analysis technique to determine the logical conclusion of the data obtained from the questionnaire.

4.1.1. Questionnaire of risk perception

The questionnaire on risk perception consists of 40 questions, plus one more related to the personal opinion about the quality of the questionnaire. Those 40 questions are divided into four blocks and addressed to MSP partners involved in the risk management process of several case study areas[4].

The first block addresses questions about the organization characteristics. These organizations are part of MSPs within the case studies analysed. Taking into account that this

[4] See more information about case studies in chapter 5.

study on risk perception considers the collective dimension of perception, the respondents, even though they are individuals, were asked to answer from a collective point of view. Such opinion should represent the partnership understanding and the perception of the partnership to each question (with exception of the last question, which looks to seek individual opinion as already stated). The second block addresses questions related to the natural hazard they are facing and its specific characteristics. The third block has questions regarding the management around the hazard. And the fourth block approaches questions related to the management characteristics of the MSP related to the natural hazard described in the second block. First, second and third blocks focus on the single partnerships. The fourth block is on work cooperation within MSPs: if they are part of one in combination with their characteristics.

In the following figure (4.2), the different blocks mentioned before are represented, including the key-words of each question of the questionnaire[5]. This mind map was presented to the stakeholders to give them a vision of the path used to capture the information.

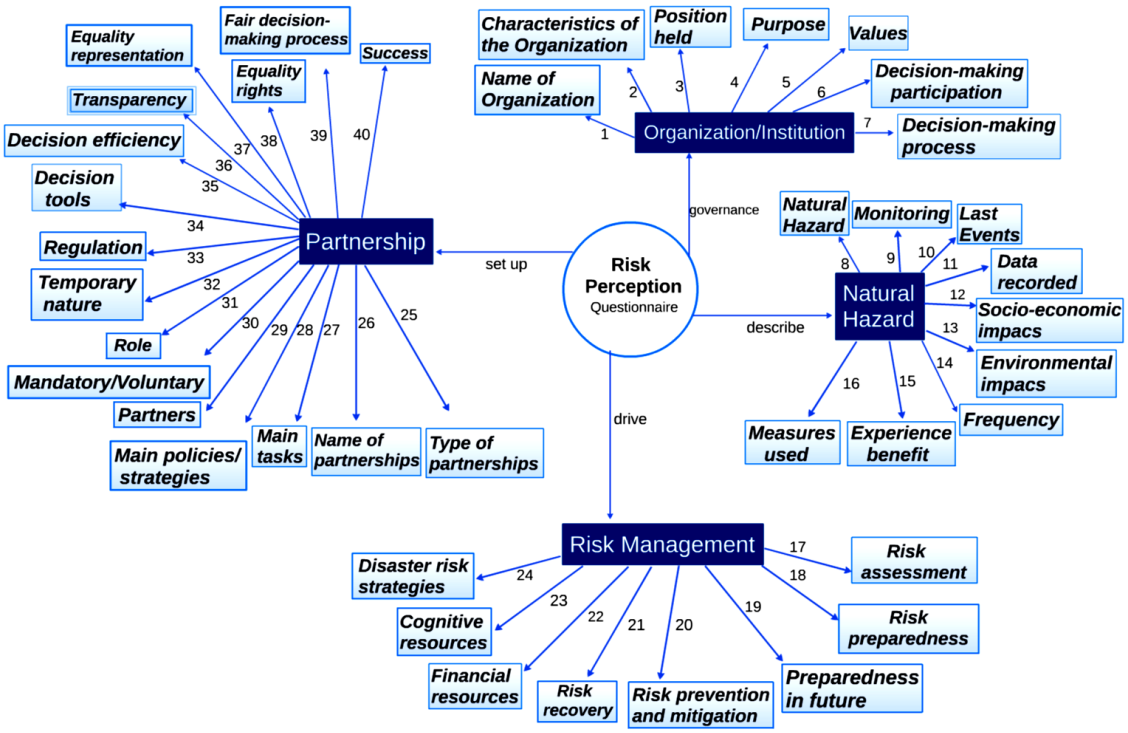


Figure 4.2 *Mind-map Questionnaire on risk perception*

[5] For the questionnaire see Appendix B

The responses of the questionnaire allow the crystallization of the idea as to what a culture of risk is. Cultures should be understood as values, beliefs, knowledge, attitudes and understandings about risk(s) shared by the MSPs, with the common purpose of managing that/those risk(s). Information on the policies in use and characteristics of MSPs are also obtained through the questionnaire. Moreover, the responses allow this study to identify the perceptions of MSPs on impact levels, policy effectiveness and cooperative work.

4.1.2. Analysing risk perception: Qualitative-Comparative Analysis (QCA)

The Qualitative-Comparative Analysis (QCA) is a data analysis technique which enables logical conclusions of data to be reached by applying rules of logic inferences. This technique scientifically studies a small sample of research objects. Contrary to the quantitative methods which need a large amount of data collected, the QCA is ideal to analyse only a few cases (Ragin, 1987). With this kind of sampling, the selected cases do not pursue a statistic sample but provide the maximal information from this reduced number of cases (Flyvbjerg, 2004). Generalization is necessary to select factors through logical rules that favour the authenticity of the considered hypothesis (Merton, 2002).

The QCA was originally developed by Charles Ragin in 1987. This technique was used mainly for political and public policies research, but also in sociology and, in a few cases, in economics. The QCA uses a qualitative method of observation for the understanding of selected cases. This kind of analysis highlights the causality. The cause and context are linked inseparably in such a way that the same cause in a different context can provoke a different kind of consequences.

The QCA demands to:

1) Select case studies. Each case is important because of its singularity. The selection gives emphasis to the knowledge of the cases.
2) Use methods of systematization of the information related to the causes and exploration through Boolean algebra, with the aim to ensure transparency, duplicability and generalization.

The Boolean algebra translates the empiric propositions into logic propositions. This technique of qualitative comparison uses truth tables which are constructed from raw binary data (Ragin, 1987) and allows the comparison of cases.

To analyse the data collected through the questionnaire, the answers given by the respondents were recorded in an excel table. Responses with two possible options (*e.g. policies in use or not in use*) were coded as Boolean variables i.e. policies 'in use' (1) and 'not in use' (0) or answers such as 'yes' (1) and 'no' (0).

To define effectiveness, the respondents were asked to provide a number running from 1 to 5, in which 1 is not effective and 5 is very effective. The results have been expressed in percentages and presented in graphics to clarify these calculations (see sub-chapter 6.2).

Apart from the quantitative results, analytical description has been carried out, including examples given by the respondents to better understand their organization judgment. This part of the description is a qualitative analysis, not a codified one.

It must be mentioned that this study does not look to recognise, nor address differences between countries or natural hazards. The priority has been given to risk management characteristics.

On the one hand, the analysis of the data provides a general description of the cultures of risk in the sample. This description is possible thanks to having analysed the information obtained using the Boolean technique for some data and the qualitative picture for other data. On the other hand, the analysis provides a description of the perceived risk, also made possible by the Boolean technique and the qualitative picture. Both descriptions give a comprehensive outlook of perceptions influencing risk management.

4.2. Governance methods: Capital Approach Framework (CAF)

With regard to the governance research pillar the methodology is based on capitals. In the following the Capital Approach Framework (CAF) will be presented. The CAF encompasses concepts, theories and methods.

The CAF is theoretically based on risk governance, sustainable livelihoods, institutional fit and the Capability Approach. These bases help to assess effective governance through five capitals, i.e. social, human, political, financial and environmental (see figure 4.3).

Figure 4.3 *Capital Approach Framework*

The CAF is the analytical framework used for the second part of this study. It serves as a support for assessing the effectiveness performance of governance regarding natural hazard risk management in MSPs. This assessment will identify effective governance structures, those with the ability to maintain their capability to react to natural hazards through their risk management. The CAF also helps to identify weaknesses that might need to be addressed or improved. Therefore, the assessment should not be a one-off event, it should be repeated periodically to provide continuous feedback on governance performance strengths and weaknesses.

The analysis of the governance performance is carried out by looking in detail at five capitals. They are adapted from the five capitals of Goodwin's work (2003). The original 'natural capital' has been changed to environmental capital in order to focus more on environmental issues. 'Man-made capital' was replaced by political capital due to the key importance of analysing governance processes.

Figure 4.4 shows the structure of the CAF. The first column of the figure represents the five capitals. Each capital has one or more factors related which are represented in the second column. To each of the factors, one or more indicators are allocated (third column). These indicators are related to the factors and allow for evaluation. The fourth and fifth columns describe the units of measurement using the three colours of a traffic light. The last column of the framework structure is designated to observations made by the stakeholders during the implementation of the CAF. These notes refer to the units of measure, their possible

disagreement with these units of measure, and how they would alternatively evaluate the indicator.

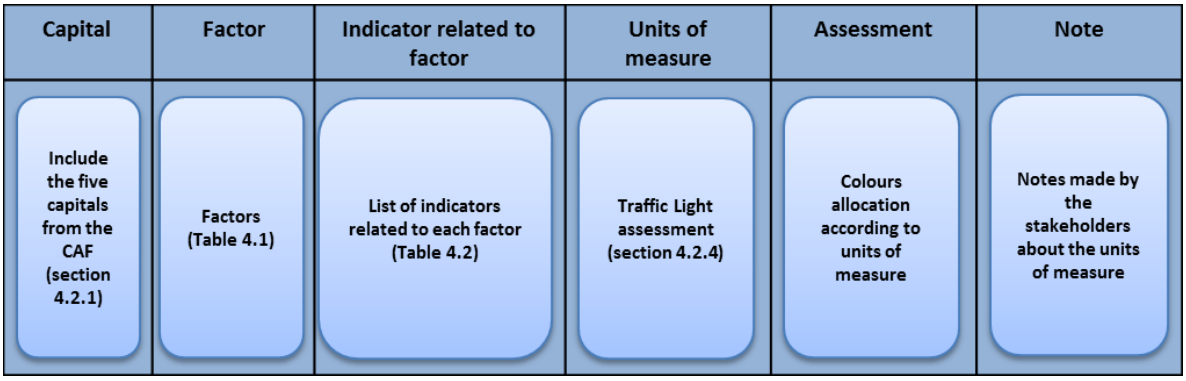


Figure 4.4 *CAF guideline*

All these elements showed in the figure (4.4) are explained in following sections.

This kind of analytical framework offers the potential to distinguish between effective and ineffective governance. Effective governance performance describes the thorough reaction to, and handling of, environmental hazards, resulting in the maintenance, enlargement or improvement of the five capitals. Based on the literature, it is assumed that the balance between capitals allows for better handling of the situation and the provision of effective governance (DFID, 1999).

Through the CAF, it is possible to understand particular aspects of governance performance, such as governance structures, institutional arrangements, public-private capabilities and financial and natural resources. This interpretation allows the understanding of the weaknesses of the analysed governance performance, detecting which specific capital is affected and providing starting points for improvement for decision-makers.

Using the CAF we are able to (a) analyse the capabilities of governance structures to manage risk management, (b) identify the weak points that might need to be solved or improved, and (c) evaluate the performance of partnerships over time after having applied new or modified management measures to these weak points.

4.2.1. The five capitals of the CAF

- The ***social capital*** focuses on relationships, networks and shared norms and values that affect social interactions, the partnerships' productivity and its well-being.

- The ***human capital*** encompasses individual skills and knowledge. It includes social and personal competencies; knowledge gathered from formal or informal learning; and the ability to increase personal well-being and to produce economic value. In the case of partnership, the human capital will be the accumulation of individual skills and knowledge.
- The ***political capital*** focuses on the governmental processes, which are performed by the governance structures of the MSP (representatives of the government, i.e. public administration, in many cases). It also includes laws, rules and norms, such as juristic outcomes from policy work.
- Regarding ***financial capital,*** it involves all types of wealth (funds, substitutions, etc.) that are provided, as well as financial resources that are bounded in economic systems and production infrastructure. Financial capital allows for fast reactions when disasters occur.
- Finally, ***environmental capital*** covers goods and values related to land, environment or natural resources.

The capability approach of Sen (1983) suggests that if partnerships were able to have a range of different resources and access to different capitals, these would provide partnerships with the desirable means to react to environmental hazards. Partnerships with significant capabilities and policies on natural resources and environmental hazards management (environmental capital), on economic resources (financial capital), with strong social networks (social capital) and with members with educational as well as social skills (human capital), might favour the actions carried out by that partnership positively, and will consequently influence their outcomes (Bebbigton, 1999). In this sense, governance processes performed by MSPs are understood as regulatory frameworks for cooperative action (Rhodes, 1997; Fürst, 2003; Máñez Costa et al., 2014).

The maintenance or enhancement of the five capitals will assure the capability of a partnership to react to environmental hazards. In an ideal situation, a sustainable partnership will focus on maintaining and/or enhancing its capitals.

The five capitals are broken down into factors presented in the section bellow. Additionally, a list of indicators attached to the factors has been developed to allow the quantifying and

measuring of the capitals (exemplary for the case study of the Jucar River basin see section 4.2.3; and also Appendix F).

4.2.2. Factors of the CAF

Each of the five capitals has between one and six factors (see table 4.1). These factors act as criteria. Factors are '*intermediate points to which the information provided by the indicators can be integrated and where an interpretable assessment crystallizes*' (CIFOR, 1999, p. 12). The classification of factors into capitals was done though a literature review on studies using capitals.

Table 4.1 *Factors definitions*

(based on Máñez Costa et al., 2014)

Capital	Factor	Factor definition
Social	Equitable treatment of all partners	Open process for all stakeholders throughout the full duration (in design, realization and assessment), including providing opportunity for civil and economic sectors to participate in decision-making processes.
	Communication and information	Open access for all partners/actors within a collaborative process to all information that is used, applied and created within this collaboration.
	Participation	The ability to join a governance process and to act within it. A balanced share of partners from different sectors is the basis of a comprehensive participation process.
	Knowledge	Experiences, including varied cultural and historical contexts.
	Trust (in stakeholders, other partners)	'*Trust helps to sustain a co-operative social climate, to facilitate collective behaviour and to encourage a regard for the public interest*' (European Social Survey, 2005).
	Rules and norms of society	Formal and informal rules and norms in a society depending on the historical and cultural context.
Human	Skills and competencies	Formal educational skills, knowledge and experiences to favour risk awareness and preparedness.
Political	Transparency and trust in political actions	Trust and transparency in interaction processes between civil society/stakeholders and government. Clear and comprehensive communication of aims and interests between the stakeholders enables trustful and democratic cooperation allowing for a successful participation process.
	Regulatory framework: formal rules and norms	Presence of qualitative regulatory framework(s), which attests the government's ability to implement sound policies with respect to permit and promote development especially in the private sector.
Financial	Disaster funds	Existence of disaster funds that provide short-term as well as long-term financial support to affected populations, industries and service providers.
	Risk of impoverishment	Losses and damages resulting from natural risk and hazards, including losses of personal assets and economic losses (industry or tertiary sector).

Capital	Factor	Factor definition
Environmental	Regeneration of environment	Actions taking by the society for environmental regeneration to benefit not only the environment but also the society. Recovery actions of the ecological status before a new natural hazard event happen.
	Management strategies and planning processes	Planning processes to implement protection as well as management strategies from legal framework to action.

With regard to the social capital factors, other studies (Grootaert and Van Bastelaer, 2001; Harper and Kelly, 2003; Dakhli and De Clercq, 2004) recognise *civic and social participation*, *institutional trust* and *social networks* as factors. For this study, the social capital is divided into six factors, i.e. equitable treatment of partners, communication and information, participation, knowledge, trust and communication, and relation to the society. *Civic and social participation* are translated for this study as ***Participation*** and ***Communication to the society*** **factors**. *Institutional trust* is considered for this study only as ***Trust*** to include both shared information and knowledge which reduce the need for monitoring (Dakhli and De Clercq, 2004), and the experience gained from past conflicts and longstanding cooperation. Those experiences enhance the means to face future actions. *Social network* factor is interpreted as the ***Communication and information*** factor. ***Knowledge*** is considered a factor in social capital as providing information on knowledge sharing. Connected to knowledge sharing, '*social capital is relevant while information behaviour patterns are anchored in the individual and organisational structures where people interact*' (Widén, 2011, p. 49). The first factor of this capital could be viewed as part of the ***Participation*** factor, but is presented independently due to the value given to each indicator[6]. It was considered important for this study to give strong emphasis on equality among partners. This takes root in the notion that cooperative work is one of the key characteristic of the MSPs.

Human capital, in this study, includes skills and competences according to the previously presented definition of this capital. Skills are considered here as the ability to do something well and competencies are considered as the capacities needed for performance management.

Political capital has been subdivided into two factors: ***Transparency and trust in political actions*** and ***Regulatory framework: formal rules and norms***. Other studies (Stolle and

[6] For more information about indicator values see table 4.6

Rochon, 1998; Trägardh, 2007) also view political activity factors as the appropriate areas of focus when measuring this capital. That includes the individual capacity to appeal the decision of public authority. Political activity is represented by the civic knowledge (Trägardh, 2007). Trägardh (2007) considers individual political involvement as a factor, which includes political participation, public meetings and collective actions of protest. Stolle and Rochon (1998) consider the *trust in public officials and institutions* as part of social capital. This is included in the CAF as part of the political capital under the factor related to trust.

The factors related to financial capital are focused on financial recovery and not on benefits obtained from production. Financial capital factors are closely related to political decisions, depending on public budget and responses to the use of the financial resources. That is the case of the ***Disaster funds*** factor. Financial capital also addresses problems of poverty and thus one of the two factors shaping the financial capital in this indicator framework is the ***Risk of impoverishment***, although it alone cannot solve all poverty problems (DFID, 1999).

The last capital, the environmental capital, encompasses two factors, one related to the ***Regeneration of the environment*** and other related to the ***Management strategies and planning***. Some indexes measure environmental capital through regeneration and environmental performance (Fawcett, 2011). Other sources focus on protected areas (WDPA, 2015), and consider the linkage between the environmental and financial performance as in the Dow Jones Sustainability Indexes (Hoti et al., 2004) as well as management indicators, which provide complementary information that often explains the environmental performance as quantified by the physical, economic or impact indicator (Olsthoorn et al., 2001).

4.2.3. Indicators of the CAF

The indicators of the CAF encompass three functions:

1) Analysing the capabilities of governance structures to guide risk management,
2) identifying the weak points that might need to be solved or improved, and
3) evaluating the performance of partnerships over time after having implemented new or modified management measures to these weak points.

These indicators simplify the measurement of the different factors. Indicators are understood here as variables of governance structures that facilitated the assessment of a particular factor (CIFOR, 1999). As already noted, every factor is broken down into indicators to help the measurement and assessment of governance performance.

The number of indicators varies depending on the factor. The variability runs from one to seven. The list of indicators has been developed based on different literature references but taking into account the particularities of the Permanent Drought Commission (PDC) of the Jucar River Basin (JRB) and its needs. These particularities come from several sources, such as stakeholder's interviews[7], workshop validations and the information gained from the Jucar River Basin Partnership (JRBP) among others. Although an initial list (first version) was created and implemented, it has facilitated the development process (see sub-chapter 7.2). Table 4.2 presents the second and final list version.

Table 4.2 *CAF indicators list*

Factor	No.	Indicator related to the factor	Units of measure
Social capital			
Equitable treatment of all partners	1	All members are equal in decision-making processes.	Y/N
Communication and information	2	Existence of a transparent and well established communication process (*e.g. periodic reports, meetings, etc.*) that guarantees the flow of information.	Y/N
	3	Existence of platforms, committees and networks where all representatives can join the process of information exchange.	Y/N
Participation	4	Cooperation of partners from different sectors such as public, private and civil, as well as agricultural, energy, tourism, etc.	Y/N
	5	Amount of periodic formal meetings held between members of the Commission.	1 to 4 yearly 5 to 9 yearly +10 yearly
	6	Implementation of monitoring processes (*e.g. internal or external audits*)	Y/N
Knowledge	7	Percentage of individual members of the Commission or institutions represented in the Commission trained in droughts and prevention management.	68 to 100% 33 to 67% 0% to 32%
	8	Existence of registration of past drought events in the basin. Access to these registrations for all members.	Y/N
Trust (other members)	9	Evidence whether knowledge gained from historical events in the basin has influence over the increase in trust to lead new drought events.	Y/N
	10	Existence of longstanding cooperation between the same members which encourages trust (teamwork during years).	Years 1-4 5-9 +10

[7]Interviews with the stakeholders of the Jucar River Basin, which the main objective was to understand perceptions concerning the resilience to droughts. The interviews also obtained interesting information about management strategies and historical conflicts caused by water rights. Moreover, they also revealed the governance strategies and processes used in the basin.

Factor	No.	Indicator related to the factor	Units of measure
	11	Experiences of conflict and problem resolution.	Y/N
Communication and relation to the society	12	Existence of informal boards/groups resulting from cultural-historic development.	Y/N
	13	Existence of educational programmes in relation to the droughts promoted by the Commission and/or awareness campaigns addressed to civil society.	Y/N
	14	Access by civil society to the last drought events registered in the basin.	Y/N
	15	Information material on drought management. Presented through different information channels and available in different languages where appropriate.	Y/N
	16	Launching of donation initiatives promoted by the Commission to aid in covering losses caused by natural disasters.	Y/N
	17	Mobilization of volunteers in the face of risk.	Y/N
Human capital			
Skills and competencies	18	Level of education (average academic degree of Commission members)	High[8] Medium Low
	19	Innovation capacity of the Commission members. Enterprising spirit.	Y/N
	20	Valuation of the social skills of the members (*e.g. assertiveness, active participation and listening, decision making, conflict resolutions, etc*.).	High Medium Low
	21	Percentage of membership with training on drought management.	68 to 100% 33 to 67% 0% to 32%
	22	Level of member's experience in drought management.	High Medium Low
Political capital			
Transparency and trust in political actions	23	Information updating regarding the submission of new laws or decrees related to droughts.	Y/N
	24	Equal vote of all Commission members in processes of formal voting.	Y/N
	25	Equal participation (the right to have voice) of all Commission members in decision making.	Y/N
	26	Percentage of members taking part in internal elections of the Commission (voting participation).	68 to 100% 33 to 67% 0% to 32%
	27	Existence of statistical surveys published reflecting the opinions of the actors (Commission members and external representatives of drought management partnerships) in regards to the governance of the Commission.	Y/N
	28	Existence of comprehensive anti-corruption policy.	Y/N
	29	Existence of laws/declarations, etc. in order to provide legal basis that promote the freedom of media.	Y/N
Regulatory framework: formal rules and norms	30	Periodic revision and updates of laws and regulations concerning the protection against droughts and the management of drought disasters.	Y/N
	31	Existence of emergency plans.	Y/N
	32	Existence of obligation to obtain insurance for protection in the face of disasters.	Y/N
	33	Existence and open access (whole public) to risk maps (promoted or not by the Commission).	Y/N

[8] High: University degree. Medium: Technical education. Low: General Certificate of Secondary Education.

Factor	No.	Indicator related to the factor	Units of measure
Financial capital			
Disaster funds	34	Percentage of the drought expenses covered by the government	68 to 100% 33 to 67% 0% to 32%
	35	Proportion of public and private investments on drought funding.	68 to 100% 33 to 67% 0% to 32%
Risk of impoverishment	36	Existence of rights of compensation (offered by the government) to affected population.	Y/N
	37	Percentage of losses covered by these compensations if they exist.	68 to 100% 33 to 67% 0% to 32%
	38	Percentage of households/institutions that have insurance related to the specific threat in basin (*e.g. droughts, floods, etc*.).	68 to 100% 33 to 67% 0% to 32%
	39	Percentage of damages that were covered by insurances during the last drought event.	68 to 100% 33 to 67% 0% to 32%
Environmental capital			
Regeneration of environment	40	Percentage of ecologic compensation per total area.	68 to 100% 33 to 67% 0% to 32%
	41	Percentage of actions taken by the Commission for environmental regeneration after a disaster.	68 to 100% 33 to 67% 0% to 32%
Management strategies and planning processes	42	Existence of climate change studies for preparedness for potential increment of drought events.	Y/N
	43	Binding deadlines/schedules for implementation of drought management processes.	Y/N
	44	Existence of big infrastructures that affect the environment (*e.g. diversion of water*)	Y/N[9]
	45	Percentage of different land use types within the basin (in order to implement targeted strategies/actions to minimize droughts).	68 to 100% 33 to 67% 0% to 32%
	46	Percentage of protected area within the total basin area	ha[10] 27% to 100% 14 to 26% 0% to 13%

As mentioned previously, decisions about which indicators are used to assess governance were reached through the analysis of historical data and characteristics drawn out from the in-depth case study, literature review and stakeholder's interviews.

Social capital encompasses the shared norms, values and knowledge in which communication and participation serves to distribute and share the norms, values and knowledge. This capital has six factors and seventeen indicators. The indicators were decided with the aim of uncovering responses that allow the evaluation of these factors. Part of the social capital is social networking, which includes collective actions. These actions

[9] Attention: Here YES answer is considered red and NO answer is considered green. (Generally, this kind of constructions causes a big environmental impact in land and fauna).
[10] Number of hectare (expressed in %) destined to protected area within the total area in risk

were included in the list (*e.g. indicator 4,* '*Cooperation of partners from different sector such as public, private and civil as well as agricultural, energy, tourism, etc.').* Cooperation in work groups includes coordination, helping, communication and division of labour (Argyle, 1991).

Human capital represents the skills, knowledge and expertise that people have and is linked to innovation (Dakhli and De Clercq, 2004). Within the competences are indicators concerning to the expertise that people hold, innovation capacity, knowledge and the degree of preparation to face the risk, measured by the level of education of the individuals that shape the group.

The aspects considered by Trägardh (2007) within the individual political involvement criteria include political participation, public meetings and collective actions of protest. These aspects can be reflected in the indicator 26 '*Percentage of members taking part in internal elections of the Commission (voting participation)*' which also denotes participation and indicates political efficacy (Trägardh, 2007; Stolle and Rochon, 1998), citizen's norms and political interest and engagement.

Indicators of financial capital try to provide information about measures and budgets to face financial issues caused by natural risks.

In the European Green Table (1997), indicators of environmental investments or degree of compliance with regulation were highlighted. Those indicators can be compared to the environmental CAF indicators 43, 44 and 45, *Binding schedules for implementation of drought management processes*, *Existence of big infrastructures that affect the environment (e.g. diversion of water)* and *Percentage of protected area within the total basin area.*

4.2.4. Assessment guideline of the CAF indicators: Traffic Light Assessment

A unit of measure is assigned to each indicator for its assessment using the CAF. The criteria to assign units were based on the characteristics of the in-depth case study, as well as general characteristics of the other MSPs (see chapter 5), and on a literature review.

The units of measure respond to three kinds of units: binary, ordinal and cardinal. The binary units of measure are expressed by '*yes* or *no*'. The ordinal units of measure are represented by grading (*e.g. high, medium, low*) and percentages. The cardinal units of measure are represented by natural numbers.

The binary unit of measurement is used for indicators so that the response is clear, indicated by marking one of two responses. The major number of indicators is measured in this way, affirming or denying the indicator.

With regard to indicators measured by ordinal units, the assignation of them was thought to catalogue the responses into three levels or grades, corresponding to the three colours of the traffic light (see point below). These three grades represent three statuses clearly differentiated to catalogue the responses.

The indicators measured with cardinal units expressed by natural numbers, i.e. indicators 5 and 10, are based on the following reasoning (see table 4.3).

Table 4.3 *Reason of assignation of cardinal units (natural numbers)*

No.	Indicator	Unit of measurement	Reason of assignation of units
5	Number of periodic formal meetings held between members of the Commission	1 to 4 yearly 5 to 9 yearly +10 yearly	Many institutions in the world hold at least one meeting every month. With this in mind, the range of meetings per year considered for evaluating this indicator runs from 1 (annual meeting only) to more than 10 (one per month avoiding summer months).
10	Existence of longstanding cooperation between the same members which encourage trust (longstanding teamwork)	Years 1-4 5-9 +10	During the case studies, it was observed that an institution that has developed longstanding work cooperation might be more confident to face risk events than a young institution. Most of these MSPs have a life of more than 10 years. A study has demonstrated that old people encourage more trust than young people (Poulin and Haase, 2015). Transferring this demonstration to institutional cooperation allows affirmation that the same members in an institution grow trust over a certain number of years.

Decisions on percentages assigned were made following two conditions: (1) expressing the exact division of 100% in three equal parts (*e.g. indicator 7)*, in order to use the three colours of the traffic light; and (2) an indicator whose unit of measure has not been done by the division of 100% in three parts for special conditions (see table 4.4).

Table 4.4 *Reason of assignation of cardinal units (percentages)*

No.	Indicator	Unit of measurement	Reason of assignation of units
46	Percentage of protected area within the total basin area.	ha 27% to 100% 14 to 26% 0% to 13%	In year 2013 the amount of protected area in Spain represented 27,9% of the total land area(MAGRAMA, 2014). This percentage has been taken as a minimum hectares percentage shaping protected area. 27% has been divided equally into the three colours.

Traffic Light Assessment development

A colour is assigned to each unit of measure (see example in table 4.5). Those colours are the colours of traffic lights (green, yellow and red). For this reason, the assessment guideline of the CAF has been called Traffic Light Assessment. In the case of binary responses, only red and green are used.

Table 4.5 *Exemplary of indicators responses types*[11]

	Type of response			
	Binary	**Cardinal**		**Ordinal**
Colours classification	Yes	+10 yearly	68% to 100%	High
		5 to 9 yearly	33% to 67%	Medium
	No	1 to 4 yearly	0% to 32%	Low

To facilitate the posterior analysis, and to make the results accessible and easy to understand for the stakeholders, each response was assigned a traffic light colour. The colour assignation was done under the consideration that affirmative responses and higher percentages, grades and amounts, i.e. natural numbers, have the highest considered value (green colour) and consequently the negative responses are catalogued as red. In the case of three possible responses (*e.g. cardinal units of measure*), medium percentages, grades and amounts were considered as yellow (*e.g. in the indicator 5 the range comprising of between 5 and 9 meetings per year is catalogued as yellow, while the range between 1 and 4 meeting yearly is evaluated as red and over 10 meeting per year is considered green*).

Assigning a colour to each response simplifies the analysis and assessment. Nevertheless, a kind of quantitative analysis was required to facilitate the presentation of results. This quantitative assessment was characterized by assigning a quantitative value to each colour through specific calculations (see table 4.6).

[11] Indicator number 44 presents an exception in this measurement. The type of responses is as follows: Yes-Red and No-Green.

Table 4.6 *Calculations of indicators guideline*

Factors related to capitals	Value	Number of Indicators	Indicator value		
			Green (Fv/Ni)	Yellow (G*0,5)	Red (G*0)
SOCIAL CAPITAL	20,00	17			
Equitable treatment partners	3,33	1	3,33	1,66	0,00
Communication and information	3,33	2	1,66	0,83	0,00
Participation	3,33	3	1,11	0,55	0,00
Knowledge	3,33	2	1,66	0,83	0,00
Trust	3,33	3	1,11	0,55	0,00
Communication to the society	3,33	6	0,55	0,27	0,00
HUMAN CAPITAL	20,00	5			
Skills and competencies	20,00	5	4,00	2,00	0,00
POLITICAL CAPITAL	20,00	11			
Transparency and trust	10,00	7	1,43	0,71	0,00
Regulatory framework	10,00	4	2,50	1,25	0,00
FINANCIAL CAPITAL	20,00	6			
Disaster funds	10,00	2	5,00	2,50	0,00
Risk of impoverishment	10,00	4	2,50	1,25	0,00
ENVIRONMENTAL CAPITAL	20,00	7			
Regeneration of environment	10,00	2	5,00	2,50	0,00
Management strategies and planning process	10,00	5	2,00	1,00	0,00

Legend:
Fv: Factor Value **Ni**: Number of indicators **G**: Green

Each indicator has a value with regard to the five capitals and the factors related to each capital. From 100% each capital gets a proportional part (20%). Within each capital several factors are included, but not all the capitals have the same number of factors. This is why each factor has a different value. The sum of all the factor values within one capital must be 20 (*e.g. the social capital has 6 factors then 3,33 will be the value of each of them since the sum of all six is 20)*. Following this line, the indicators within a factor will also have values which all them sum up the factor value (*e.g. in the case of indicators within the factor of 'participation' in the Social Capital, 1,11 is the value of each of the three indicators, the sum of all three is 3,33, the value of that factor*).

But depending on the colour, the value will vary. The calculations explained above refer to the green colour, which indicates effective governance. For yellow and red colours, additional calculations are made. Taking as a basis the value of the green indicator, following certain rules it is possible to calculate the other two colours. To calculate yellow assessed

indicators, the rule responds by multiplying the green value of each yellow indicator 0,5 times. The colour red will always remain zero (green multiplied zero times), (*e.g. Management strategies and planning processes factor (the last one of the list) related to Environmental capital which has a factor value of 10 and an indicator value of 2 (as green) will be calculated as 6 taking into account that factor has 2 indicators in green (2x2=4), 2 in yellow (2x1=2) and 1 in red (1x0=0)).* Table 4.6 shows the value each indicator has within its belonging factor, which depends on the colour assigned during the assessment.

With the calculations done, the numbers of table 4.6 should be converted into percentages to help to further understand the analysis and allow for the identification of the degree of effectiveness (see table 4.7). The use of percentages provides an increase in the capacity for qualitative analysis and also allows for the creation of visual representations of the effectiveness.

Table 4.7 *Formula for calculations*

	Formula
Factor	$F=V_I*100/V_F$
Capital	$C=SumV_F*100/V_c$

Legend
F= percentage of effective governance related to the factor.
V_I= value of the indicators within the factor after the Traffic Light Assessment.
V_F= value of the specific factor.
C = percentage of effective governance related to the capital.
$SumV_F$= Sum of the all factor values obtained after the Traffic Light Assessment.
V_c= value of the capital (always 20).

The degree of effectiveness is given by the Traffic Light Assessment and interpreted following table 4.8:

1) Colour green represents '*Effective governance'*: The capital is healthy enough.

2) Colour yellow represents '*Moderately effective governance'*: The capital needs to be improved in some aspects (factor assessments help to see where the improvements are needed).

3) Colour red represents '*Ineffective governance'*: The capital has many aspects that need to be improved (factors assessment and even indicators assessment help to detect which aspects need to be improved).

Table 4.8 *Degree of effectiveness*

	Percentage of effective governance related to the capital
Ineffective governance	**0% to 32%**
Moderately effective governance	**33% to 67%**
Effective governance	**68% to 100%**

This classification has been validated by the stakeholders of the in-depth case study (Jucar River Basin).

4.3. Research approach

In previous chapters, figures served to frame the content of those chapters and also to help provide an overview of the insights gained from the literature related to this study (see figures 2.1; 3.1; 3.4; 4.1). All these four figures are related to the following one (4.5), which encompasses theories, concepts, frameworks and methods already presented.

The ensemble of the three bigger circles shapes the theoretical basis of the research approach and allows the development of the methods circle (the smaller one). This fourth circle is developed according to the following general objective: (a.) To determine risk perception as a driver of risk management in Multi-Sector Partnerships dealing with natural hazards, and (b.) to analyse whether their governance performance is effective, using the MSP 'Permanent Drought Commission' of the Jucar River Basin as an in-depth case study.

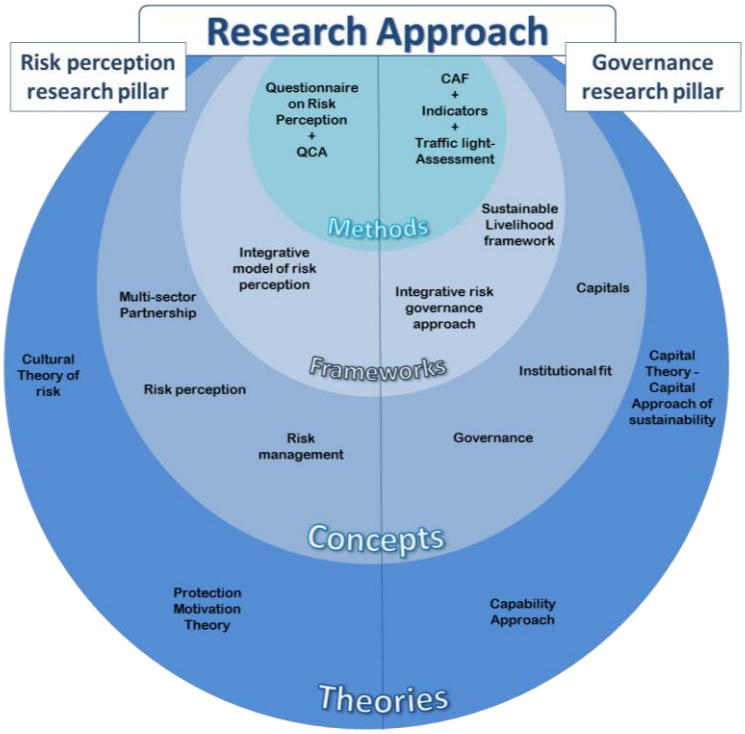


Figure 4.5 *Research approach*

'Risk perception and governance performance in Multi-Sector Partnerships'

A line divides the whole research approach into two parts: The risk perception side on the left and the governance side on the right. The circles represent the theories[12], the concepts[13], the theoretical frameworks[14] and the methods[15] used for the development of this study.

The specific objective 1 - ***to identify criteria for determining risk perception***- and the specific objective 2 - ***to describe cultures of risk shaped by the influence of risk perception in risk management strategies and decision-making processes***- facilitating the achievement of the first general objective (see *(a.)* above). They belong to the risk perception research pillar (see left side of figure 4.5). Firstly, a list of criteria was identified which helped for the creation of a questionnaire on risk perception. This questionnaire provided a characterization of risk cultures in several case studies in Europe as well as in the in-depth case study of this study (steps 1 and 2 of figure 4.6). The in-depth case study worked as a driver for this research in sub-sequent objectives.

The specific objective 3 -***To develop a tool to assess governance performance***- and the specific objective 4 -***To assess effectiveness in governance performance in a case study***-

[12] For theories used in this study see sub-chapters 2.1 and 2.2
[13] For the most important theoretical concepts included in this study see sub-chapter 3.1
[14] For the theoretical-analytical frameworks integrated in this study see sub-chapter 3.2
[15] Within this circle are included the method to collect the data and the method to analyse these data. Also as part of the methods can be found the CAF, which is not a method per se but is a framework, in which the method is integrated (see sub-chapter 3.3). This framework is part of the methodology due to the fact that was developed for this study and does not belong to the theoretical-analytical frameworks.

help to reach the second part of the main objective (see *(b.)* above). They are focused on the governance research pillar (see right side of figure 4.5). This research pillar looks for, on the one hand, the development of a framework to assess governance performance using five capitals to appraise the MSPs in detail. On the other hand, it looks for the application of such an approach to assess a particular MSP (The Permanent Drought Commission of the Jucar River basin in Spain) through an indicators framework. This also aims to validate the framework (see steps 3 and 4 of the figure 4.6).

To develop the empirical research, several case studies in Europe[16], which include MSPs dealing with natural hazards, help the risk perception research pillar. The in-depth case study supports the research on governance performance[17]. The in-depth case study is also one of the cases of the risk perception research pillar, which helped make the possible linkage between risk perception and risk management and consequently the governance performance assessment.

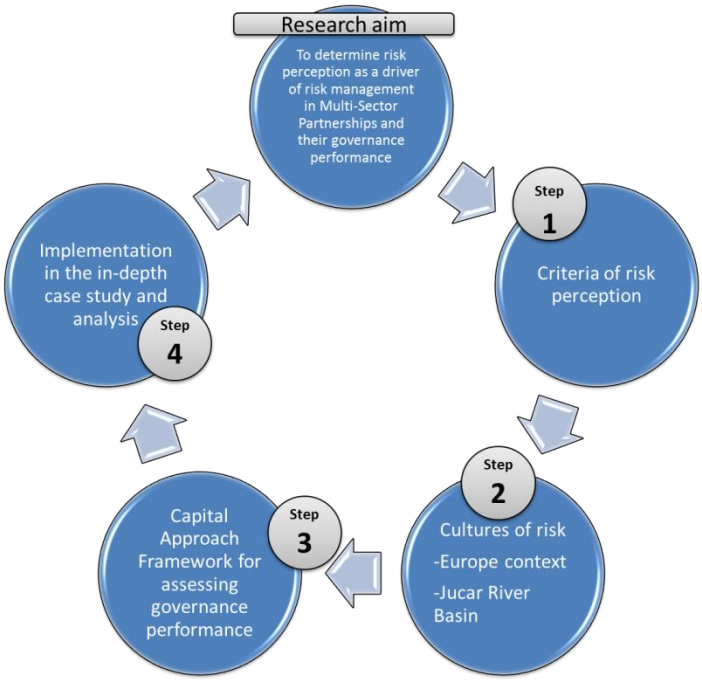


Figure 4.6 *Research development process*

The steps presented in figure 4.6, which help to achieve each of the general and specific objectives of this study, will be briefly described below. First and second steps respond to first and second specific objectives of this study and their empirical findings are presented in

[16] For information about case studies in Europe see sub-chapter 5.1
[17] See information about the in-depth case study in sub-chapter 5.2

chapter 6. Third and fourth steps respond to specific objectives third and fourth. The empirical findings of these last steps are presented in chapter 7.

Objective 1: To identify criteria for determining risk perception (step 1)

The first step in describing risk cultures was to identify criteria about perception of risk (step 1 in figure 4.5). For this reason, this work was based on the Protection Motivation Theory (Rogers, 1975) and the Cultural Theory of Risk (Douglas and Wildavsky, 1982) as well as on the Integrative Model of Risk Perception (Renn and Rohrmann, 2000) already presented in section 3.2.1. The factors, levels and collective dimension of the adapted Integrative Model on Risk Perception, were specifically used for the development of the criteria[18]. Concepts of risk perception and risk management are also important for this development.

Objective 2: To describe cultures of risk shaped by the influence of risk perception in risk management strategies and decision-making processes (step 2)

To continue with the research, the influence of perception in the development of management strategies and decision-making processes was analysed. This was done in the context of MSPs dealing with natural hazards. To describe the culture of risk of these MSPs, a questionnaire was carried out (see section 4.1.1). The creation of such a questionnaire focused on risk perception and was based on the previously defined criteria (step 1). It was useful to see the management strategies implemented in accordance with the perceptions of the MSPs which are in charge of that risk management. Moreover, the cultures of risk include the decision-making processes and the functioning of governance structures.

Part of this objective was also to identify the perception concerning the effectiveness of management strategies. This helped to predict the policies most likely to be used in the near future, determining thus the new culture of risk. Culture is shown to not be static.

The questionnaire,[19] answered by several cases in Europe, was the first to be analysed. The questionnaires were answered from the point of view of MSP representatives. Later, a short version of the questionnaire, which included responses by different partnerships that shape the MSP managing drought in the JRB, was analysed. The aim of this was to focus the research on a particular case and from there, start the second part of the research, i.e. the

[18] For the adapted Integrative Model on Risk Perception see figure 3.5. For criteria list see sub-chapter 6.1
[19] Questionnaire analysis in place in chapter 6

governance research pillar. The JRB case study is part of the ENHANCE project which this research is part of. Also, the long term management of the water resource in the basin is interesting with the view of it providing a good example for assessing the governance of this management.

Objective 3: To develop a tool to assess governance performance (step 3)

To proceed with the consecution of the third objective, an innovative analytical framework was developed, i.e. the CAF. It has been based on the Capital Approach Theory[20] (Smith, 1776; Bebbington, 1999; Goodwin, 2003) and in the Capability Approach[21] (Sen, 1983) as well as the Sustainable Livelihood Framework[22] (Scoones, 1998; DFID, 1999). The CAF helps the assessment of governance through five capitals. These capitals help to gain a closer understanding of all the aspects involved in MSP's governance processes. A list of factors related to these capitals help to identify indicators to implement the framework. The indicators collect insights to determine the effectiveness of the governance performance in such MSPs. To evaluate the indicators a guideline is provided.

The process to develop the tool entails a process of improvements, which provides the existence of two versions. The second and last one represents the final findings of this study.

Objective 4: To assess effectiveness in governance performance in a case study (step 4)

In order to validate the CAF and to use the framework for obtaining data on governance performance effectiveness, the indicators framework (step 3) has been implemented in the in-depth case study through a workshop with stakeholders as well as personal interviews with experts.

The responses (*or assessment of indicators*), have been evaluated following the assessment guidelines, presented in section 4.2.4, to offer a complete analysis of MSP effectiveness, highlighting the strengths and showing the weaknesses, in order to facilitate improvement.

[20] For more information see section 2.2.1
[21] For more information see section 2.2.3
[22] For more information see sub-section 3.2.2.2

CHAPTER 5

Case study approach

The use of case studies allows for the development of practical theoretical approaches within science. Through their implementation are also gained insights that allow reviewing these approaches and improve them. In order to implement the research approach (see sub-chapter 4.3), several case studies have been used. The research starts with the analysis of risk perception providing a general overview of risks and the linkage to risk management in Multi-Sector Partnerships (MSPs). This last step assesses the governance performance in a specific MSP. In this line, the research covers from a wide-ranging overview on risk perceptions to a particular view on management and its governance performance (see figure 5.1).

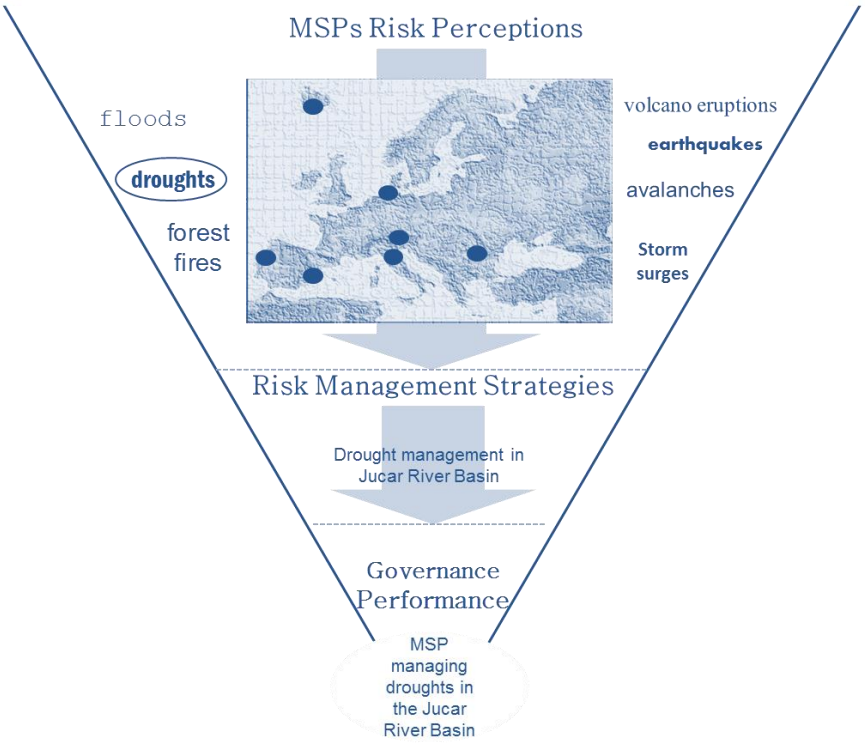


Figure 5.1 *Funnel research: from general to particular*

The case studies descriptions are divided into two sub-chapters. The first sub-chapter (5.1) encompasses several case studies located within Europe. These case studies help the analysis of the risk perception research. The case study of the Jucar River Basin (JRB) is not presented in this sub-chapter. But this particular case study, which is used for analysis of the risk perception research pillar and the governance research pillar, sits centrally within the study. For that reason, the second sub-chapter (5.2) is dedicated to present in depth the JRB case study.

5.1. Case studies: MSPs dealing with natural hazards in an European context

Seven case studies were used to analyse risk perception. These case studies identify at least one MSP dealing with specific natural hazards. These MSPs are in general the ones implementing specific risk management strategies in the case study area. The compiled data helps to analyse the collective perception of risk (see also section 3.1.2) and the implemented management measures. These case studies are located in different European countries (see table 5.1). All the presented case studies are part of the European project ENHANCE[23].

Table 5.1 *List of case studies*

Country/countries	Area/Region	Natural Hazard/s	MSP/s
Austria	Austrian Alps	Floods - Avalanches - Landslides	ÖBB Infrastructure (Department of Natural Hazards Management)
Portugal	Santarém district	Forest Fire	Inter-municipal Commission[24]
The Netherlands, Germany, Denmark	Nord Sea Cost	Storm Surges	Wadden Sea Forum
Romania	Romania	Floods - Earthquakes	Risk financial mechanisms[25]
Italy	Po River Basin	Droughts - Floods	Drought Steering Committee Transient flood storage
Iceland	Iceland and airspace in Europe[26]	Volcano Eruptions	European resilience towards volcanic eruptions[27]
Spain	Jucar River Basin	Droughts	Jucar River Basin Partnership and Permanent Drought Commission

[23] 7th Framework Programme ENHANCE - Enhancing Risk Management Partnerships for Catastrophic Natural Disasters in Europe -. Grant Agreement number 308438.
[24] Formal commission that includes all the stakeholders have responsibilities to the forest fire defence (no specific name for the MSP).
[25] MSP identified for this case study is represented by the risk financial mechanisms with the aim to redistribute financial risk (no specific name for the MSP).
[26] The European airspace related air industry.
[27] It involves volcano monitoring and forecasting stakeholders and air industry stakeholders related to volcano eruption with the aim to detect weaknesses in decision-making to reduce the economic losses in future events (no specific name for the MSP).

The reason to use this broad variety of cases with such differing scopes in this study, resides in the opportunity made available to describe the link between perception and management independently of the location and the risks. The traditional culture belonging to these areas as well as the geographical characteristics should not act as a reason for this linkage.

5.1.1. Floods, avalanches and landslides in Austrian Alps (Austria)

The Alps represent a key place in Europe for transportation. Important transit routes from North to South Europe cross the Alps mountain range (Rachoy et al., 2010). Austria is situated in the centre of the Alps (see figure 5.2). In its Alpine region, which covers around 70% of the country (Worldatlas, 2015), extreme weather events such as avalanches (snow and rocks), inundations, debris flows or landslides represent threats which affect railway transport system (Rachoy et al., 2010). About 7,500 trains per day cover the 11,000 km of tracks which connect regions and cities (Rachoy and Scheikl, 2006).

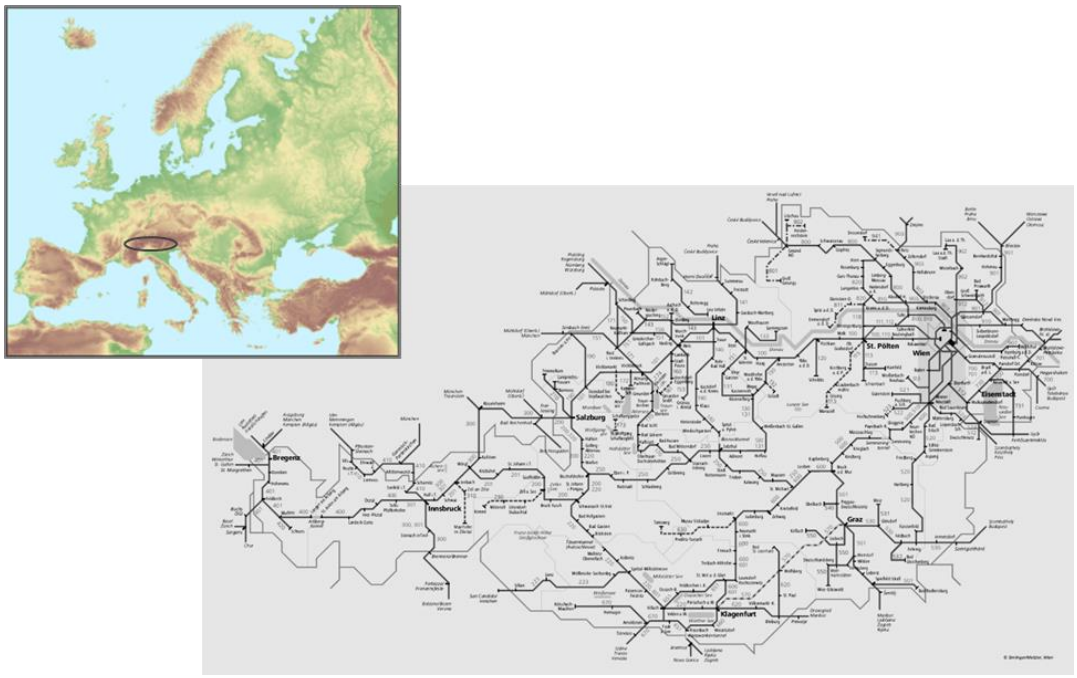


Figure 5.2 *Austrian railway network infrastructure*

-ÖBB map-

(based on Simlinger and Metzler, 2010; and EEA, 2009)

The consequences of the hazards are mainly incremented by the conditions and places in which the railway system has been built. The railroad is frequently placed on the bank of the rivers or situated on sloping hillsides (Thieken et al., 2013). The Austrian Federal Railway (German name: ÖBB – Österreichische Bundesbahnen) assumes responsibility for the costs

of the consequences resulting from the natural hazards. The main consequences are the interruption of the railway network and the reconstruction of the lines affected (Thieken et al., 2013).

The MSP identified in this case study is the Department of Natural Hazards Management within the ÖBB. This entity has specifically handled natural hazards since 2005, in order to protect people, goods and rail infrastructure. The MSP cooperates on three levels of decision-making, i.e. strategic discussion and decisions in legislation (national scope); risk reduction measures (regional and communities scope); and event response (local, regional and communities scope). The different landscapes and natural hazards affecting the region offer a wide basis for risk assessment to plan risk reduction measures within the Alpine railway infrastructure (Thieken et al., 2013).

5.1.2. Forest fire in Santarém district (Portugal)

This case study focuses on forest fires, which Portugal is prone to (Castro et al., 2015). In 2003, the country underwent the most catastrophic fire event ever recorded (Schmuck et al., 2004). The area, which this case study analyses, comprises the district of Santarém in the Centro Region of the country, a central region in Portugal (see figure 5.3), where during the 2003 event 87,000 ha were burned (Colaço et al., 2013).

The district of Santarém is shaped by very different municipalities. In the West municipalities urban areas are more prominent, and it has greater population than the East municipalities, in which the urban areas are smaller and also encompasses an older population (Colaço et al., 2013).

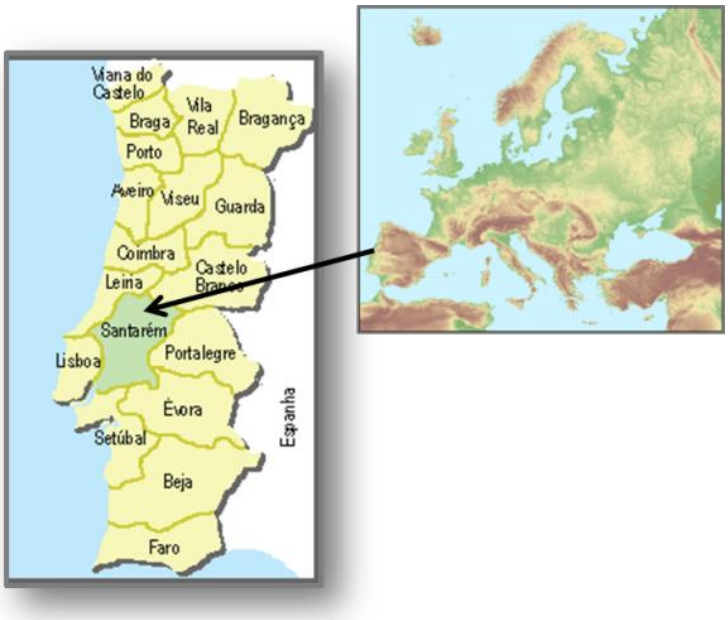


Figure 5.3 *Santarém district map (Portugal)*
(based on EEA, 2009; and Visitar Portugal, 2016)

Forest fires have a negative impact on the economy in the region due to the importance of forest and agriculture sectors in the district. The municipalities of Chamusca and Mação are the most affected by this natural hazard. These two municipalities represent 64,000 ha of burned area in 2003 (Colaço et al., 2013).

Protection against wildfire is carried out at a local level. The municipalities, specifically their Forest Cabinets, represent the most relevant stakeholders with regard to the hazard. However, a formal commission that includes all the stakeholders have responsibilities to minimize negative impacts of the forest fire. This commission that can be municipal or inter-municipal encompasses municipalities, municipal cabinets of Forestry and Civil Protection, National Republican Guard, Landowners Associations, District Civil Protection and firefighters. The commission has to manage all the resources and entities that intervene in the forest fire defence actions. This commission also approves the Municipal Plan for Forest Fire Defence. They decide equally every year, i.e. equal voting rights, which risk reduction measures to implement.

5.1.3. Storm surges in Nord Sea Cost (The Netherlands, Germany and Denmark)

The region of the Wadden Sea comprises the North Sea Coast of the Netherlands, Germany and Denmark (see figure 5.4). This area comprises 22,000 km² of land and is mainly rural and

principally characterized by agriculture, human settlements, energy production, and ecosystems services.

Figure 5.4 *Wadden Sea Region map*

(based on EEA, 2009; and Wadden Sea World Heritage, 2016)

The coast of the Wadden Sea is under or only lightly above the sea level and needs to be protected from the storm surges effects (Weisse and Plüß, 2006), heavy rain and storm events as well as sea level rise. Around 73% of the German Nord Sea Coast is protected by dikes (Ministerium für ländliche Räume, Landesplanung, Landwirtschaft und Tourismus des Landes Schleswig-Holstein, 2001).

Meteorological circumstances (rainfall and storms) and the morphology of the area (shallow water areas along the coast) determine the occurrence of storm surges. This natural hazard causes high water levels along the coast. This demands different protection measures (Gerkensmeier et al., 2013).

The three countries of the Wadden Sea Region have cooperated successfully since 1978 (Wadden Sea Forum, 2005). The Trilateral Wadden Sea Cooperation pursues to protect, manage and conserve the common ecosystem (Wadden Sea Secretariat, 2010). This cooperation encompasses collaborations between national and regional authorities as well as scientific institutions. In 2005, the Trilateral Wadden Sea Cooperation established a cooperative forum to include governmental and non-governmental stakeholders; those '*who live, work and recreate in the area and are willing to endow its protection*' (TWSGC, 2010, p.2). The aim of this forum, the Wadden Sea Forum, is to foster '*sustainable development*

scenarios and strategies for their implementation, respecting the existing protection levels and ensuring economic development and quality of life' in the Wadden Sea area (Wadden Sea Forum, 2005, p.8). The coastal protection represents the priority over other concerns along the coast.

The Wadden Sea Forum, as MSP, is set up by representatives from different sectors of production (*e.g. agriculture, energy, fisheries, industry, tourism*) and nature protection, as well as from local and regional governments. Thus, this MSP represents a voluntary cooperation between public authorities, private enterprises, science and civil society.

5.1.4. Floods and earthquakes (Romania)

Romania, located in Eastern Europe, represents a prone area to flooding and earthquakes[28] (see figure 5.5), which presents disastrous consequences affecting the population, as well as have economic effects on the government and private households.

On the one hand, floods, the major threat in the country (almost 6% of the territory is exposed to floods), have caused EUR 6 billion in damages over the period of 2000 and 2010 (Lorant et al., 2013). On the other hand, earthquakes, which have a risk management index for humanitarian crises and disasters of 8,2 (INFORM, 2016), have shaken Romania several times during the last 68 years (Vrancea region 1940, 1977, 1986, 1990) (Vlad and Vlad, 2008).

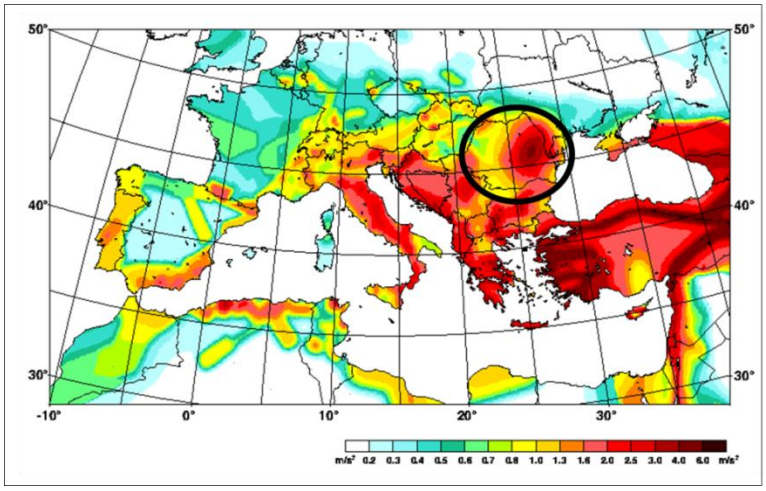


Figure 5.5 *Seismic hazard map*
Representing stiff site conditions for an exceedance or occurrence rate of 10% within 50 years (GSHAP, 1999)

[28] In the map it can be seen the colour red in Romania which reflect higher rates of earthquake occurrence.

This case study pursues to transform the currently reactive financing mechanisms of the Romanian risk management to more pro-active financing mechanisms through loss prevention and compensation. Therefore, the MSP identified for this case study is represented by the risk financial mechanisms with the aim to redistribute financial responsibility of risk. It has partners from different levels and includes public interventions, insurance companies (new mandatory insurance system) and the European Solidarity Fund (EUSF). The EUSF is the major instrument at the European level that provides compensation to uninsurable losses by providing financial aid. In case of disasters, the Romanian government also helps to finance different actions (*e.g. support for the victims*) (Lorant et al., 2013).

5.1.5. Droughts and floods in the Po River Basin (Italy)

The Po River Basin is located in Northern Italy (see figure 5.6). It is the largest river basin in the country also in terms of streamflow. It has an extension of 71,000 km^2 (Coppola et al., 2014). The river basin spreads over seven Italian regions. The water resources of the Po River are intensely used for irrigation, hydropower generation and civil and industrial applications (PRBA, 2006). 20% of the Italian population lives in this area. It is also the most economically developed part of the country (Mysiak et al., 2013).

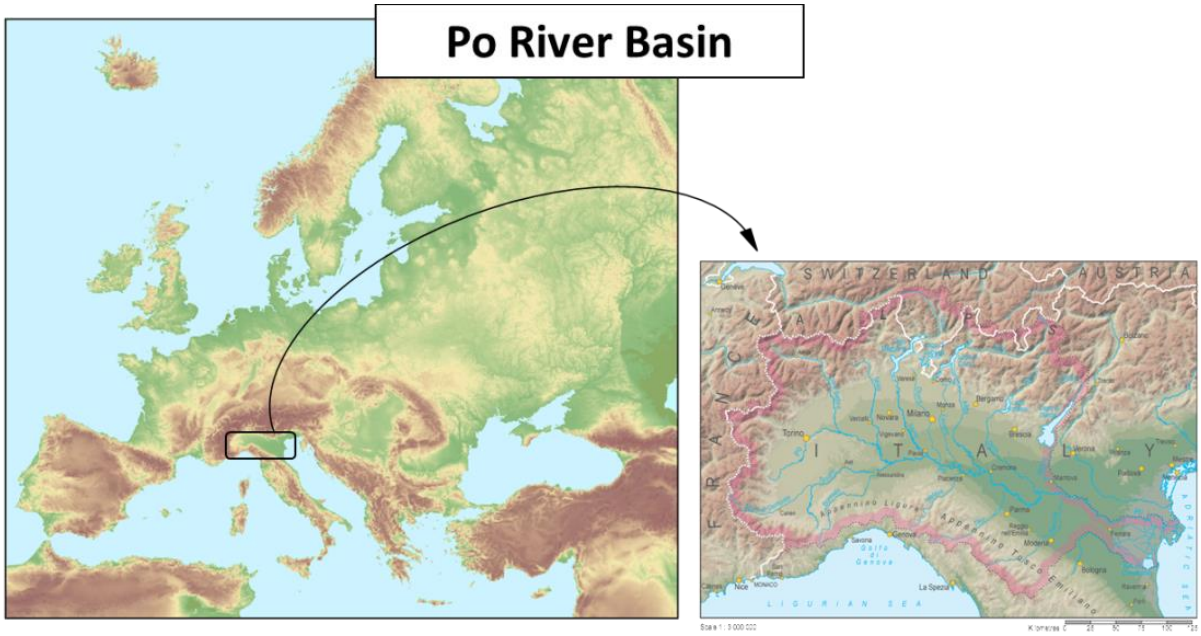


Figure 5.6 *Po River Basin map*

(based on EEA, 2009; and Eastern Kentucky University,2016)

This case study is focused on climate variability, including floods and droughts. Until 1989 water resources were administered regionally or locally. In 1989, the Law no.183/89 gave the control over to the Po River Basin Authority (PRBA) (in Italian – Autorità di bacino del fiume Po). This authority addresses operations concerning all the water resources in the Po basin (PRBA, 2006).

Even though this basin is abundant in water under normal conditions, the long drought periods from 2003 to 2007 and later in 2012 have increased vulnerability of water production sectors (agriculture, energy, public water supply) (Mysiak et al., 2013). As a response to these drought events, a Drought Steering Committee (DSC) has been established. The DSC was initiated in May 2003 as a consequence of a critical water crisis due to threats to both urban water supplies and irrigation systems (Santato et al., 2016). This committee is presided by the PRBA. The DSC works as a multi-actor platform to monitor droughts and to help collective management decisions. The DSC forces, restricts and re-allocates water resources among the water users across the basin (Mysiak et al., 2013).

In addition of the DSC, another MSP exists in the basin. This MSP, the Transient Flood Storage (TFS), is related to the constant flood risk in the basin. It involves public and private partnerships. The public side of the TFS encompasses the Civil Protection Agency, the PRBA, and the Land Reclamation and Irrigation Board. The private side encompasses land stakeholders. The aim of this MSP is to facilitate transient flood storage (its name) on agricultural land in order to protect the urban centres where the flood damage can be of higher magnitude (Mysiak et al., 2013).

5.1.6. Volcano eruptions (Iceland and European airspace)

In April 2010, the eruption of the Eyjafjallajökull volcano, located on the southern coast of Iceland (see left side of figure 5.7), created an unprecedented disaster within the history of European air traffic. This unprecedented disaster took place over the 15th and 20th April. The resulting cost for the aviation industry was estimated at EURO 225 million per day (Gudmundsson et al., 2010). This kind of disaster had not even been previously considered by European air industry before the event happened. The response to this natural event was successful and demonstrated a highly prepared response to volcanic eruptions. Nevertheless, the economic losses due to the closure of air traffic over those days showed an inefficient response with regard to the air industry. The natural hazard itself, the volcanic

eruption, was managed but the interconnected economic disaster represented a shock (Ulfarsson et al., 2013).

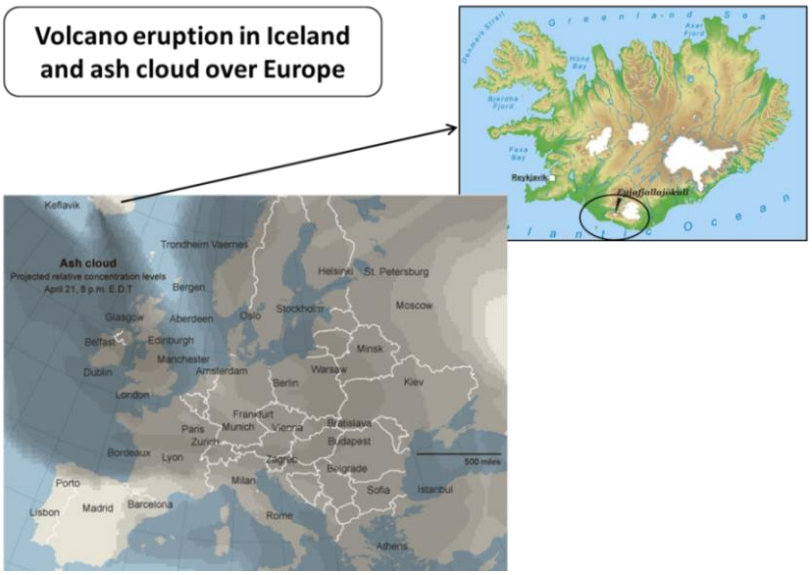


Figure 5.7 *Volcano eruption in Iceland and ash cloud over Europe*[29]
(based on Brandt,2010; and Free World Maps, 2016)

The case study of Iceland is focused on the consequences of volcanic eruptions on the air industry in Europe. Exploring MSP behaviour is the priority, in order to increase European resilience towards volcanic eruptions. This MSP includes the centres related to volcano eruption monitoring, the ash distribution forecasting agencies and the agencies involved in air industry as well as the regulatory bodies for aviation administration. Through this combination of partners is intended to detect weaknesses in decision-making to reduce the economic losses facing another natural hazard of these characteristics.

5.2. In-depth case study: the Jucar River Basin (JRB) (Spain)

Drought management in the JRB is used for this study as a case study focus. This analysis serves as a starting point for the assessment on governance performance, i.e. the control of actions surrounding the implementation of risk management.

Below, the description of the in-depth case study highlights the management of drought as a main natural hazard and the historical development of this kind of management in the basin.

[29] The ash cloud map (right side), show the air situation on 21st April 2010 due to the Eyjafjallajökull eruption.

5.2.1. Geographical location

The JRB area is located in Eastern Spain (see figure 5.8). The territory of the JRB encompasses eight provinces: Valencia, Albacete, Alicante, Castellón, Cuenca, Teruel, Tarragona and Murcia. The largest provinces (by km²) within the basin area are Valencia, Cuenca, Albacete, Teruel and Castellón (CHJ, 2014a).

Figure 5.8 *Territorial area of the JRB area*

(CHJ, 2014a, p.5)

In Spain, the hydrological system is divided into river basins areas (as shows figure 5.9). These river basins are managed by Hydrographic Partnerships or River Basin Partnerships (in Spanish – Confederaciones Hidrográficas).

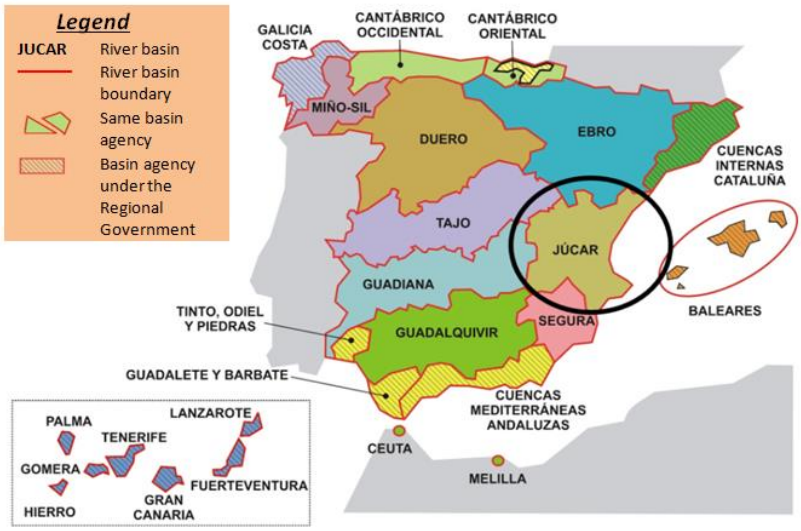


Figure 5.9 *River basins in Spain*

(Durán Leirado, 2016)

The Jucar River Basin Partnership (JRBP) ('*Confederación Hidrográfica del Júcar' -CHJ-*) is the authority in charge of the public hydraulic control in the JRB area and serves as the MSP under study. It comprises all the rivers flowing into the Mediterranean Sea from the Cenia River to the Vinalopó River. The largest river in the area is the Jucar River (512 km long and 21,580 km^2 of total area), which gives the name to the basin. The Jucar River has its source in the mountain range known as Montes Universales (in Cuenca, Spain) and flows into the Mediterranean in the town of Cullera (Valencia) (see figure 5.10). It is followed in size by the Turia River (280 km of length and 6,400 km^2 of total area) and the Mijares River (156 km of length and 4,300 km^2 of total area) respectively. These three basins represent 75% of the total area of the basin (42,989 km^2) (CHJ, 2014a).

Figure 5.10 *Jucar mouth (Cullera, Valencia)*

July 2016

The JRB area is shaped by nine water exploitation systems (or sub-basins) which include all rivers in the area (see table 5.2 and figure 5.11).

Table 5.2 *Water Exploitation Systems in the Jucar River Basin Partnership area (CHJ, 2014a)*

Name of Water Exploitation Systems (Basins)	Number of Rivers within the Water Exploitation Systems
Cenia-Maestrazgo	16
Mijares-Plana de Castellón	43
Palancia- Los Valles	10
Turia	45
Júcar	141
Serpis	15
Marian Alta	8
Marina Baja	11
Vinalopó-Alacantí	15
Total JRBP	304

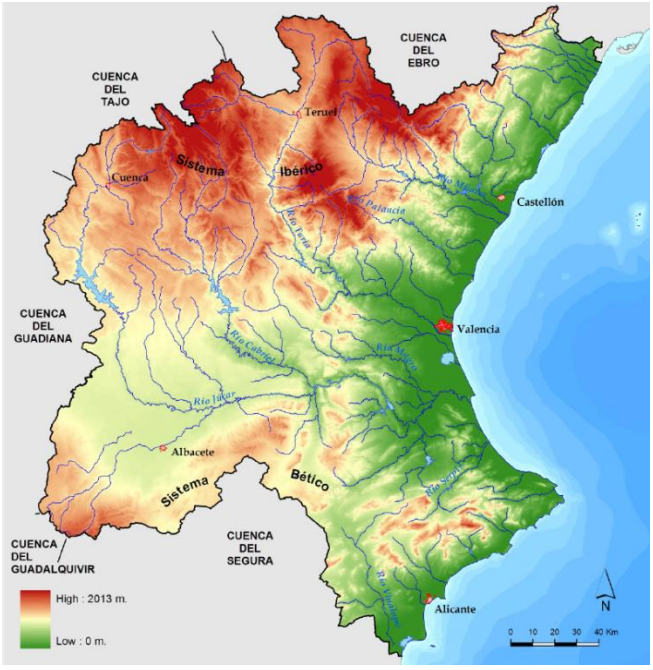


Figure 5.11 *River system and digital elevation model of the JRBP (Geographical department of the Spanish Army- cited in CHJ, 2005)*

5.2.2. Climate characteristics

The area enjoys a Mediterranean climate, characterized by hot-dry summers and mild winters. The annual average temperatures ranges from 9°C in the Northwest mountainous areas, to 18°C in the Southern coastal part of the basin (CHJ, 2005).

The rainfall has a high spatial and temporal variability. Mean annual precipitation for the whole basin is about 500 mm, ranging from 300 mm in the driest years to 800 mm during the most humid ones (CHJ, 2016a). The persistence of dry years produces significant drought

periods. Precipitation presents a strong spatial variability. Mean annual values vary from 250 mm/year in the South to about 900 mm/year in the North of the basin. During some years, episodes of high intensity precipitation take place in short periods over the months of October and November. They are known as the 'Cold Drop' (*in Spanish, Gota fría*) (CHJ, 2014a).

Groundwater plays an important role in the basin. There are large calcareous aquifers in the North-western upper parts, where the rivers Turia and Jucar are born, providing base flows. There are also important aquifers in the middle part of the Jucar basin, such as the Mancha Oriental aquifer that used to provide important base flow to the Jucar River. This is one of the most extensive aquifers in Spain (7,260 km^2) (Sanz et al., 2011). However, nowadays it is overexploited by irrigation perimeters, which is causing the inversion of flows, so the river loses water to the aquifer in spring and summer. And finally, the coastal alluvial aquifer of Plana de Valencia occupies the coastal plain, which is home to the lower sections of the Turia and Jucar rivers as they make their way towards the Mediterranean Sea.

5.2.3. Socio-economic characteristics

According to the Municipal Register of Inhabitants, 5.188.662 persons resided in the area in 2012 (CHJ, 2014a). Large number of inhabitants lives in the coastal areas, mostly in the big cities, but also in the urban areas of Albacete and Cuenca in the hinterland.

The major productive sector in the area economically speaking is the services sector, especially tourism. They are followed by industry, agriculture and energy. Nevertheless, agriculture (both dry and irrigated) is the sector which occupies the largest area of the basin, representing almost 50% of the total territory area (around 370,000 ha). Main crops include citrus fruit, rice, vegetables and vine.

Part of the socio-economic characteristics area strongly related to water use. This relation is described in the next sub-chapter.

5.2.4. Water in the JRB

Water in the basin is used mainly for agriculture (irrigation), urban water supply and industry. From the total water use (3,175 hm^3/year, in year 2012), 80% was demanded by agriculture, 17% by urban water supply and 2,7% by industry (including the energy sector). The energy sector uses the water but does not consume it. The Jucar and the Turia water

exploitation systems are the ones which greatest water provision (see table 5.2) and demand in the JRB (CHJ, 2014a).

Several artificial conducts (canals and irrigation ditches) transport water between rivers to facilitate the irrigation and the urban water supply systems (*e.g. Canal Jucar-Turia*). In total there are eight canals and eight ditches (*e.g. Acequía Real del Júcar*). Additionally, 3,300 hm^3 of water are kept in the 27 reservoirs of the basin, such as Alarcon, Contreras and Tous in the Jucar basin and Benageber in the Turia basin (CHJ, 2014a).

The main urban demands of the principal rivers come from the metropolitan area of Valencia (30 hm^3/year from Turia river, and 90 hm^3/year from Jucar river); the city of Albacete (15 hm^3/year); and the city of Sagunto (8 hm^3/year). Surface water is used in the traditional irrigated areas (see figure 5.12), mainly in the lower Jucar (50,000 ha), and the lower Turia (30,000 ha). The last ones frequently use groundwater as a supplement of surface water deliveries. Furthermore, the irrigated area in the middle Jucar basin uses around 400 hm^3/year of groundwater from the Mancha Oriental aquifer. However, in order to reduce overexploitation, the middle Jucar basin can use up to 35 hm^3/year of surface water.

Figure 5.12 *Traditional irrigation area in the lower Jucar River*
View of the Jucar basin in Ribera Alta and Ribera Baixa counties
(picture taken from Santa Anna Chapel, Llosa de Ranes, Valencia, May, 2016)

In the Valencia coastal plain, where the rivers Jucar and Turia flow into the Mediterranean Sea, and between both mouths, there is a shallow lake, i.e. Albufera lake (2,300 ha), with an associated wetland (23,000 ha). Both, the lake and the wetland, depend on return flows from irrigation areas belonging to both basins, and also on groundwater flows from the coastal aquifer beneath the plain.

The JRB is one of the most vulnerable areas of the western Mediterranean region, due to high water exploitation indexes, and to environmental and water quality problems when droughts occur. In the future, considering climate change scenarios for the region, it could be even worse, if both variability of precipitation and temperatures are higher.

5.2.5. Risks in the JRB[30]

Spain (especially East and South), together with other Mediterranean countries in Europe (*e.g. Cyprus and Malta*), are characterized by scarcity conditions. Scarcity is defined as the combination between consumption of water (demand) and the supply. The higher variability (spatial-temporal) of the water, i.e. water as a resource, generates several droughts at the same time, triggering aridity. The major part of the JRB is thus semi-arid.

The JRB will suffer important changes in precipitation and temperature due to climate change. Most of the global and regional models predict an increase in temperatures, and a decrease in precipitation, with a general increase of variability of the precipitation. Such changes may produce a reduction in hydrological inflows, groundwater recharge, water availability, and more frequent and intense drought and flood episodes. Moreover, an increment of salinity in the coastal aquifer, increase of water quality problems, and strong social and economic implications are forecasted (Hernández-Barrios, 2007).

The semi-aridity conditions aggregate water scarcity, high hydrological variability, cold drop and low flows in summer, which entail several hazards that currently threaten the JRB and drive recurrent multiannual droughts, autumn floods and water quality.

[30] Most of the information provided in sections 5.2.5, 5.2.6 and 5.2.7 (especially 5.2.6) was obtained through an expert interview done on 24th September 2015 to Joaquín Andreu –Technical Director of the JRBP during the period 2004-2008 and current director of the Research Institute of Water and Environmental Engineering, Technical University of Valencia, Spain)

Droughts

There are different types of droughts in the JRB:

- **Meteorological drought:** Caused by a continued lack of precipitation.
- **Agricultural drought:** Caused by the insufficient soil humidity after the meteorological drought. That decreases the crop yields due to the crop needs not being me in a particular time and place.
- **Hydrological drought:** The long meteorological drought cause decrease in surface and groundwater water resources availability, in particular water exploitation systems for a specific time period, compared to the average values. It may take months, even up to one year, from the start of the rainfall shortage.
- **Operational drought:** Comprises the term in which the supply failures do not reach the purposed water uses in Water Exploitation Systems.
- **Socio-economic drought:** Represent socio-economic and environmental impacts caused by water scarcity. It produces economic or personal damages on the affected population. Water demand is higher than the availability.

The first three types of droughts are related to climate variability and the two latter are linked to the water resources management.

The major historical recent drought events have occurred in the last part of the 20th and the beginning of 21st centuries (CHJ, 2007), with the most recent one occurring over 2005 - 2008 that had the classification of an extreme event (Andreu et al., 2009). Currently, the JRB is suffering from a drought episode since May 2015 (RD 355/2015).

Historically, the most severe impacts have affected all sectors. Currently, agriculture and hydroelectricity are most affected, since urban water supply and environmentally sensitive areas (*e.g. protected wetlands*) have priority over other water uses. But economic impacts also affect municipalities, since they have to pay more for water in order to purchase water rights or alternative sources of water; and they also affect society, because they have to cover the costs of environmental measures during droughts. In the future, impacts are expected to be higher, at least economically, and for agriculture it will be more difficult to get an adequate supply.

From year 2001, Spanish Water Law requires the River Basin Partnerships to develop Drought Special Plans (DSPs) in order to turn the traditional reactive crisis management approach into a proactive approach. The DSPs for the JRB include monitoring for early drought detection, drought stages definition, and measures to be applied in each of the stages (CHJ, 2007).

The JRBP developed the DSPs in 2007 during the severe drought episode of 2005 - 2008 (Ministerial order – MAM698/2007). The management system for the different drought scenarios established in the SDP required the establishment of the Permanent Drought Commission (PDC) when the emergency scenario is reached and a Royal Decree[31] is passed by the national government. The aim of this Commission is to take decisions on water management during a drought in order to reach equilibrium between the interests of different sectors and to mitigate the impacts of the drought (see more information in sub-section 5.2.7.2).

Even though the DSPs were not developed until 2007, since the year 2001 the JRBP initiated a drought monitoring indicator system to control the hydrological status of the different water exploitation systems of the JRB as well as the development of periodical reports (CHJ, 2007). In total, there are 34 indicators which help to collect data such as reservoir volume, rain gauge and piezometric control in 34 zones of the JRB (see Appendix C for an example of indicator system results).

The status of the drought monitoring in the JRB is evaluated following table 5.3. The index value of each zone is weighted to obtain an overall index value which allows the classification of the water exploitation systems into four hydrological states or scenarios: Normal, pre-alert, alert and emergency.

[31] In the Spanish legal system, a Royal Decree is a legal provision from the executive branch of the government. The royal decree only requires approval from the Cabinet, thus avoiding a parliamentary voting.

Table 5.3 *Drought monitoring indicators system*

(based on CHJ, 2007, p.110)

DROUGHT MONITORING INDICATORS SYSTEM				
SCENARIO	Normal	Pre-Alert	Alert	Emergency
STATUS INDEX	0.50 - 1	0.30 - 0.50	0.15 - 0.30	0 - 0.15
OBJECTIVE	Planning	Control-Information	Conservation	Restriction
TYPE OF MITIGATION MEASURE	Strategic		Tactic	Emergency

The results obtained after monthly measurements of each indicator, like those showed in Appendix C, are transferred to a map, which shows the status of the whole Spanish River Basin Partnership areas. The figure below (5.13) shows a comparative picture between the status during the same month in 2010 and in 2016, the latter having a declared drought event. This comparison allows the observation of the prevailing colour green in March 2010, which shows a normal scenario, while the colours yellow, orange and red are predominated in March 2016, emphasising thus the drought state.

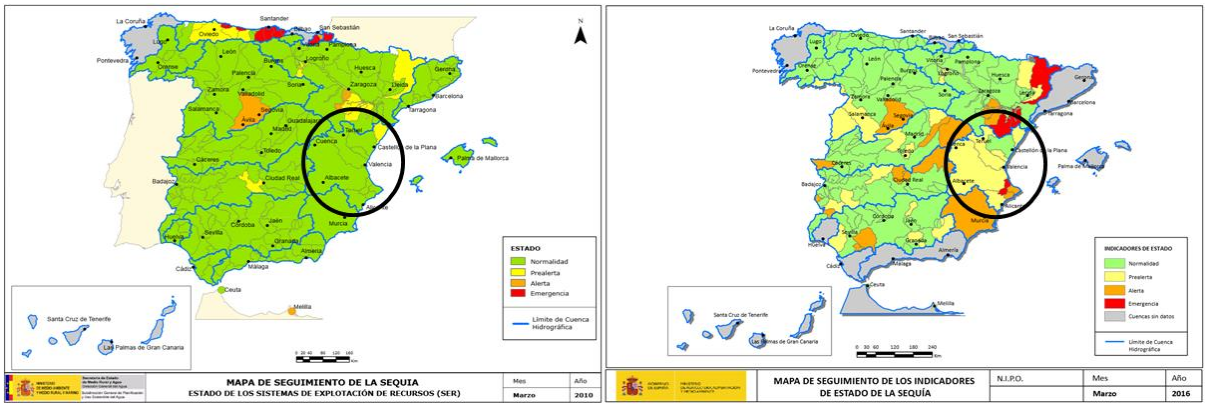


Figure 5.13 *Drought monitoring map of Spain*

-March 2010 and 2016-

Jucar River Basin within the black circle (colours explanation in table 5.3)

(MAGRAMA, 2010; 2016)

5.2.6. Historical background: From the past till the future.

The semi-arid condition of the JRB together with the long periods of drought, have meant that the JRB has been applying adaptive drought measures for a long time, such as the construction of reservoir and wells (beginning more than 100 years ago) (*e.g. wells in Mijares exploitation system and Sagunto Irrigation Ditch*). These measures are proactive and not reactive, since these constructions were planned to face future droughts.

The JRBP works using a proactive approach in socio-economic management as well as in agriculture, thanks to old irrigation partnerships. For example, the *Water Court of the Plain of Valencia,* which dates from approximately 960 AD (Borrull i Vilanova, 1828), is considered to be one of the oldest justice institutions in Europe, or the Irrigators Community of the Jucar Royal Irrigation Ditch (in Spanish, Acequia Real del Júcar) that holds water rights since the second half of 13th century (Acequia Real del Jucar, 2016). This kind of institutions plays an important role in drought management in the JRB.

In the 16th and 17th centuries, during long humid periods, the irrigated land surface was extended, expanding the area of the Jucar Royal Irrigation Ditch (Acequia Real del Jucar, 2016). This resulted from the high confidence in having enough water. The problem arrived when droughts appeared and the new conditions (extended irrigated land) increased the water demands and consequently the resource started being restricted. The royal rights possessed by the Jucar Royal Irrigation Ditch have played an important role during this time, benefiting the new irrigated land and also affecting other areas with no royal rights. But in June of 1934 the JRBP was created (constituted in November 1935) and conflicts between different users decreased (CHJ, 2016c). The JRBP represents a participative public-private partnership (the government is involved but each River Basin Partnerships operates without direct control of the central government, i.e. decentralization). Even though the royal rights continue to be active, the intervention of the JRBP facilitates the balance between institutions. The constitution of the JRBP is determined by the increase hydraulic interest acquired in Spain between 1865 and 1935 (CHJ, 2016c).

In Spain, there are two forms of irrigated land: The historically irrigated areas (with centuries of tradition) and the new irrigated areas. In the Spanish Mediterranean, agricultural partnerships have been more predominant than the government initiatives, i.e. traditional irrigated areas (CHJ, 2016c).

The aim of the JRBP was to build infrastructures and ensure their maintenance, adapt to and mitigate droughts to solve problems of scarcity, and to protect against floods. The JRBP essentially frames reactive approaches for solving droughts after it comes and proactive approaches, like infrastructures, to improve the assurance. For instance, six years after the establishment of the JRBP, the construction of the Alarcón Reservoir began (in the upper Jucar River), which may contain 1,112 hm^3 (SEPREM, 2016).

At the beginning of its establishment, the JRBP was shaped by agricultural irrigators, hydroelectricity partners, water supply entities and the government. In 1985, the Water Commissary started to become part of the JRBP (CHJ, 2016c). It is in this year that the new Spanish Water Law (Law 29/1985), which regulates the River Basin Partnerships in Spain, was approved. The law intended to respond to several issues concerning protection and control of the public water domain, to control the human action in rivers, to manage the groundwater, to manage the basin planning and to create the water councils. Moreover, this new law includes the environment issues, but was not given its deserved importance until the regulatory reform of 2001 (RD-Law 1/2001). The Water Law has helped and reinforced the governance of the policies in use since 1980, as a consequence of the water crisis suffered since the beginning of the 70s, and as well as facilitating the enforcement of these polices in a legal framework.

In the year 2001, the Hydrological Plan was modified (approved by the Water Council) and it is here that the DSPs are included (Law 10/2001). However, it was not until 2007 when the DSPs, in the JRB, were finalised (CHJ, 2007). Stakeholders of the JRB participate in the decision making processes for the development of the DSPs. During 2004, every second Thursday, a forum with stakeholders and technicians was carried out to develop a management model of JRB resources to reduce drought vulnerability, also making the decision-making process for water policy more participative. That was an initiative of the Water Framework Directive (Ferrer and La Roca, 2011). These forums benefited from the management through the participation and the consideration of the beliefs of all the actors.

This kind of plan represents a proactive approach including the droughts indicators, which have been not put into the action in other European countries as it has been in Spain. Within the DSPs officially appear the establishment of the Permanent Drought Commission (CHJ, 2007). Even though its name includes the word “permanent”, it is a Commission that is only stablished by Royal Decree when a drought situation is declared, i.e. through the monitoring of drought indicators system. It has the power to act supported by the law. In Spain, water rights are assigned by legislation.

The approval of the DPSs, in 2007, included awareness campaigns as part of the measures to be taken at the beginning of a drought episode, including in situations in which no emergency situation is declared. Also, drought risk awareness and responsible water

consumption campaigns are organised in a continued basis to increase future drought risk resilience.

The PDC is a different entity than the JRBP, which was first established in 1981. At this moment in time emerged the Crisis Committee, with the Technical Director of the JRBP as the unique link to the JRBP. The Crisis Committee was shaped by one representative of the national government, representatives of the affected provinces, the Water Commissary (at this moment it was not yet part of the JRBP) and the Technical Director of the JRBP. The next time that it was established was in 1983 (still before the reform of 1985 which included the Water Commissary as part of the JRBP). At that time, irrigators and urban supply entities joined the commission. Following this line, every time that the commission has been formed, the number of members has also increased.

Those changes in the legal structure (*e.g. Crisis Committee*) highlight reinforcements by law of measures and policies implemented for improving the management of the drought situations. Thus, the River Basin Partnerships in Spain, and specifically in the JRB, are the precursors of this new legal structure, exercising a bottom-up approach.

Since 2005, when the PDC was established for the last time before the current drought (declared in May 2015), all the sectors were represented in the commission and the decisions were made by consensus, even though all members had the right of voice but not the right to vote.

In other regions (*e.g. California*), these droughts issues also exist but they do not have partnerships to manage hazards like in the JRB. In the JRB people have realised that irrigation actions demand agreements between stakeholders, for which the collective actions help (*e.g. water auction in La Vega Baja, Alicante*). Moreover, the effects of droughts require agreements and an entity that has the role of mediating.

The bottom-up approaches mentioned before characterize the JRBP, achieving legal regulations that have been initiated by previous stakeholder's agreements.

5.2.7. Role of the MSPs in the JRB

The JRB contains a great range of water related institutions in which stakeholders play a fundamental role. Some have an internationally recognized history and tradition, such as the

Water Court of the Plain of Valencia already mentioned. Some others have strong stakes like the drinking water supply of Valencia city and its metropolitan area with about 1.5 million inhabitants; or the Albufera Lake, which belongs to the RAMSAR wetlands convention[32]. There are also industrial interests in the shape of hydropower generation along the rivers of the JRB and refrigeration for a nuclear plant in the Jucar River. Finally, there are irrigation systems of a more recent development (20th century) that obtain their water from aquifers hydraulically connected to rivers with the consequent affection to streamflow.

Initially, mono-sectorial partnerships were predominant (*e.g. farmers associations in order to build, operate and maintain irrigation weirs, canals and ditches, to allocate water, and to organize irrigation turns such as the Jucar Royal Irrigation Ditch*). Since the beginning of the 20th century, with increasing water stress in the basin, high temporal variability of flows and droughts became a serious societal and economic threat. The diversification of interests due to the different aspects of water planning and management revealed the necessity of dividing the decision making process aspects into several internal bodies. These bodies have always had the intentionality of including all, or most, of the voices interested in the topics addressed. Therefore, several MSPs have been created along the years to deal with the different problems existing within the territory of the JRB (in the context of the JRBP). In the case of droughts, two entities currently operate: the Water Council of the JRBP, and the PDC. In the following sections, these two MSP related to droughts will be described.

5.2.7.1. Jucar River Basin Partnership

Spain was the first country in the world to manage the water through river basin partnerships (Colmenar, 2001). In year 1926, thought a Royal Decree (RD 05/03/1926), the establishment of the River Basin Partnerships in Spain was declared; the Ebro River Basin Partnership was the first of the State (RD 05/03/1926).

Even when the Decree (Decree 28/06/1934) which creates the JRBP was published in 1934, the JRBP was not completely constituted until 24th November 1935. One of the main reasons for its development was to create a body in charge of planning and managing surface waters with a special emphasis on drought adaptation and mitigation (Mateu Bellés, 2010). Over the years, other objectives were included such as flood protection, general protection of the

[32] RAMSAR wetlands convention has the main goal of 'the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world' (RAMSAR, 2014).

public water domain, and the control all human actions on rivers (*e.g. water intakes, waste spillage, arid extraction, etc.*). Nevertheless, the activities of the JRBP have always been addressed to overcome the recurrent problem of drought and its consequences, trying to maximize the supply to all water uses both in quantity and quality.

The JRB includes all major sectors of water uses (see first paragraph of section 5.2.7), the main bodies of the central administration related to water, as well as provincial and local representatives. Within the JRBP, the Water Council of the Jucar basin is the participatory body in charge of approving the Hydrological Plans and hence also the plans related to droughts.

Over the years, stakeholders of the basin have increased in numbers and added additional interests (*e.g. the development of new needs of society, beyond the use of water for purely economic purposes*). Among its objectives, the JRBP has included. Finally, after the new Spanish Water Law of 1985, declaring groundwater also as a public domain, groundwater has been also included in the JRBP. At that time, in addition to the stakeholders related to groundwater, other stakeholders were included in the JRBP as well as representatives of the autonomous region's governments. The objectives of the JRBP grew, advancing aspects that would be later considered by the European Water Framework Directive (WFD) (EC, 2000), such as environmental objectives, economic recovery of costs, and integrated basin planning (Hydrological Plans) and management. This is reflected in the early development of basin plans, like one that began in 1992 and includes a list of the '*Plan agents'* (CHJ, 1997, p.105). Hydrological Plans are approved by the Water Council of the JRBP. More recently, after the transposition of the WFD to Spanish legislation, two more basin plans have been developed for the periods 2009-2015 (CHJ, 2014b) and 2015-2021 (CHJ, 2015).

5.2.7.2. Permanent Drought Commission

Even though the diminution of drought vulnerability has been an objective of planning activities and infrastructures development throughout the history of the JRBP, in the past most drought episodes have been managed in a reactive manner (*e.g. the drought episode 1990 - 1995, when emergency measures were decided late, and thus the infrastructures were not available until the drought had almost ended*).

Within the DSPs emerge officially the PDC, an entity designed to make decisions when an emergency scenario is declared. The PDC is convened as a temporary measure when the drought special alarm system (indicators system) within the DSPs detects a drought event (see section 5.2.5). The main goal of DSPs is, according with the article 27.1 of the Law 10/2001, to minimise the environmental, economic and social aspects of the drought situations. This Commission assumes the control of the management of the exploitations systems affected by drought within the JRB and will be in charge of complying with the regulations established in the Hydrological Plan. The Royal Decree may give to the Commission additional competencies leading to a better management of the drought episode. The PDC leaves off convening and, therefore, making decisions in the JRB when the drought's indicators identify again a normal scenario (see table 5.3).

Despite the fact that the normative requirement for creating a PDC was first established in 2007, there is historic evidence that such Commissions have also been created during previous significant drought episodes. Their composition has changed over time from purely administrative commissions in the 1980s to the highly representative ones like in the 2005-2008 episode and 2015-2016, in which the PDC encompasses governmental authorities; private enterprises; partnerships of water users; NGOs; and union representatives (for the complete list for each episode see Appendix D).

The first time it was applied was in 1981 during the dry period of 1978-1986, it was neither an MSP, nor derived from JRBP. A royal decree law (RD-Law 18/1981) established the creation of a commission formed by the Civil Governors of the affected provinces, the Chief Commissar for Water, the National Government Delegate, the Hydraulic Services Chief from JRBP, and representatives of ministries of Internal Affairs; Public Works and Urbanism; Agriculture, Fisheries and Food; and Industry and Energy. Following royal decrees in 1983 (RD-Law 9/1983), 1984 (RD-Law 15/1984) and 1994 more actors were introduced in the drought commission, especially from out of the administrative environment, making it more accessible and participative. It was in 1994 (RD134/1994) when the term '*Permanent Drought Commission*' officially appeared for the first time. Finally, the PDC by the Royal Decree of 2005 (RD 1265/2005) acquires more power than the JRBP to manage and mitigate extraordinary droughts. Last time it was created was in May 2015 (RD 355/2015). In total 14 members shape the Commission.

The relevance of the PDC relies on its decisions influencing the management and mitigation of drought episodes, when very high potential damages, and risks to the economy and human safety can materialize. To provide more depth, the duties of the commissions are to survey available water resources management, to establish priority criteria for water supply to the different uses, to accelerate the water assignment processes to the priority uses, to order small water abstraction and transportation works, to establish water saving guidelines for all sectors, to coordinate the actions of all the administrative bodies with competencies on water, and to reduce or suspension of any water facility or activity with a water pollution potential.

Thus, it can be said that the PDC represents a participatory committee, in which most stakeholders are represented, and in which the aims are to take decisions on water management during the drought in order to reach a balance between the interests of different sectors, different groups of users in the same sector, and environmental needs. Other goals include mitigating the impacts of the declared drought, to carry out continuous monitoring in order to control the achievement of the decisions, and to follow the evolution of the drought, and its impacts on users, water quality, and the environment. Finally the PDC approves emergency works for improving control, efficiency of water use and connectivity, as well as for improving reliability of the water supply by additional resources development (*e.g. drought wells*) (Andreu et al., 2009).

CHAPTER 6

Risk perception empirical findings

The first and second specific objectives of this study are addressed in this chapter. The purpose is to analyse if risk perception is a main driver for risk management in MSPs.

This first objective aims to identify criteria for determining risk perception and describe cultures of risk (see sub-chapter 6.1). A criteria list, structured into ten general elements and several specific criteria related to the elements, which facilitates the description of cultures of risk in MSPs has been developed. The data were obtained through a web-based questionnaire on risk perception presented in section 4.1.1. From the results obtained in this part of the research, the second objective was achieved (see sub-chapter 6.2). This second objective supports the description of cultures of risk, which are shaped by the influence of risk perception in risk management strategies and decision-making processes.

The web-based questionnaire on risk perception:

- provides responses to describe the cultures and the perceptions of risk; and
- verifies if the concept that risk perception drives risk management is correct

The sub-chapter 6.2 starts presenting the analysis of the questionnaire results in a sample of six case studies in the European context (see section 6.2.1) and continues presenting the in-depth case study empirical findings (see section 6.2.2). The reason for giving a broader overview of risk perception in the European context and later a particular vision in the JRB is to see if the patterns reflected in the broader context also exist in the specific case study. This allows for a more reliable confirmation on whether risk perceptions drive risk management.

6.1. Risk perception criteria

For the elaboration of a criteria list on risk perception (see table 6.1), the specific elements deemed to be important for this research were determined. This supports reducing the

scope of the study to identify specific criteria. These elements can be considered as blocks of information which are broken down into specific criteria (Douglas and Wildavsky, 1982; Rogers, 1975, 1983; Renn and Rohrmann, 2000). They are very much related to the theories influencing this work: for example, the 'coping capacity' element belongs the Protection Motivation Theory (PMT) background, the 'values and belief' element to the Cultural theories and the 'risk perception' element to the Integrative Model of Risk Perception. This criteria list facilitated the description of MSPs risk cultures by providing characteristics of the MSPs. An example of the in-depth case study is presented below.

The list's main aim was to provide a theoretically framed basis for the development of the questionnaire.

Table 6.1 *Risk cultures criteria list*

Elements	Criteria
Hazard	Type of hazard
	Data observation
	Consequences
Behaviour	Attitude
	Pattern of behaviour
Information and Knowledge	Knowledge
	Educational level
	Preparedness strategies
	Response planning
	Kind of information (media)
Participation	Participation in the decision-making process
	Cooperation between members/users/parties
	Communication (between partners)
Economic issues	Economic losses
	Economic response (insurance)
Political issues	Political preference
	Decision-making process
	Policy options
Coping capacity	Experience
	Rapid response
	Recovery
	Vulnerability
	Resilience
Shared emotional factors	Values (*e.g. trust, emotional harm*)
	Beliefs
	Motivations
	Emotions (*e.g. fear*)
Perception	Uncertainties about the consequences of a risk event
	Severity
	Judgment
Challenges	Necessities
	Preparation
	Difficulties

Description of the cultures of risk in the Jucar River Basin

Using the in-depth case study a description of the risk cultures in the basin was created. This description entails the risk cultures of the stakeholders of the Jucar River Basin (JRB) in general, and particularly the risk culture of the Permanent Drought Commission (PDC).

Following table 6.1 and based on stakeholders' interviews[33], expert's interviews[34] and historical information[35] subsequently the description of the elements of table (6.1) can be drawn:

Hazard

The type of hazard most commonly perceived in the JRB is drought. They are observable by the reduction of precipitation, rivers streamflow, and reservoirs storage. The consequences of that hazard are determined by the failure to fulfil water demands, the decrease of water quality and the environmental deterioration. They are also determined by its impact on the relations with stakeholders causing social conflict for water resources allocation.

Behaviour

The attitude of the stakeholders facing the threat is regulated and organized. There is a series of drought scenarios defined according to a set of drought indicators that are continuously monitored. The Drought Special Plans (DSPs) define the measures to mitigate the possible effects of drought during each scenario to prevent its development into a more severe scenario.

Information and knowledge

Taking into account droughts as natural hazards, the MSP managing these situations of risk is the PDC, which members have important experience in the management of drought situations. The educational level of those members is normally from medium to high[36], with a few exceptions.

During normal situations the management and hydrologic planning are oriented towards minimizing the consequences of droughts. A system of indicators helps to monitor the water

[33] Interviews with JRB's stakeholders developed from 15th to 19th July 2013 about resilience in the basin and risk perceptions (Appendix G).
[34] Joaquín Andreu and David Haro interviews (Technical University of Valencia, Spain) on 14th – 15th April 2014.
[35] Based on data provided by the Jucar River Basin Partnership
[36] High: University degree. Medium: Technical education. Low: General Certificate of Secondary Education.

indexes[37]. The PDC is responsible for the proper and complete application of all measures defined in the DSPs for drought impact prevention and mitigation. The Jucar River Basin Partnership (JRBP) elaborates regular reports on the state of the Water Exploitation Systems and the evolution of the drought indicators. This allows everyone to have timely information about the hazard and its severity.

Participation

Additionally to the elaboration of reports of the state of the Water Exploitation Systems, there has been a participatory exercise that lasted for many months in which a decision support tool to analyse the operation of the JRB has been used. This tool assessed the risks and tested the measures efficacy. This process allowed creating a common perspective of the problem and defining common objectives (related to the concept of governance). This participatory process supported greater transparency of the decision making since all stakeholders participated in it.

Participation is crucial to cooperatively manage any risk. In the case of the JRBP and especially the PDC, all the members have the opportunity to participate and offer their vision on the different issues regarding the decision making process during the periodic meetings. However, in the case it is impossible to reach commonly agreed decisions, not all the members would have the right to vote in the consequent process. This is still a very hot issue in the PDC, heavily discussed between stakeholders. Past experiences show, however, that voting is not necessary since it has so far always proved possible to reach agreements.

Despite the fact that the objective of the PDC is to find commonly agreed solutions to the problems caused by droughts, each stakeholder has its own objectives and normally will push to reach them. There may be occasional alliances in certain aspects. The communication between partners is facilitated through periodic meetings, almost monthly, in which the management issues are discussed and decisions are made.

Economic issues

Economic issues are closely related to risk management. Many times the consequences of natural catastrophes are measured by the economic losses caused by the situations. In the case of the JRB, reduction of production in the different sectors represents the major

[37] When the monitoring system detects an emergency scenario, the DSPs foresee the creation of the PDC by Royal Decree.

economic loss. As a consequence, there is an increase of prices, losses of market positions and losses in secondary industries associated to the main water uses (*e.g. if there is less crops, the owners of cropping machinery will have less work*). Drought consequences also affect water quality due to higher pollutant concentrations in water or increases of harmful microorganisms. Cases of decreases in water quality cause an increase of water depuration costs. The observed economic responses to drought include the exoneration of payment for water rights unsupplied, water rights purchased for environmental purposes and to guarantee urban supply, and insurances for loss of crops.

Political issues

Political issues also determine the management, decisions and organisms dealing with risks. These are influenced directly by governments. In the JRB, the JRBP as well as the PDC are directly related to the national government. The issues dealt with, however, are normally out of the scope of political preferences. The decisions of the JRBP with regard to droughts are made through regular meetings of the PDC components in which actions surrounding implementation are discussed in order to ensure proper management of the basin. The decision-making process works under the paradigm of agreement although there is a chance to vote, when consensus is not reached.

Policy options defined in the DSPs can be divided into three main aspects. They can have an impact on water availability, on demand of water and on environmental aspects. Measures on availability are these which purpose is finding, developing and exploiting new water developments that may incur in an increase of the available resource. This may be attained by the construction of new reservoirs, utilization of new aquifers, sea water desalination or waste water reutilization. Measures on demand include the ones that strive to satisfy the different uses with lower resource consumption. Mechanisms are diverse such as infrastructures improvement to reduce losses, modernization of irrigation techniques or creating public awareness. Finally, measures on environment have the objective to protect the water domain, including: environmental survey plans, maintenance of environmental flows, and intensification of spillages from waste water treatment plants or farmlands.

Coping capacity

The coping capacity plays an important role in the recovery and future preparedness. In the case of the JRB even though many drought episodes have occurred, due to difference in these events, different management measures have had to be adopted. The existence of the DSPs allows efficient responses to each drought-related problem at the time it occurs. The DSPs also regulate the recovery measures that are to be implemented after the drought. The objective is recovering the water exploitation systems to levels prior to the occurrence of the event, or better if possible. These measures range from supply restrictions suspension to environmental restoration works. This coping capacity increases the resilience and decreases the vulnerability. Thus, vulnerability to drought is currently relatively low due to existing preparation and planning to prevent droughts. Additionally, changing in measures to be adopted between different drought scenarios is easy to do. It is quite simple to enter in a more severe scenario that triggers measures to avoid the situation from worsening.

More information about risk management policies implemented and its perceived effectiveness to deal with droughts are provided by the analysis in section 6.2.2.

Shared emotional factors

Within the JRB management exists a high will to collaborate towards a common good through agreed decisions. They have the belief that traditional way of acting needs to be continued in a certain manner. That includes the trust in this kind of acting reinforced by the JRBP management during many years. There is common agreement that JRBP will probably end up solving the problems that appear in the case of a drought event. Or that, the intervention of the JRBP usually lead to good solutions. There are not important fears related to drought hazard except the availability of necessary economic resources for implementing all the measures considered important in the plan.

Perception

A big uncertainty with regard to the consequences caused by a drought event is how to cope with the costs related to certain measures if an episode occurred during an economic slump. Droughts in the JRB generally cause a degree of medium severity. To prevent drought episodes having very severe consequences the DSPs provide the right instruments. In the opinion of the stakeholders, droughts have always occurred and will always continue to

happen. Therefore there is an acceptance of the risk. They have the conviction that they have always been able to cope with them and to find a satisfactory way of dealing with the event and its impacts.

Challenges

After each new episode appears, new needs associated to the particular problems arise. The DSPs require that after a drought event an audit is carried out to study its final effects and to detect new needs. It also foresees the necessity to review the plan after each event to introduce changes that may approach future events more successfully. This audit helps to prepare to future events, connecting the needs detected in the previous episode and in the hydrologic planning process. The major difficulty perceived is the current economic situation, which cause uncertainty. But also the uncertainty related to climate change, including increase in frequency and severity that could be difficult to cope with using the current risk management strategies.

6.2. Case study analysis

This sub-chapter is structured into two parts. One part relates to the analysis of the responses obtained from the implementation of the web-based questionnaire in a sample that includes several MSPs in Europe (n=15) with a common nexus on risk management of natural hazards regardless of which kind of risk they manage (see section 6.2.1). And the other part reflects the results obtained from a short version of the questionnaire that has been only implemented with a sample of institutions involved in the JRB context (n=7) (see section 6.2.2).

To develop the questionnaire, the following table (6.2) of criteria has been used, which shows the sections of the questionnaire and facilitates the writing of questions. This table (6.2) represents an improved and more concise version of the table 6.1. Table 6.2 embraces the characteristics of the institutions, taking into account that it is not an analysis of the individual dimension but of the collective dimension[38]; the description of the natural hazards[39]; the risk management[40]; and participation[41]. The sections cited in the table

[38] For more information see Renn and Rohrmann, 2000 and see also governance concept in section 3.1.5
[39] Description of the different hazards in chapter 5
[40] Based on the concept of Risk Management in section 3.1.3 and also in Rogers, 1975.
[41] Based on the concept of MSP in section 3.1.1 and the concept of Institutional fit in section 3.1.5 as well as the governance concept in section 3.1.4).

represent the four blocks of the questionnaire (see Appendix B for the complete questionnaire).

Table 6.2 *Questionnaire criteria*

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

A differentiation between cultures of risk and perceived risk has been highlighted in this analysis. This was determined by the kind of questions included in the questionnaire. On the one hand, responses regarding policies in use as well as those that encompass the characteristics of MSPs and their members, including values, beliefs, knowledge, attitudes and understandings, allow for descriptions of the culture of risk in MSPs to emerge. On the other hand, the responses with regard to the views, opinions and emotions on the impact levels, policies effectiveness and cooperative work refer to the risk perceived by the MSPs.

Both parts of the chapter are divided into cultures of risk results and perceived risk results, and through graphics and descriptions the analysis of both kinds of results are shown. The responses have enabled a clear picture to emerge of the risk perception in MSPs in a European context as well as the risk perception in the JRB. In this last chapter, a description of the cultures of risk in the area will be also included, forged from the criteria list given above.

6.2.1. Analysis of Europe's Case Studies

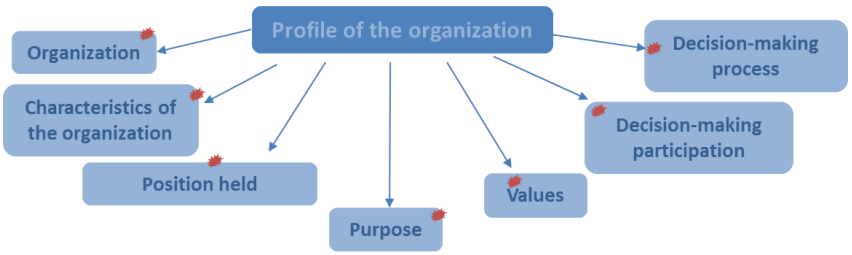
Here the analysis of the questionnaire responses is presented. During the months of December 2014 and January, February and March 2015 the access to this web-based questionnaire was possible through the website of the ENHANCE project as well as the website of the Climate Service Center Germany (GERICS)[42]. The questionnaire was translated from English into five languages (Spanish, Portuguese, Italian, Dutch and German) to increase the participation of non-English-speakers. Many of the stakeholders of the different case studies (see sub-chapter 5.1) were not fluent in English and it was assumed that participation might increase when questions were provided in the local languages.

Once the responses were collected at the end of March 2015, they were coded using the Boolean Technique of the Qualitative Comparative Analysis (Ragin, 1987) in an Excel document. Through the adding up of the different answers to each question, the balance of responses for each question was estimated, which allowed - through the number of shared answers - to determine the shared characteristics.

The results regarding the cultures of risk and perceived risk were analysed and they are presented below. They are divided into the four blocks that comprises the questionnaire. At the beginning of each block, a mind-map shows the specific questions which were analysed (see the red marks in the related boxes)[43].

6.2.1.1. Cultures of risk results in the European context

Block 1: Organizations/Institutions



The respondents were mainly institutional authorities, dealing with hazards from a national and regional scope. Their main focuses were on environment, agriculture, industry,

[42] GERICS is 'a scientific organizational entity of Helmholtz-Zentrum Geesthacht based in the city of Hamburg' that 'offers in a scientifically sound manner products, advisory services and decision-relevant information in order to support government, administration and business in their efforts to adapt to climate change. (GERICS, 2016).

[43] For the complete mind-map of the questionnaire see figure 4.2

administration, forestry, transport, emergency and protection. The respondents were mostly heads of institutions with the aim of protecting, preventing, disseminating, and exchanging risk information. They also have acted as users' defenders; they monitored, trained and taught, and increased effectiveness for managing emergency situations.

A MSP risk culture is a critical element that in a situation of risk can lead on choosing the right management approach to face the risk or being confronted with a difficult situation.

Decision making processes within a culture of risk are made on a consensus basis, involving all members of the membership. Usually mechanisms of participation that regulate the involvement exist.

The respondents saw available expert knowledge (see figure 6.1) as an important element of a risk culture. This knowledge should not be limited to the institutional level, (*e.g. the knowledge acquired through formal education*), but should also include the historical knowledge of dealing with a risk and how this has been managed, i.e. learning from the past to face the future. Many of the instruments and actions implemented to face a risk came from past experiences. Efficiency and transparency were also considered important key values.

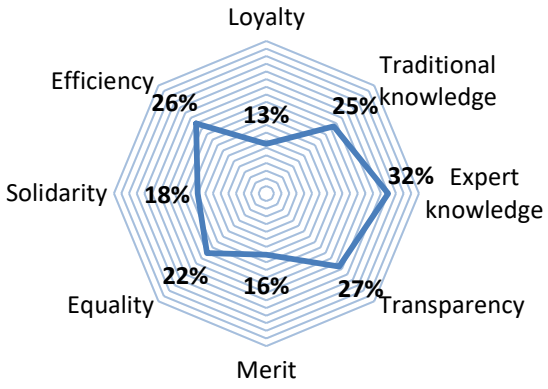
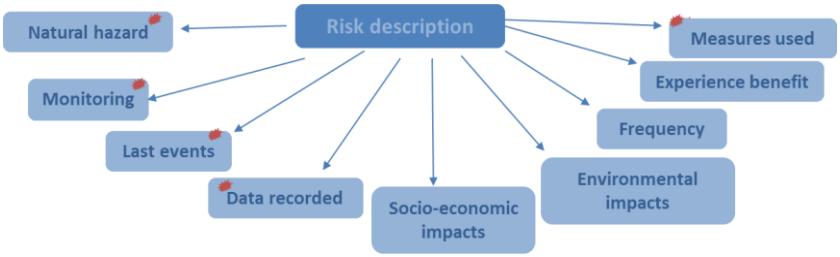


Figure 6.1 *Key values held by the partnerships*

Block 2: Risk description

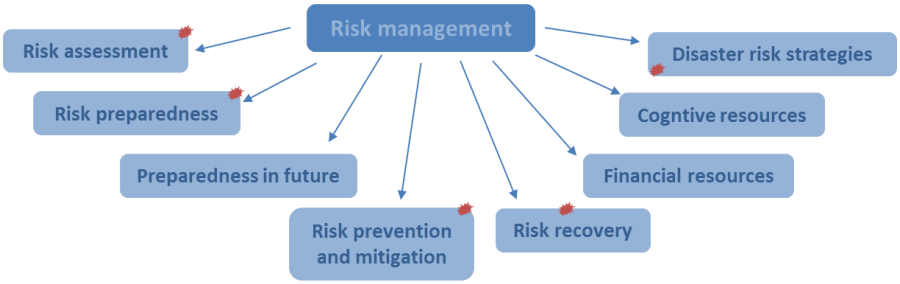


The case studies analysed are affected normally by floods, forest fires, droughts, storm surges, landslides, earthquakes and their natural consequences (*e.g. volcano eruption*). It is important to mention that the results have been analysed only from the natural hazards perspective. Other risks (*e.g. socio-economic development*) have been not taken into account.

A well-functioning culture of risk includes also the collecting and recording of data related to the hazards they might face. Part of the partnerships' available knowledge was based on the systematic monitoring carried out in these institutions with regard to the risks they were suffering. This monitoring were based on warning systems, sensing networks and remote sensing, Geographical Information System (GIS), systems of indicators and multidisciplinary monitoring, among others. Of the respondents, 92% recorded data in the last event and normally this was done through their own data collection networks and empirical analysis.

All the cases analysed developed management strategies taking into account the past experiences. These management strategies included the creation of risk management models, defence programs, incorporation of new prevention techniques, construction of new infrastructures, plans of emergency, increased risk perception in the population, the improvement of monitoring networks and simulation models, among others.

Block 3: Risk management



Part of the risk culture created among the MSPs involved the improvement of risk assessments (see figure 6.2). Risk mapping and regular monitoring were the most used measures which could be responsible for this improvement. They were even mandatory in many cases. In some of the analysed MSPs, these measures were so deeply anchored in their risk culture that examples of their use can be seen to span back to the first half of the last century. Other measures widely used in the analysed MSPs were knowledge and technology transfer, information and networking, and future climate simulations. Noticeable has been that economic monitoring of losses has not formed part of their usual instruments for monitoring risk. This was most likely due to economic loses normally being accounted long after the catastrophic events have taken place. In addition, and due to the continuous improvement in risk minimization in many cases, economic losses varied from one event to the next, both in quantity and location, complicating the monitoring process.

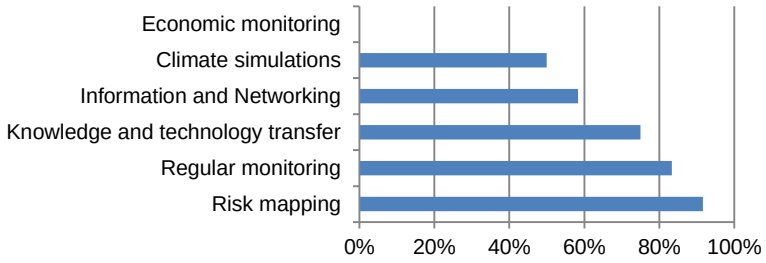


Figure 6.2 *Policies implemented to improve risk assessment*

Most analysed institutions implemented risk management and emergency plans as part of their risk preparedness plans (see figure 6.3). In most cases these plans were more than 10 years old. Risk management plans were mandatory in 60% of the cases meanwhile emergency plans were mandatory in all of the cases. The transfer of knowledge was used in more than half of the analysed cases due to the desire to become more prepared and discuss the sharing of responsibilities. Through the transfer of knowledge, perceptions were

assessed and information on causes and consequences was developed and provided to the stakeholders.

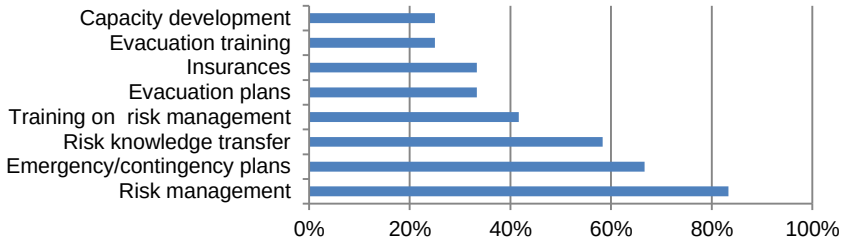


Figure 6.3 *Policies implemented to enhance risk preparedness*

Awareness rising, as a measure to support prevention and mitigation, has been implemented for more than 10 years in 50% of the cases. Currently, it is a measure implemented by 92% of the cases. At the opposite end (see figure 6.4), insurances were used by only 17% of the cases, sometimes because the legislation has not allowed this measure in certain fields, and at other times the perceived low effectiveness resulted in non-use. Measures such as knowledge and technology transfer (utilised in 75% of cases) proved that previous assessments and preparation helped to mitigate risks, though it was also important to detect the risk in advance.

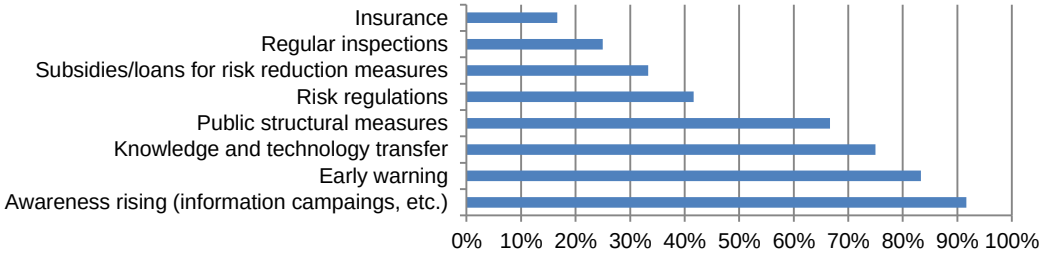


Figure 6.4 *Policies implemented to support prevention and mitigation*

Long-term post-disaster policies and compensations funds achieved the major implementation programmes to ensure recovery after a disaster event (see figure 6.5). Though, as figure 6.5 shows, they have represented only 36% of the total of cases analysed, i.e. the measures to ensure recovery did not characterize risk management in those partnerships and thus in these risk cultures. After the disaster, emergency plan updates with the accumulated experience proved to be important. The partnerships involved in this study have not provided economic support to the affected population, and instead national governments frequently stepped in.

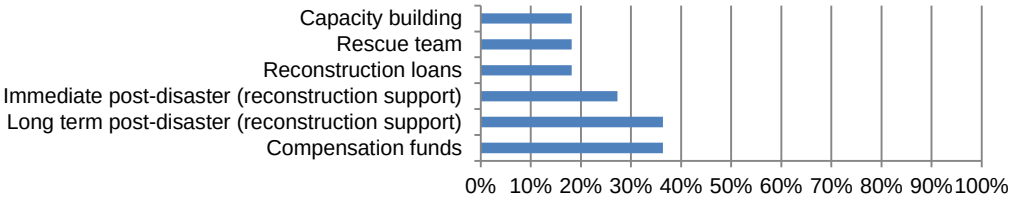
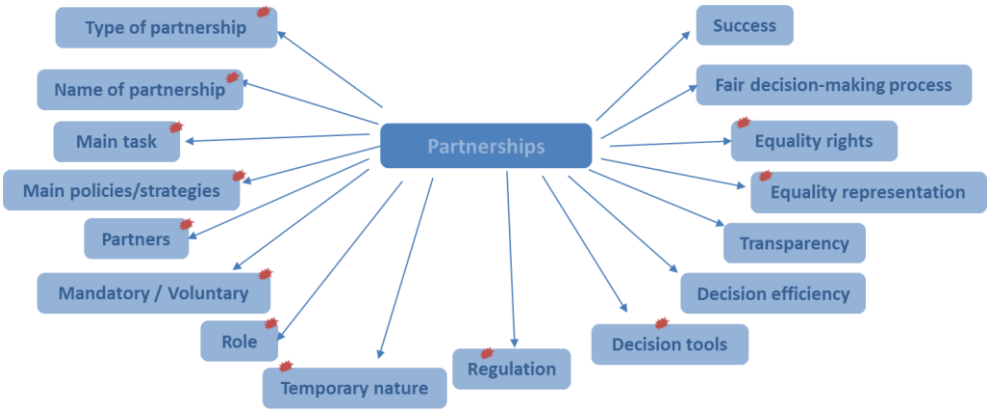


Figure 6.5 *Policies implemented to ensure recovery*

National Platforms for disaster risk reduction are responsible for the coordination of actions oriented to develop guidelines for monitoring and management, to foster agreements between stakeholders, to develop information and its dissemination, and to provide financial support for the implementation of all tasks at the regional and local level. This implementation process was usually carried out through conventions, project evaluation, monitoring committees, governmental funds and mandatory insurance of properties. 70% of respondents knew of the existence of National Platforms in their countries. These generally involve public and governmental entities, civil protection departments, universities, infrastructure businesses and environmental agencies, among others.

Block 4: Multi-Sector Partnerships (Partnerships)



The participation of experts in networks constitutes the major involvement of the organizations analysed in MSPs (see figure 6.6 for other types of partnerships). 80% of the cases have identified and recognised MSPs in which the partnerships analysed have been working cooperatively for over ten years.

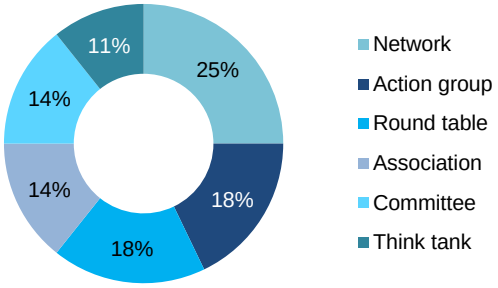


Figure 6.6 *Type of MSPs that manage natural risks*

The tasks developed within these partnerships have especially coordinated actions to prevent and forecast risks, analyse perceptions, exchange knowledge and experiences as well to define rules of management, group organization, monitoring evaluation, conflict resolution (discussion) and minimization of hazard effects. These tasks have been achieved thanks to strategies of knowledge and experience sharing (40%), involvement in working groups i.e. meetings and common exercises (more than 50%), and training and research activities (50%). The role played by the institutions within the partnerships was to provide information and knowledge as well as data. These institutions were in some cases also representatives of stakeholders. The MSPs have been shaped by partners from different sectors and fields.

These MSPs mainly used database (22%) and mapping (18%) as support tools to decisions making processes (see figure 6.7). Those tools represent measures to face the risk.

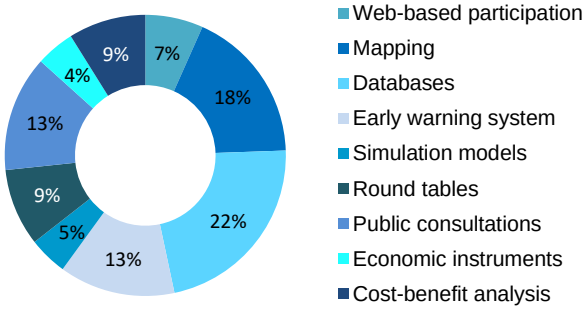
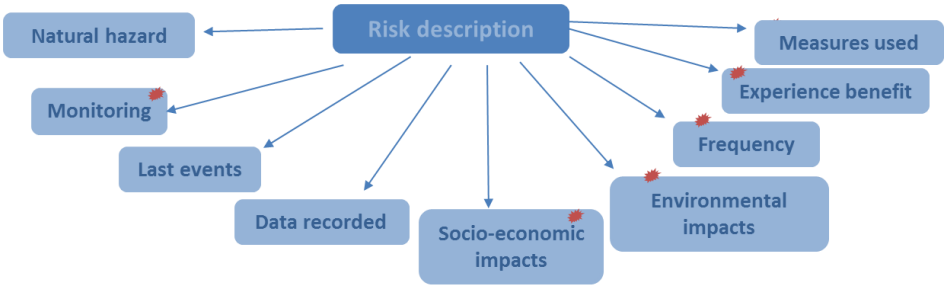


Figure 6.7 *Tools used to support the decisions within the partnerships*

In 75% of the cases the decisions making process was democratic (*e.g. the members had an equal right to vote and to be active in the decision making process, as well as to be equally represented in the partnership*). MSPs have been identified as generally voluntary, except some partnerships focussing on civil protection. Almost 60% have been regulated by official legislation.

6.2.1.2. Perceived risk results in European context

Block 2: Risk description



All of the systematic monitoring used by the analysed partnerships were considered important by the partnerships in order to effectively manage the risk.

According to the organizations analysed, the main socio-economic impacts they suffered in the last relevant event were loss of production (43%), followed by the damages of houses and loss of jobs. With regard to environmental impacts the greatest were land degradation (26%) and loss of ecosystem services (22%) (see figures 6.9 and 6.10).

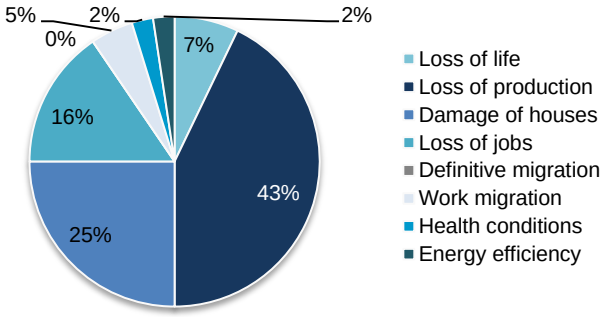


Figure 6.8 *Socio-economic impacts*

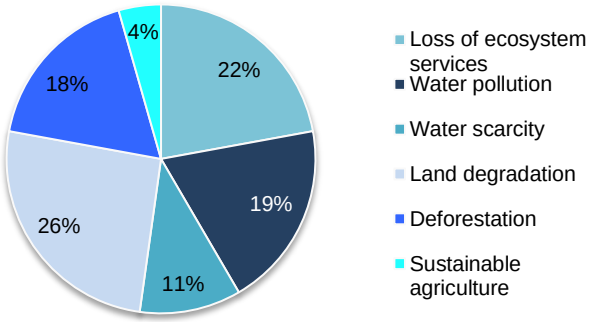


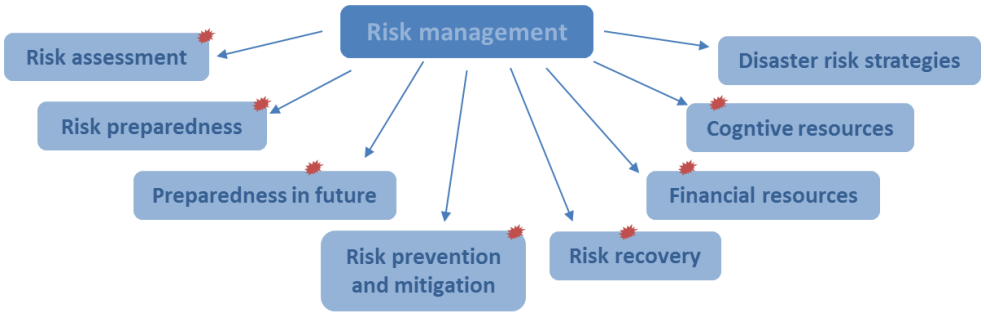
Figure 6.9 *Environmental impacts*

Almost all (85%) respondent believed that there will be an increase in the frequency of disasters. The reasons are different depending on the natural hazard and the region in which

they managed the risk situation, but mainly these have been stemmed from the increase or decrease of precipitation; sea level rise; intensification in climatology intensity; increase of human settlement in some areas and even human abandonment in others; deficiency in infrastructures; and especially climate change.

Past experiences have helped the management of subsequent events in 100% of the cases. From these experiences the partnerships have learnt which strategies were more effective than others or which kind of policy was better to use for which occasions (*e.g. land use planning and construction of the structural defence programme in the Po river Basin in Italy; higher dikes, and more hard constructions and barriers in the Wadden Sea cost*). Nevertheless, two events have been never identical, meaning management should always vary.

Block 3: Risk management



The respondents were asked to give their opinion about the effectiveness of the policies in use with regard to risk assessment, preparedness, prevention and mitigation, and recovery. These perceptions on policy effectiveness allow observation on whether the risk cultures reflect perceptions and if perceptions modify risk management in subsequent events. All the percentage expressed in the following four phases of risk management address the full compilation of cases (100%) using the specific measure analysed, and not the whole sample of cases analysed through the questionnaire.

Information and networking is perceived as the most effective measure in risk assessment (97%). At the opposite end, *climate simulations* are seen as the least effective measure. Though the percentage of case studies perceiving such simulations as effective still stands at 72% (see figure 6.11). Furthermore, 85% of the cases used *regular monitoring* against the 58% that used *information and networking* (see figure 6.2) and from these percentages it can be considered that in general, *regular monitoring* was the most effective (85%) as a

measure to improve risk assessment. That provides the conviction that this is a measure that will be further used for its effectiveness perception.

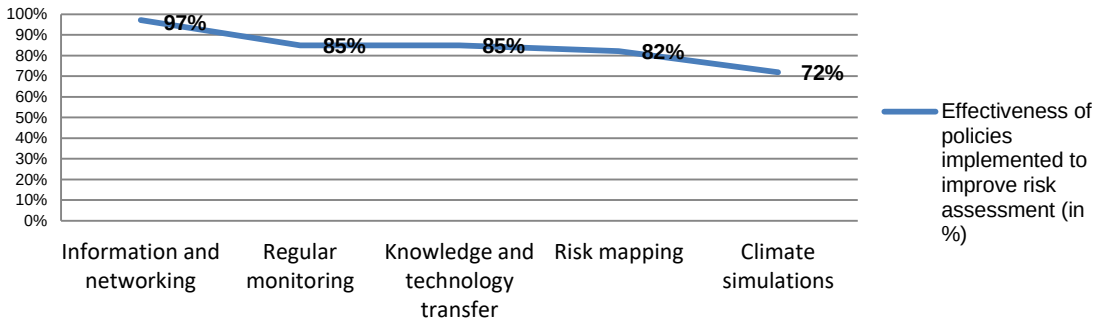


Figure 6.10 *Policies effectiveness to improve risk assessment*

In the opinion of the representatives of the institutions analysed, in order to enhance risk preparedness the most effective policy should be to have an appropriate *risk management plan* (62%) that also served as the policy most frequently used (83%). The range of effectiveness with regard to risk preparedness strategies was very broad, running from 62% in *risk management plans* to 22% in *evacuation training* (see figure 6.12). Of the respondents, 83% considered their organizations to be better prepared to manage a risk in the future if they compare their current management with previous events. In only 8% of the cases were perceived past events as well prepared as in the present (*e.g. the Austrian case study opines that the preparation, processing and handling of the last events was extremely efficient and professional, which confirm their perceptions with regard to the past events to be sufficiently prepared*). Nevertheless, even though the current perception of these policies can determine the future application of them, the deficit in the economic situation often has influenced the implementation in a negative manner *(e.g. in the Italian case study the policies were called into question due to the reduction in funding and the cuts of services and staff which might determine the future management*).

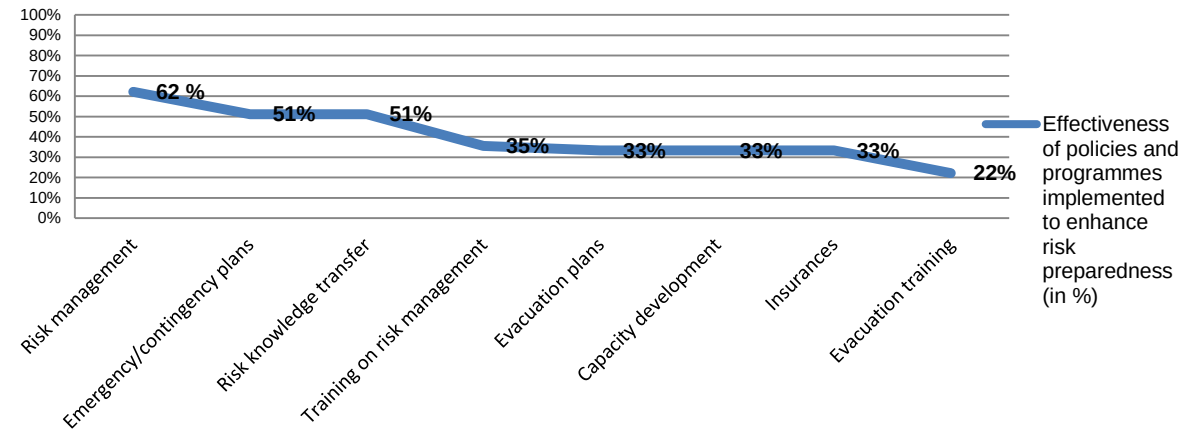


Figure 6.11 *Policies effectiveness to enhance risk preparedness*

Across all partnerships, 92% implemented *awareness rising* (see figure 6.4) as a measure for risk mitigation, of which 88% considered this as an effective measure. Nevertheless, the curve of effectiveness of prevention and mitigation measures has highlighted *insurances* as the approach with the greater percentage of effectiveness (see figure 6.13). However, at the same time, only 17% of the analysed institutions used *insurances* as a measure to support prevention and mitigation (see figure 6.4). This shows us that in the future more partnerships will redistribute risk through insurances.

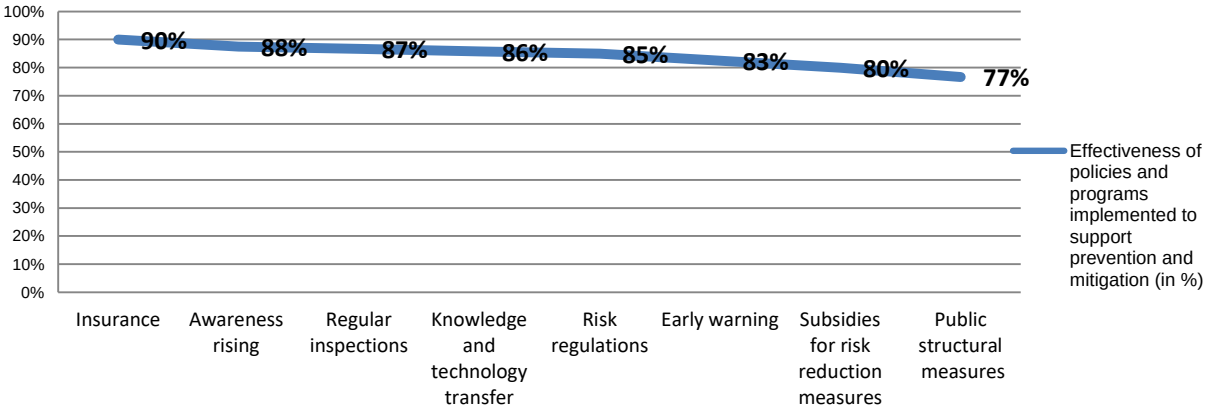


Figure 6.12 *Policies effectiveness to support prevention and mitigation*

Taking into account that compensation funds have been one of the two more commonly implemented policies to recovery, it is interesting to remark that it was not seen as one of the most effective by the organizations which participated in the questionnaire (see figure 6.13). Perceptions of policies implementation sometimes show a difference between the measures chosen for use and their actual levels of success, i.e. not every measure with a high degree of use means that the measure is perceived as more effective. One of the

measures that has been lower used (18%) but with a perception of high effectiveness (80%) is capacity building. The institutions that affirmed to have used this measure have been implementing it for more than 15 years, which shows the level of importance given to it.

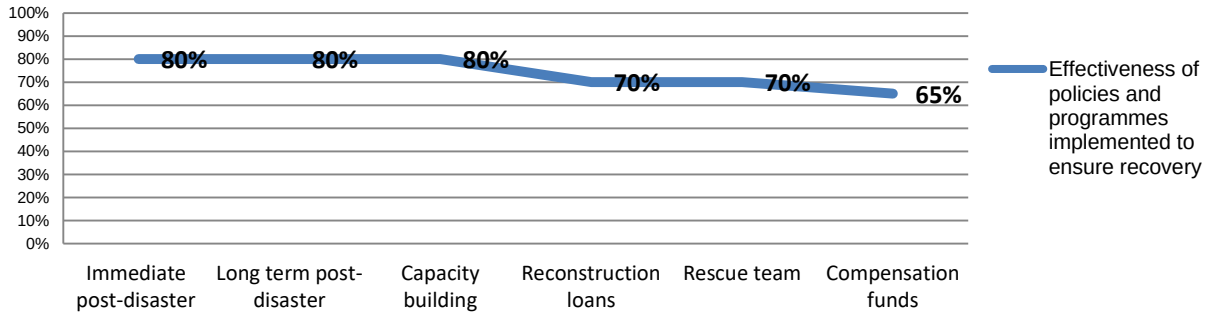


Figure 6.13 *Policies effectiveness to ensure recovery*

Financial and cognitive resources were also important considered with regard to risk management. The respondents were asked about the effectiveness of financial and cognitive resources in their organizations. They answered in relation to the development of policies, implementation of policies and monitoring of the outcomes of these policies to manage a proper working process designed to face risks. They opined that financial resources were one of the most important aspects for managing risk. Most respondents considered the monitoring of outcomes as very effective (see figure 6.14). It was already mentioned in last sub-section the importance that these organizations gave to the monitoring process. Almost all of the analysed case studies affirmed that their organization or MSP carried out systematic monitoring, and in some cases they have done so for more than 70 years.

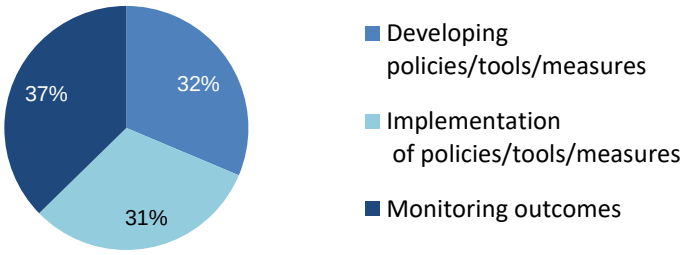


Figure 6.14 *Financial resources effectiveness*

On the other hand, the best cognitive resources for achieving a proper working process to face the risk fall within the implementation of policies and tools to manage the risk, but as it also happened with financial resources effectiveness, answers here showed barely differences (see figure 6.15).

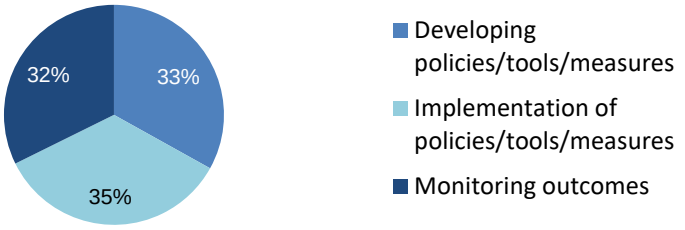
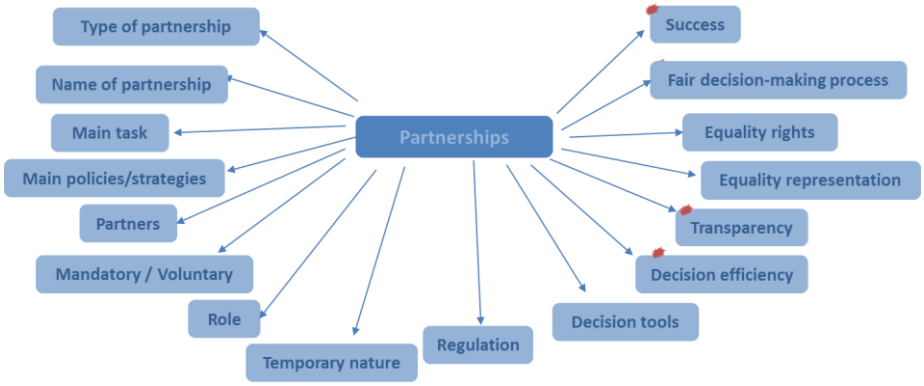


Figure 6.15 *Cognitive resources effectiveness*

Block 4: Multi-sector partnerships



The decision making process within the MSPs was perceived as efficient (78%), mostly being transparent (80%) and fair (72%).

Of the institutions' representatives, 81% considered the MSP in which their institutions are involved as quite successful. No one described them as being unsuccessful.

6.2.2. Analysis of the Jucar River Basin

Once the questionnaire on risk perception was implemented and analysed in the European context, a specific analysis in the JRB was done. In this case, it was important for the study to have more specific insights of the JRBP perceptions and the cooperation of institutions in MSPs for two precise reasons.

Firstly, for the aim of having a particular vision of how the risk perceptions influence risk management, as well as using this to determine and confirm the patterns showed by different cases in a general European context. Secondly, this specific analysis of risk perception was also carried out with the intention to focus the study on a single case study. That allows the initiation of the second research pillar of this study. This research pillar investigates if the MSP, which manages droughts in the JRB, has an effective governance performance.

For achieving these aims, a short version of the questionnaire was implemented in several institutions of the JRBP. This version includes the identification of the risk, i.e. droughts, and its impacts; the four kinds of risk management policies and their effectiveness; as well as some insights about the MSP in which all of them are in some way involved. This concise version of the questionnaire on risk perception was sent by e-mail in November 2015 to different stakeholders participating in the Jucar River Basin Drought Seminars[44]. The following institutions of the JRB responded:

1) **EMIVASA**. Empresa mixta valenciana de aguas. Public-private partnership in charge of supplying water in the metropolitan area of Valencia.
2) **Valencia Municipality**. Public partnership whose purpose is the water supply and sanitation of the city of Valencia.
3) **Iberdrola**. Private partnership for energy hydropower.
4) **Acequia Real del Júcar** (in English Jucar Royal Ditch). Partnership of irrigators of the Jucar Royal Ditch.
5) **AGROSEGUROS**. Public-private partnership of agricultural insurances (22 insurances, companies and the government).
6) **Junta Central de Regantes de La Mancha Oriental**. Partnership of irrigators in La Mancha Oriental Aquifer.
7) **USUJ**. Unión Sindical de Usuarios del Júcar (in English Jucar Users Union). Partnership of traditional irrigators of the Jucar (see number 4 of the present list) and Iberdrola (see number 3 of the list).

In following sub-chapters, figures and comments related to the results are used to facilitate the visualisation and understanding of the culture of risk in the JRB as well as the risk perceived.

Cultures of risk are determined here by the use of policies intended to manage future risks, observing their perceived effectiveness which could vary between one institution and another. But also, aspects such as the organization and cooperation are included in this part. The perceived risk also includes, apart from effectiveness perception of policies, perception on impacts and their intensity, views on future conditions and opinions regarding the MSP.

[44] Expert's seminar about the drought situation in the JRB performed yearly since 2012 and organised by the IIAMA (Research Institute of Water and Environmental Engineering, Technical University of Valencia, Spain).

All the results are presented not only as comparison between the opinions, practise or perception of specific partnerships, but by the average of all the analysed partnerships or institutions to provide a complete outline of the case study.

6.2.2.1. Cultures of risk in the Jucar River Basin

The principal risk detected by all the respondents in the JRB is drought, as well as floods and water quality, the latter being a consequence of the frequent droughts. Nonetheless, all the subsequent responses took drought as the focus.

The roles played by the institutions analysed cover, among others, water supply and sanitation in the city of Valencia, hydropower generation, defence of irrigators and other stakeholders, water management, coordination of water rights in the Jucar River, union of users, and agricultural insurance management. This last, for its special characteristics, is analysed and described in an independent section.

The management strategies implemented by the partnership are mainly focused on droughts management. These strategies are categorized into the four phases of the risk management cycle, as done in the previous sub-chapter, regarding the selected cases in Europe. These four phases are here risk assessment, risk preparedness, risk prevention and mitigation, and risk recovery. For every phase several policies are in use, some over long periods of time, and others have more recently arisen from the perception of improving the risk management to reduce vulnerability.

RISK ASSESSMENT

More than the 80% of the stakeholders used *knowledge and technology transfer* as a strategy for risk assessment, followed by *information and networking* (see figure 6.16). Knowledge transfer taking place over many years as well as the extensive cooperative work with other stakeholders to manage the risk, result in these two approaches being the most commonly applied. Nevertheless, other policies were also used, such as regular monitoring carried out over many years by the MSP (50%) and risk mapping (33%) which can be checked by anyone who wishes via the archive of the JRBP. There are also two institutions that used climate simulations to foresee future conditions and assess risks arising from future events, as well as economic monitoring to evaluate the economic trends during these events.

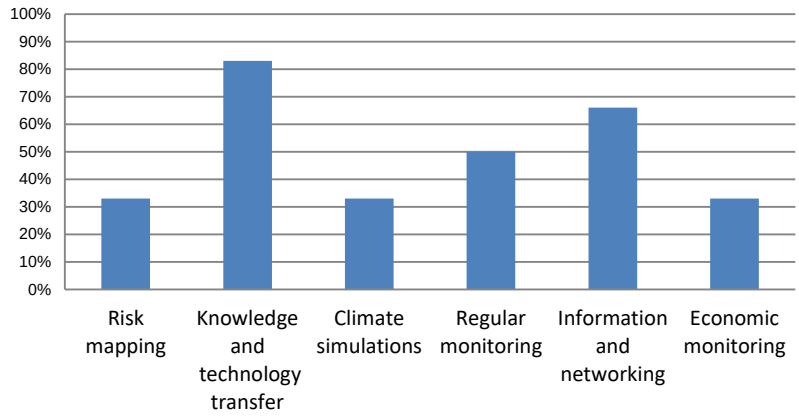


Figure 6.16 *Policies implemented to improve risk assessment in the JRB*

RISK PREPAREDNESS

Risk knowledge transfer has been the most commonly used strategy in risk preparedness with 71% of the analysed institutions (see figure 6.17) applying it. At the opposite end, training on risk management can be found (14%). This was backed-up by the fact that the managers in the JRB partnerships had a high level of educational preparedness on water management and also had a lot of experience on risk management. Therefore, the low percentage of training programs has been not negative. Risk management plans were implemented in more than half of the partnerships (57%), however it is important to mention that the JRBP[45] exerts the major effort in this area. Furthermore, it is also important to highlight that insurances as a risk management strategy, are reflected separately in this analysis (see insurance section and the end of sub-section 6.2.2.1). Thus the partnerships analysed do not consider them as policies that they have used as an organization.

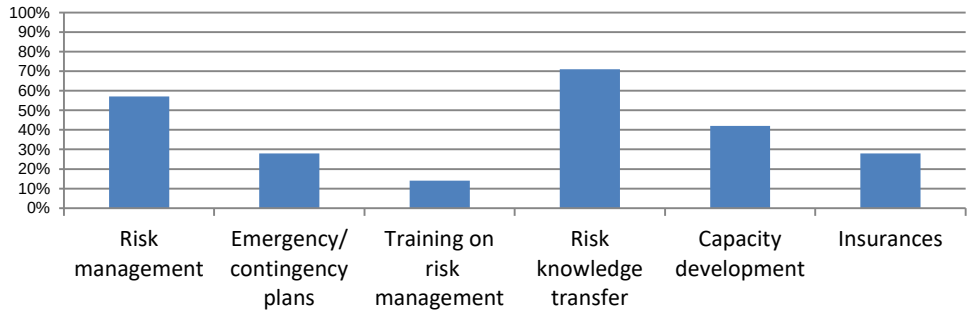


Figure 6.17 *Policies implemented to enhance risk preparedness in the JRB*

[45] The JRBP was not included as a single entity in this analysis.

RISK MITIGATION

The most frequent policy used to mitigate and also prevent drought has been early warning (used by 85% of the cases), followed by public structural measures and knowledge and technology transfer (see figure 6.18). This latter was often used in all risk management categories. This has demonstrated the high level of cooperative work as well as the usefulness of what has been done previously. Besides knowledge and technology transfer showed a high confidence (71%) in traditional management (*e.g. culture of transferring knowledge over generations*). Protection and awareness campaigns were also quite regularly used (57%); the latter also allowed the transfer of knowledge as well as the sensitization of the stakeholders to the risk and its consequences. Moreover, this strategy provokes more responsiveness to help with drought mitigation through sensitization.

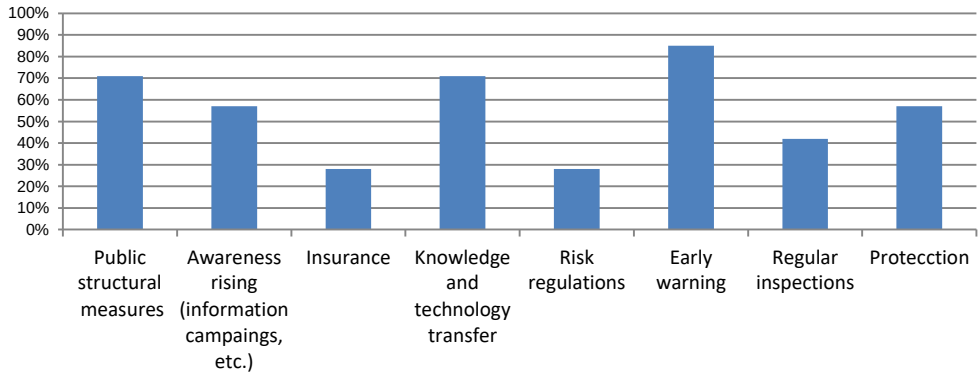


Figure 6.18 *Policies implemented to support prevention and mitigation in the JRB*

RISK RECOVERY

There was a very low implementation of risk recovery strategies in the JRB, decreasing the percentage from 15% to 30% when the other management categories showed percentages of over 50% (see figure 6.18). Capacity building can be highlighted in this case as comparable to the other cases in Europe, in that it represents the least frequently implemented policy (see section 6.2.1). Nevertheless, over half of the respondents (57%) confirmed not using recovery policies. These policies have been implemented by the government through the JRBP and by insurance companies (see next section).

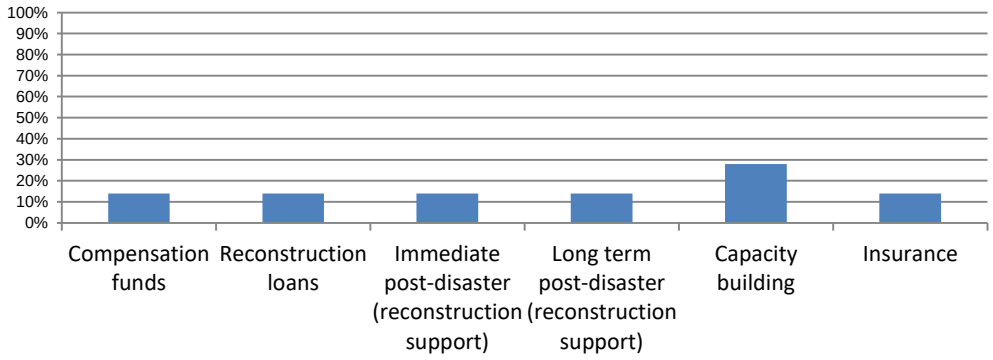


Figure 6.19 *Policies implemented to ensure recovery in the JRB*

All the institutions participated in the MSP of the JRB[46], i.e. JRBP, and all of them have water use representatives in the PDC every time it has been established. 100% of the institutions say that they had equal representation within the MSP. However, the weight of the JRBP has been always higher.

Insurances in the JRB context[47]

The institution analysed is a partnership that encompasses an alliance between insurances companies with the purpose of reaching a competent technical, technological and financial capacity for managing natural hazards. This alliance aims to achieve greater dimensions of protection and assurance in insurable production as well as in insurable risks throughout the whole Spanish territory. Furthermore, this partnership is part of a public-private system arisen from Spanish legislation in order to define alliances between public institutions, farmers and the insurance sector. The analysis was facilitated through a distinct questionnaire in which only the questions with regard to insurances were taken into account for the analysis of the JRB's stakeholders. The other significant responses are included in this section. This partnership considers risk to be all the natural events derived from meteorological conditions causing damage to insurable areas of production such as agricultural, livestock, aquaculture farm and forestry. The partnership considered the use of insurances as an effective risk preparedness policy, as well as a prevention and mitigation strategy.

[46] Excluding AGROSEGURO, which has not been included in this part of the analysis.

[47] It has been considered interesting to include this section within the cultures of risk in the JRB due to the importance nowadays of this management strategy to handle risks emerged by natural hazards. The section has been developed using the testimony of a Spanish public-private partnership which control the agricultural insurance sector in Spain and consequently in the JRB. AGROSEGURO -Spanish pool of agricultural Insurances- is a management entity which encompasses 22 insurances companies and the government (Agroseguro, 2014).

Regarding financial resources this partnership supported the redistribution of financial responsibility of risk through insurance policies but these measures have been a clear mechanism of mitigation a posteriori. This consideration was due to the fact that they were used after a loss for compensation, proportional to the risk capital and the warranty taken out. Considering that the national government can endow aid through assistance programs after the damages have occurred, the insurance development could be promoted, or alternatively even limited, as a risk management tool depending on the policies and programs implemented.

On the other hand, with regard to the knowledge and skills resources that this partnership possessed, the following resources have been highlighted (see table 6.3). These resources and their percentage of effectiveness, have demonstrated the high knowledge and skills of this partnership available for the proper management of risk.

Table 6.3 *Cognitive resources effectiveness in agricultural insurance (Spanish context)*

Cognitive resources	Effectiveness percentage
Risk information	90%
Damages information	90%
Vulnerability and production information	80%
Technical and human resources	90%
Technical and economic solvency (reinsurance)	100%

This partnership is the only one from those analysed that is not part of the MSPs of the JRB. But it does cooperate with several stakeholders in the JRB, namely those who represent the agricultural users of the water.

The agricultural risk management has been considered to be a complex task if it is proposed as a strategic objective to reach universal usage. To achieve a level of solvency and equilibrium different factors are required, such as a public-private participation system and a progressive period of establishment. After 35 years in Spain, a high level of development of this strategy of risk management has been reached.

6.2.2.2. Perceived risk in the Jucar River Basin

Most perceptions on natural hazards and consequently the way to manage the hazard end up being part of the culture of risk management. That is the case of impacts perceptions which determine which management strategies to use in order to focus on the assessment, preparedness, mitigation and recovery of those impacts.

Regardless of the socio-economic impacts caused by droughts in the JRB, the sample partnerships considered loss of production as the higher impact, which is also true for the European cases analysed before (see figure 6.20 and figure 6.8 for comparison). This impact was followed by the increased prices, caused by this loss of production which occur sometimes, but mostly by the scarcity of water which increased demand and triggers an increment of rates.

Energy efficiency has had also a higher impact due to the fact that water was used for generating energy. Even though the use of water for energy in the JRB has been non-consumptive, in cases of restriction to the irrigation sector in a drought episode, these restrictions also have affected the energy sector because they used the same water.

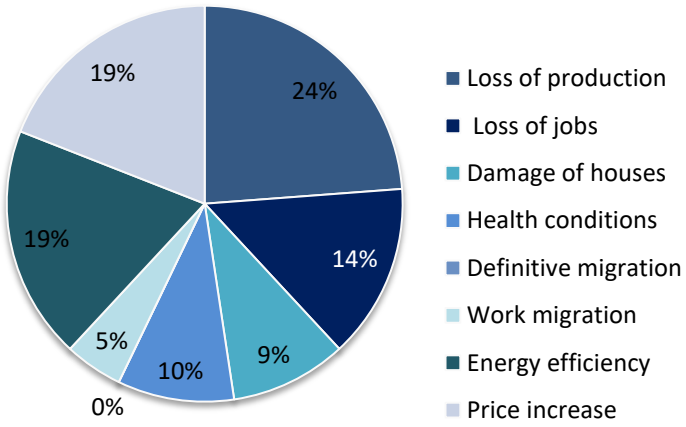


Figure 6.20 *Socio-economic impacts in the JRB*

Besides socio-economic impacts, some environmental impacts were also a consequence of droughts. The highest environmental impact perceived in the JRB has been water scarcity, followed by water pollution and land degradation (see figure 6.21). In the case of droughts in the JRB, loss of ecosystem services represented a lower impact if it is compared to the analysis in the European context in which different natural hazards were included. This is

due to the fact that through the river basin plan there is a minimal ecological flow established that protects the natural habitat of the JRB.

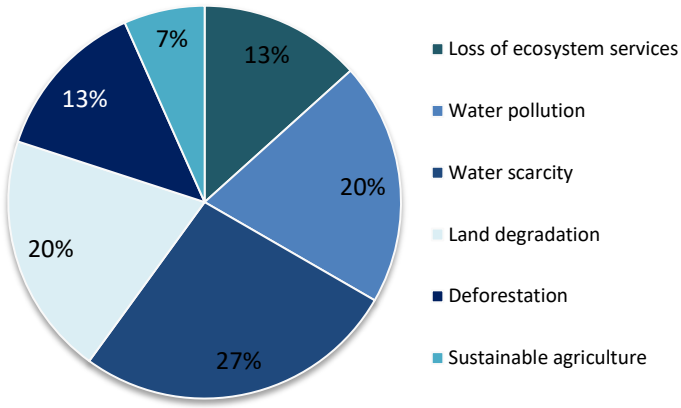


Figure 6.21 *Environmental impacts in the JRB*

Since 1980, data have shown the clear trend of water reduction as a resource in the water systems due to exploitation (see figure 6.22). This supported the perception surrounding an increase of the drought frequency. This decrement of this resource has been compensated partially with the modernization of infrastructures (*e.g. modernization of the Jucar Royal Irrigation Ditch*) and the reduction of exploitation (*e.g. reduction of water removal in the Mancha Oriental Aquifer*). However, the increase of demand expected by the Jucar Hydrological Plan leads to a structural drought situation in the JRB.

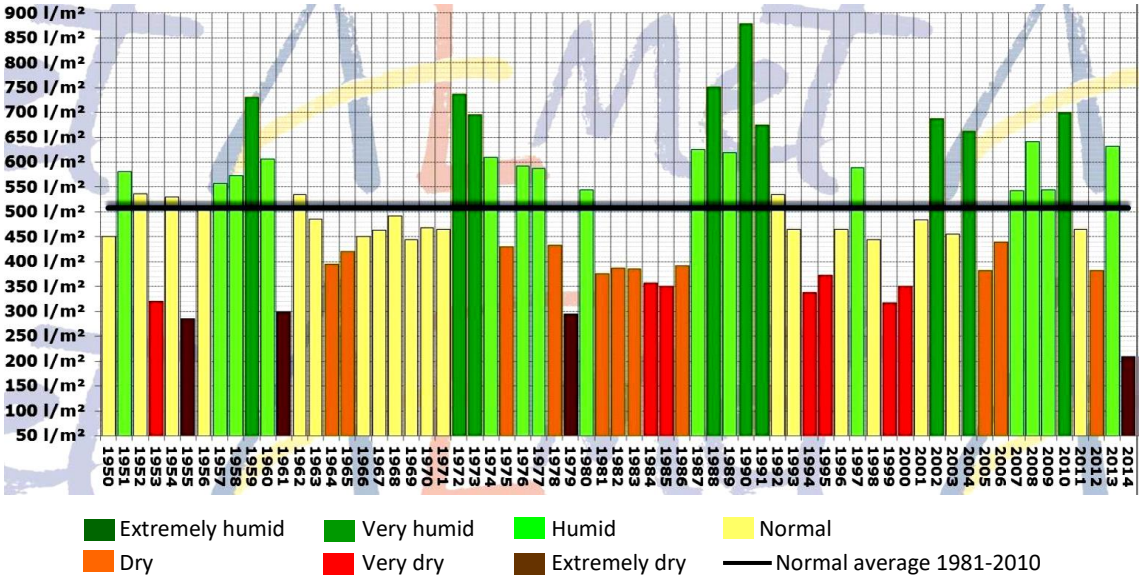


Figure 6.22 *Annual precipitation average in the Region of Valencia (Nuñez Mora, 2015)*

RISK ASSESSMENT

Among the implemented policies in the JRB, the one perceived as most effective is *risk mapping (100%).* However, as *information and networking* and *knowledge transfer* were implemented in 66% and 83% of the cases respectively, the fact that risk mapping implementation stood at only 33% denotes an imbalance between effectiveness and the usage (see figure 6.23). Nevertheless, it is important to highlight the effectiveness perceived by these cases in risk mapping as a strategy for risk assessment that could mean an increase in the use of that strategy in the future. As seen in the figure, at the other end of the scale, *economic monitoring* and *climate simulation* as effective policies were also rarely implemented (under the 70%) and not even considered as being very effective.

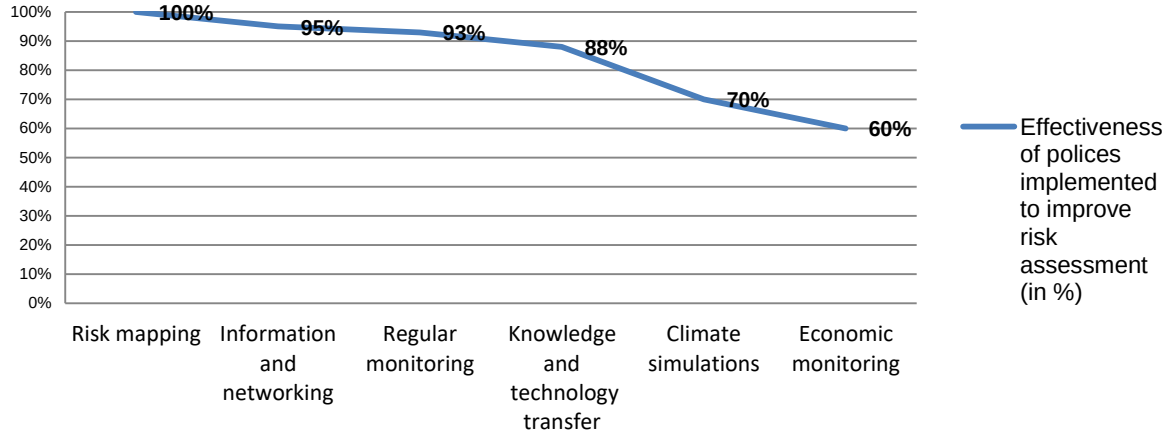


Figure 6.23 *Policies effectiveness to improve risk assessment in the JRB*

RISK PREPAREDNESS

The most effective policy for enhancing risk preparedness has been considered *emergency plans* (see figure 6.24). But considering the relation between the effectiveness perception and the implementation of those policies, *risk management*, *risk knowledge transfer* and *capacity development* are all considered for this study as more effective. Despite its low implementation, 70% of respondents considered insurances as effective.

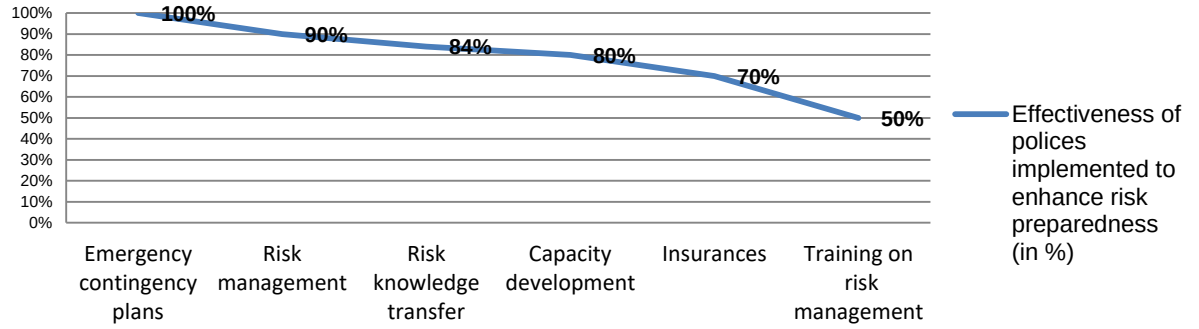


Figure 6.24 *Policies effectiveness to enhance risk preparedness in the JRB*

RISK MITIGATION

All the policies implemented by the JRB institutions were considered effective. The most effective were *protection* (95%) and *awareness rising* (90%) (see figure 6.25). Nevertheless, contrary to the other case studies analysed, *insurances* were considered to be the least effective (see figure 6.12).

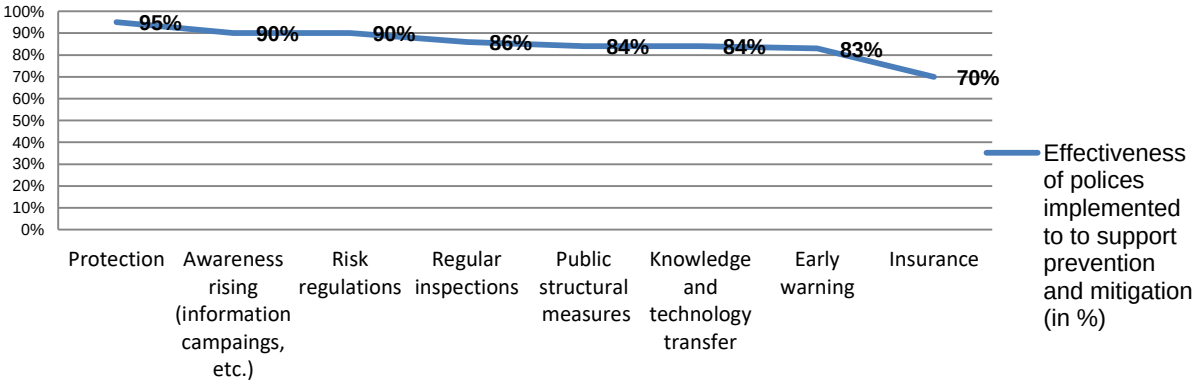


Figure 6.25 *Policies effectiveness to support prevention and mitigation in the JRB*

RISK RECOVERY

Despite the fact that *insurances* have been considered as an effective policy measure to ensure risk recovery, they were not perceived as effective as compensation funds (100%) and capacity building (100%) (see figure 6.26). Insurances were not the most frequently used due to the fact that governments offer *compensation funds*.

The *capacity building* perception allows for the belief that building and developing capacities provides more outcomes, not only for recovery after a risk event but also for preparedness for future events.

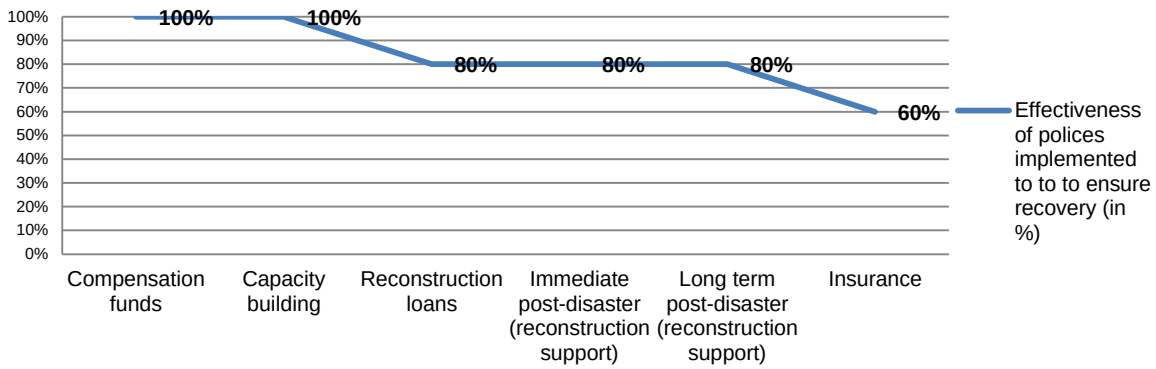


Figure 6.26 *Policies effectiveness to ensure recovery in the JRB*

FINANCIAL AND COGNITIVE RESOURCES

With regard to the resources for managing the working process facing risk, the institutions analysed highlighted the importance of previous experience as a cognitive resources that they possess.

In reference to the MSP, here the JRBP, the analysed institutions perceived the decision-making process as well as the transparency of that process highly effective (76%). The decision making process additionally was perceived as a fair practice by 70% of the cases.

The 80% of the institutions analysed considered the JRBP very successfully.

CHAPTER 7

Governance performance in the Permanent Drought Commission

After the analysis of the risk perception research pillar, it has also been considered important to check the governance performance. This has been done through the assessment of governance structures which make decisions on risk management in a specific case study. During the analysis of the risk perception research pillar the fact that perceptions drive management strategies has been confirmed. These management strategies were implemented by the different MSPs to face the risk situations they deal with. Consequently, for this study it has been considered significant to observe whether decisions and control of the action performed by MSPs are effective enough.

The current chapter responds to the second part of the objective of this study (see sub-chapter 1.1). Thus, this chapter includes the analysis of an MSP in which different partners decide what to do, and how to deal with risk situations. Governance represents, on the one hand, the 'What', that is, what one MSP does and what it should become in the future. On the other hand, management determines the 'How', that is, how MSPs will reach those aims. Governance is more related to plan and ensures the implementation of those strategies. In governance, decision-making and control of the process play a big role. The reason for assessing governance performance in MSPs is to see if it is effective or in which aspects they could be improved.

Therefore, the intention of the governance research pillar is to prove whether those management strategies that have been driven by the perceptions have effective governance. That is, if risk management planning is effectively governed in MSPs. The analysis for observing and assessing governance function has been done through the five capitals of the CAF. Those capitals provide five points of view to cover all aspects of the assessment as much as possible. To make the CAF implementation possible, the in-depth case study has

helped. To condense the analysis and make it more viable and reliable for the purpose of this current study it has been carried out only in one MSP, that of drought management, by the Permanent Drought Commission (PDC) of the Jucar River Basin (JRB).

Through the response of each indicator in the CAF's list, governance performance has been evaluated in the PDC. Additionally, through that implementation the CAF, as a methodological framework, has also been validated for reducing potential limitations.

The current chapter presents the process of developing and implementing the CAF indicators as well as the data gained from the PDC and its analysis. The description of the development and implementation starts with the definition of the PDC in accordance with the concept of MSP and the five capitals. After that, the process for developing the tool is presented. That encompasses the first version of the CAF and its improvement in order to be the second and final version here presented. Finally, this chapter includes the final implementation characteristics and results of the second and final version of the CAF.

7.1. The Capital Approach Framework (CAF) in PDC

The CAF is a methodological framework developed to assess governance performance in a coherent manner. The theoretical background of CAF, as presented in sub-chapter 4.2, has its roots mainly in the Capital Approach Theory (Smith, 1776; Bebbington, 1999; Goodwin, 2003), the Capability Approach (Sen, 1983) and the Sustainable Livelihood Framework (Scoones, 1998; DFID, 1999).

The five CAF capitals, i.e. social, human, political, financial and environmental, provide information from different spheres to better evaluate the governance in MSPs. Each capital facilitates information about its current status with regard to governance. The evaluation provided by this tool can facilitate the improvement of weak factors founded.

7.1.1. MSP characteristics of the PDC

The definition of the MSP[48] is fragmented in 11 characteristics. The PDC have been analysed using these characteristics, presented in Table 7.1.

[48] For the definition of MSP see chapter 1, p. 2.

Table 7.1 *PDC check list of Multi-Sector Partnership's characteristics*

Characteristics MSP	PDC in the JRB
Voluntary Commitment	✔
Enforced by law	✔
Public-Private	✔
Civil society participation	✔
Enforceable commitment (workable)	✔
Temporary	✔
Long-lasting	✔
Sharing same goal (mutual benefit)	✔
Reducing risk (Emergency measures…)	✔
Include different productive sectors	✔
Strong governance structures (Coordination, supported by a system of rules, norms, conventions, etc.)	✔

The fact of fulfilling all MSPs characteristic denotes that the PDC certainly forms a real MSP. The PDC appears as a voluntary MSP in the 1980s and years later was established by official legislation[49]. The term 'multi-sector' applies because of the 14 public and private partnerships and institutions that are members of the current Commission, last formed in 2015 (see Appendix D). But not only public and private character of the partners means the PDC is multi-sectoral, they also belong to different productive sectors.

Even though the PDC represents a long-lasting cooperation since 1981, it was convened as a temporary measure when the drought special alarm system (indicators system) within the Drought Special Plan (DSPs) detect a drought event. Therefore, the commission is not always shaped by the same members. They can be changed from one term to the next. As previously mentioned, during normal periods or even in drought periods before the PDC is convened, the Jucar River Basin Partnership (JRBP) is in charge of water management. The fact that both MSPs share the same executive board benefits the PDC in achieving strong governance structures.

7.1.2. Description of the five capitals in the PDC

The following table 7.2 shows the adjusted CAF five capitals for the PDC. This facilitates the later allocation of factors and indicators for analysing the governance performance of the PDC.

[49] See more information in sub-section 5.2.7.2

Table 7.2 *Capitals description according to the PDC*

Capital	Description
Social	Involves the relationships between the members of the Commission coming from different institutions and sectors. It includes meetings, forms of communication, as well as shared norms and values. The interactions of the members have an effect on the partnership decisions and activities and influence the well-being of the Commission.
Human	Encompasses the addition of the individual skills -*capabilities*- and knowledge -*learning*- of the Commission's members. In total in 2015 there were 14 individuals being part of the Commission (RD 355/2015).
Political	Focuses on the governmental processes within the Commission, led by the president of the Commission (the same as the one of the Jucar River Basin Partnership) and performed by the members of the Commission (10 members with right to vote and voice; plus 4 members with no right to vote). This capital includes laws, rules and norms coming from the Government. There is no chance to shape the Commission and make decisions without the official publication of that in a Royal Decree.
Financial	Involves economic issues, which are covered by the resources allocated to the administrative bodies and public organizations represented in the Commission (that no alter to the public spending).The JRBP is in charge of funding possible control mechanisms implemented during the dry period. The Commission might penalize the users who do not obey the water restrictions.
Environmental	Comprehends the actions and decisions to favour the quality of land and water -crops productivity, water consumption, care of environment (protected areas), ecological flow-.

7.2. First version of the CAF in the PDC

In spite of the final list of 46 indicators[50], a previous list was compiled and implemented by science experts concerning governance in the PDC. Limitations and weaknesses were detected in the instrument after initial implementation. For this reason, an improved list was developed with the intention of being implemented directly by stakeholders.

To recapitulate the implementation of the CAF has followed the next steps:

1) A case study was selected and described in order to obtain the information for developing factors with regard to the governance aspects that are convenient or interesting to analyse
2) Indicators have been allocated to each factor
3) Units of measure have been assigned to each indicator
4) and finally through a coloured and quantitative assessment guideline, i.e. Traffic Light Assessment, governance performance has been evaluated

These four phases have been carried out for implementation. Before describing the results gained from the first version in this section, is important to mention the relevant differences

[50] The final version of the CAF (factors, indicators and assessment guides) is the one described in sub-chapter 4.2.

between each of the versions. On the one hand, they each differ concerning the list of factors and indicators[51]. On the other hand, the greatest difference is the assessment process itself (calculations to quantify results). These assessment procedures are explained in next section.

7.2.1. Assessment procedure of the first version

The evaluation of the first version was obtained with the average of green indicators in each capital. In order to achieve this average, the indicators responses were classified by colours (*e.g. indicators of the social capital in the PDC had an amount of 13 greens, 0 yellow and 5 reds*[52]). Once the total amount of each colour was known, the attention was paid to the green responses which represent effective governance. To calculate the percentage of effective governance, a formula was applied:

$$\frac{\mathbf{100}\boldsymbol{gr}}{\boldsymbol{t}} = \boldsymbol{eG},$$

in which ***gr*** represents the number of green responses in one capital, ***t*** represents total of indicators within that capital and ***eG*** is the percentage of effective governance (*e.g. 72% eG in the social capital of the PDC*).

Taking as a reference the percentage calculated, each capital was classified into effective, moderately effective or ineffective governance[53] (*e.g. social capital in the PDC has an effective governance performance*). Percentages provide a easily visualization of the qualitative analyse of the responses.

In an event that responses for the indicators were 5 green (27% eG), 4 red and 9 yellow for social capital; the percentage would imply that the capital has ineffective governance although the dominant colour is yellow. To avoid this in the evaluation of this first version, attention should be paid to the number of yellow and red indicators[54].

The combination of both types of calculations offers a more reliable way to calculate effectiveness. The degree of governance effectiveness is then interpreted through two options (see table 7.3). In the first option, the degree of effectiveness is calculated by the percentage of green responses. The second option provides a more integrated evaluation

[51] See Appendix E for first version list.
[52] For other capitals see figure 7.2
[53] See first and second columns of table 7.2
[54] See column first and third of table 7.2

and even helps the visualisation of the capitals. It considers all three colour responses. In order to evaluate governance performance through this option, the higher colour would determine the assessment but that excludes the use of percentages and their advantages (*e.g. if the amount of yellow responses is higher than the other two colours, yellow would represent the capital, categorising it as moderately effective in governance performance*).

Table 7.3 *Degree of effectiveness*

DEGREE OF EFFECTIVENESS	OPCION 1 Percentage of green responses	OPTION 2 Amount of colour responses
Ineffective governance	0% to 32%	Higher amount of red responses
Moderately effective governance	33% to 67%	Higher amount of yellow responses
Effective governance	68% to 100%	Higher amount of green responses

After completing the assessment (description, preparation -*indicator allocation, units of measurement*-, indicators implementation and evaluation), the weak factors of governance performance will be revealed. This will allow for improving these factors categorized as ineffective in the MSPs. Besides this, the effective examples of governance performance can be shared as 'best-practices' to future risk management situations.

7.2.2. Implementation and results of first version

The implementation of the CAF's first version was carried out in May 2014 in collaboration with researcher experts on the case study and through historical sources comparison (Máñez Costa et al., 2014).

Taking into account the responses provided by the case study experts[55], the governance performance in the PDC represented the 62,6% of effective governance (eG). Figure 7.1 shows the existence of a low imbalance between capitals. The analysis of the governance performance of the PDC showed rather effective and successful governance. In the same figure, the percentage of effective governance in each capital can be seen as well as the amount of indicators depending on their evaluation. This classification only compiles the indicators assessment instead of including the factors assessment.

[55] See detailed colour responses in Appendix E.

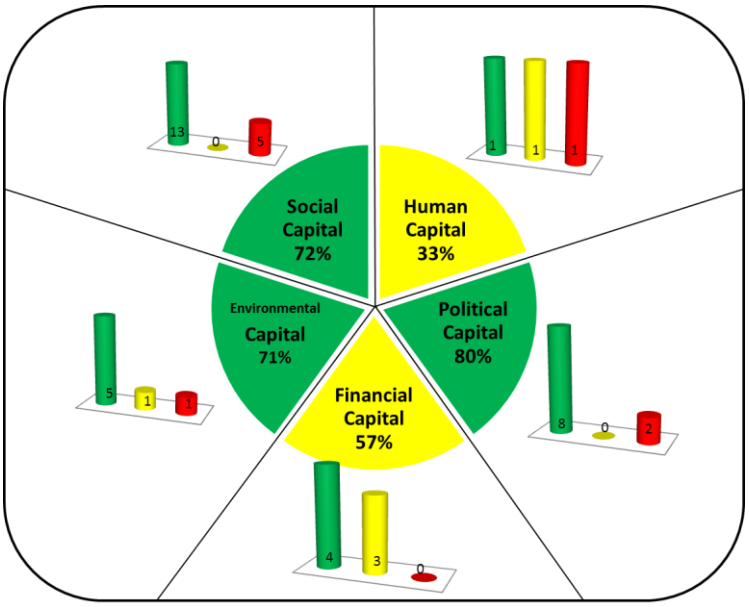


Figure 7.1 *Capitals effectiveness in the PCD (status 2014)*

Each piece of the segmented circle represents the coloured capital assessment and the percentage of governance performance. The bars show the amount of indicators of that capital within each colour.

With this form of assessment, the calculated average provided a unique colour for each capital. In that sense, the general evaluation was more centred in capitals than in factors or indicators. Nonetheless, it is very useful to look at the yellow and red results in order to detect which indicators need to be improved within the capitals assessed.

Political Capital in the PDC represented the strongest capital (80% eG). However, it also presented weak points to take into consideration such as the indicator '*existence of obligation to obtain insurance*', which has been evaluated as red. This indicator reveals information on the additional economic capabilities to cope with a risk event.

Social capital (72% eG) and environmental capital (71% eG) have represented the other two capitals evaluated with effective governance performance in the PDC. However at upon closer examination, the social capital indicators showed there was a need to enhance the conditions of '*equal voting*' in order to allow all members to exercise their right in the process of formal voting. The lack of '*risk information available in different languages*' for the general public exemplifies another weakness that could be improved upon in order to aid foreigners during extreme droughts. It is also important to mention the need for '*strengthening programmes*' to inform the broad public or for '*campaigns to increase sensibility among the population*'. Strengths in the social capital, but also related to Political capital, have been highlighted by the existence of bottom-up approaches. These can be

noted through the transformation of the current PDC, from a simple committee in the 80s, into a regulated commission dealing with drought events and managing them in an official and high-tech way.

The environmental capital has shown the conservative mentality of the agricultural sector. The majority of stakeholders invested only in one crop, regardless of whether they are adapted to water scarcity conditions or not, instead to grow two or more other crops better adapted to water scarcity. In case of heavy drought events, the farmer might lose this crop.

Financial and human capitals have shown the lowest effectiveness. The weaknesses of the financial capital have been determined by the lack of insurance that cover consequences of droughts events. Nonetheless, the ratio of public and private investment in disaster funding covered more than the 50% of losses.

The remarkably low human capital (33% eG) adjustment only has reflected the medium level of education of the stakeholders and the low percentage of members collaborating in NGOs. There is a need for additional adjusted indicators in order to describe more comprehensively this capital performance. This first version list of indicators provides limited information about human capital. Certain areas, such as social skills or innovative actions, would increase information to better assess human capital.

7.3. Improvement of the tool: From first version to second version

After the implementation of the first version the indicators of the CAF were adjusted. Therefore, the CAF was implemented twice (each time with a different CAF version), but it was not suitable to use the different version in order to perform a before and after comparison. Post-evaluations in time might be beneficial but they are not included in this study. The implementation of the first version was carried out in order to test the elements of the list (factors, indicators, assessment, etc.) for a reliable assessment. Different indicators' list and assessment measures have been improved between first and second version and their corresponding implementation.

The indicators provide measurable inputs for analysing the capitals, but a change in the allocation and even an enlargement of the number of them were considered appropriate to have a more valuable inputs. During the analysis process in the first implementation, some difficulties and gaps in the measurement were also observed. Moreover, the results of the

first version's implementation were presented to a group of stakeholder in the Drought Annual Seminar of the JRB. The discussion after the presentation provided insights from the audience that encouraged an improvement of the first version of the CAF. Therefore, changes in indicators and the interpretation of their evaluation have been included in the second and last version of the CAF, whose analysis is presented in the next sub-chapter 7.4. This last version is the one presented and described in sub-chapter 4.2.

With regards to the indicator changes and enlargement, the list of indicators has been modified, but not excessively. It includes the change of indicators allocation within factors (*e.g. in social capital the indicator 5 within factor 'Communication and information' in the first list, becomes the indicator 15 within the factor 'Communication and relation to the society' in the final list).* It also includes the suppression of indicators in social capital (*e.g. indicator 2 within social capital in the first list becomes indicator 24 within political capital in the final list*) and financial capital (*e.g. indicator 33 is deleted in the final list*), along with the addition of indicators in the human and political capital. Regarding the changes done in the measurement, the system used was strictly proportional. Each capital has the same value. Consequently their factors and indicators have been assigned by a proportional value[56].

An addition to the tool has been the inclusion of an observation column. The collected observations might enrich the evaluation, strengthen the analysis and provide more effective assessments. These observations and lessons learned during the implementation could be written down for later use. Through the observation, the degree of significance that is given to the capitals can be perceived. It may occur that within the MSP, the members give special emphasis to one capital in comparison to the rest. This emphasis represents the degree of importance given. In the first implementation of the CAF no particular emphasis for one capital was mentioned. During the implementation with members of PDC and stakeholders of the JRB, the financial capital came out as more important than others. If all capitals are assessed as effective, but the financial capital as moderately effective, the balance would affirm that the MSP has effective governance. However, in the case that the members of the MSP would consider it as not effective enough, the general evaluation might change. This is the reason why it is important to take into consideration the perceptions of the MSP members, as well as the perception of stakeholders involved through additional

[56] For indicators and factors values see table 4.6

notes. These notes, including the sharing of anecdotes, personal opinions, examples experiences in the governance processes, etc., are of extreme relevance for supporting the CAF. The participatory observation process highlights other weaknesses and strengths than the ones visualised through implementation of the indicators framework. Moreover, those observations can include changes in measurement (*e.g. the consideration as yellow and thus not green by the PDC the indicator 10 -Existence of longstanding cooperation between the same members which encourage trust (teamwork during years), in which red is from 1 to 4 years cooperation, yellow is from 5 to 9 years cooperation and green represent more than 10 years cooperation. The reality stipulates more than 10 years cooperation but stakeholders decided to consider yellow because the representatives changed in last years, but the institutions and therefore their ideology were the same*).

7.4. Results gained from the second version of the CAF in the PDC

With the changes implemented in last sub-chapter a new list of indicators was created (see table 4.2). It was presented, corroborated and assessed by the audience in the Drought Annual Seminar organized by Research Institute of Water and Environmental Engineering (IIAMA) in the technical University of Valencia in November 2015.

Sixteen representatives from different institutions and partnerships (PDC members and stakeholders of the basin) participated in the exercise in responding to the indicators. The audience was divided into three groups (see figure 7.2). A representative of the Jucar River Basin Partnership (JRBP) was present in each of those groups as the main institution in charge of water management in the river basin.

Figure 7.2 *4th Seminar on droughts in the Jucar River Basin*

-Exercise to implement the indicators list of the CAF-

Each group got a part of the CAF list, i.e. (1) social capital; (2) human and political capital; and (3) financial and environmental capital (see figure 7.3). Each group was provided with stickers which represented the three colours of the Traffic Light Assessment. A representative was chosen to place the colours decided by the group. While the groups were answering to the indicators, an observer was writing down notes about the process of decision making. From these notes, conflicts were observed and different opinions surfaced concerning the importance given to some indicators or the highlighted opinions related to the assessment of the unit of measure, i.e. colours assigned to each indicator's unit of measure.

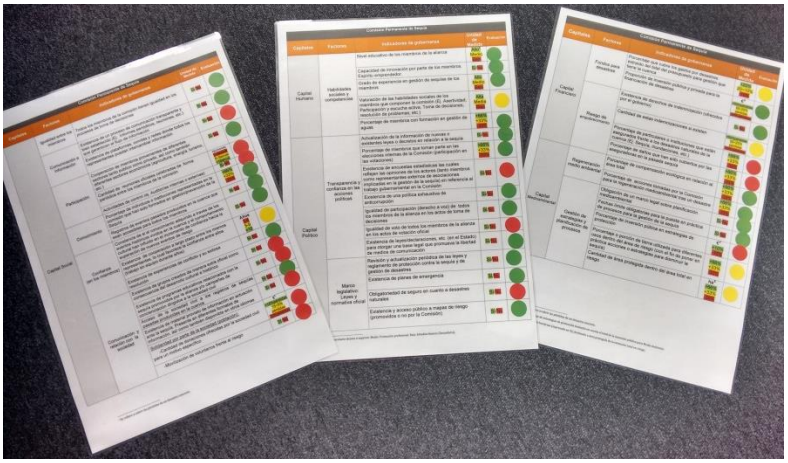


Figure 7.3 *CAF list implemented by groups*
(4th Seminar on droughts in the Jucar River Basin)

Once the results of the groups were obtained, a joint assessment of the three groups was carried out. There were no disagreements and the final implemented version was obtained.

The analysis of the indicators revealed a certain imbalance in the effectiveness among the capitals (see figure 7.4).The general assessment of the five capital was 74,1% eG[57], which according with the categories given in figure 4.8 (in chapter 4) confirms that the governance in the PDC is ***effective***.

[57] In the first implementation the effectiveness percentage achieved 62,6% (see section 7.1.3).

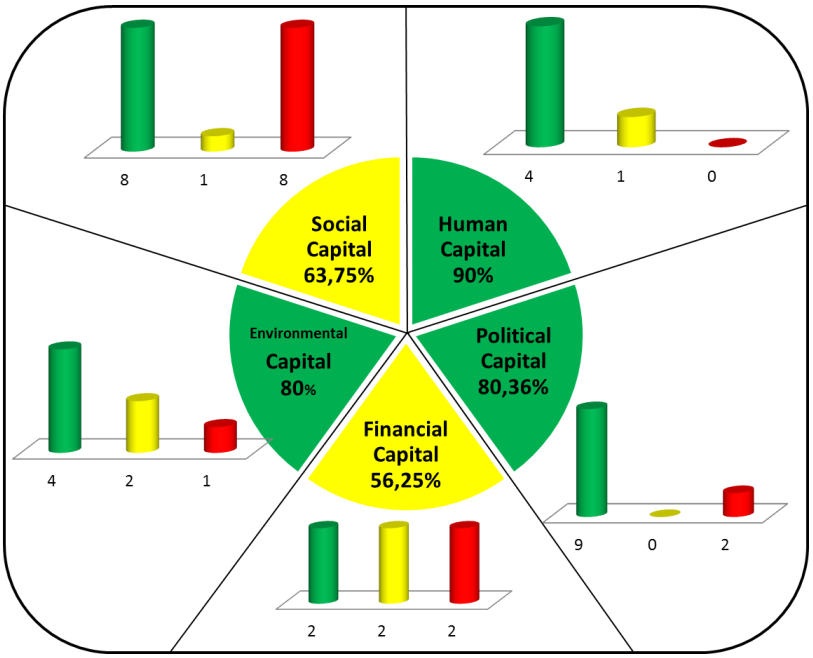


Figure 7.4 *Capitals effectiveness in the PCD (status 2015)*

Each piece of the segmented circle represents the coloured capital assessment and the percentage of governance performance. The bars indicate the amount of indicators of that capital within each colour.

In the implementation of the first version, the evaluation affirmed that the PDC had a moderately effective governance (62,6% eG). By contrast, the last implementation identified that the PDC had effective governance performance (74,1% eG).

In spite of that, all five capitals are over the 50% in a range running from 0% (ineffective governance) to 100% (effective governance) (see figure 4.8). Human, political and environmental are effective in governance performance, i.e. green coloured (see figure 7.4). The other two capitals, social and financial capital, are evaluated as moderately effective in governance performance, i.e. yellow coloured. To detect which factors and indicators deserve to be improved, attention should be paid to the different factors and indicators valuation (see figure 7.5 and Appendix F).

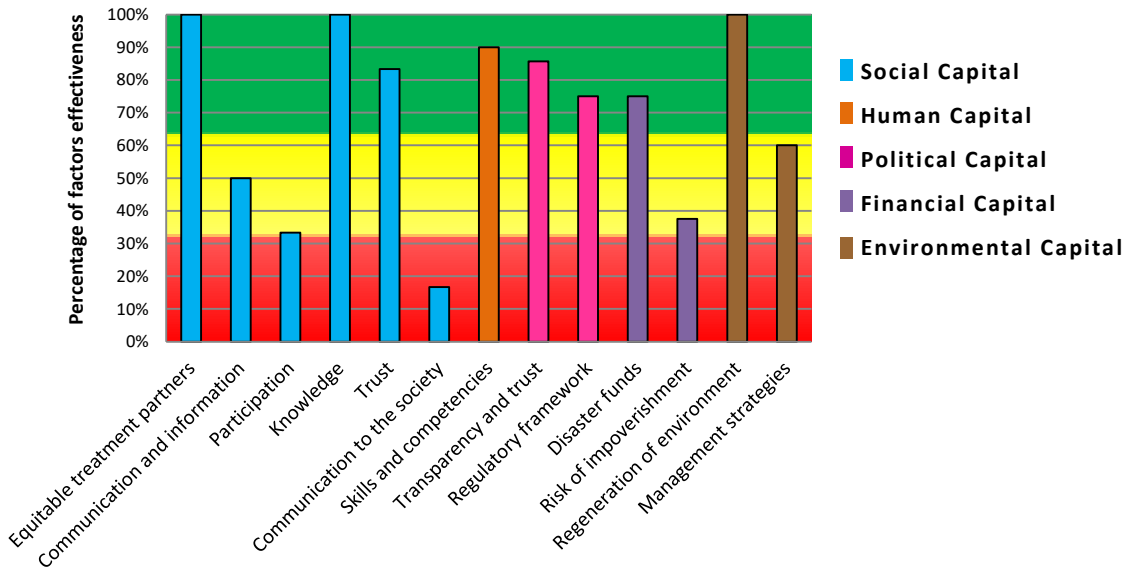


Figure 7.5 *Factors effectiveness in the PDC (status 2015)*

The bars represent the percentage of each factor with regard to effective governance performance. The colours of the bars correspond to the capitals to which the factors belong.

Social capital, coloured in blue, presents the highest discrepancy between factors, especially determined by the higher number of factors in that capital. Factors of this capital are the lower valuated in the PDC (16% and 33%), followed by the financial capital (37,5%). Those two capitals are categorized as moderately effective in governance (see figure 7.4).

The previous figure (7.5) shows which factors were evaluated better and worse and consequently which need to be improved or revised (*e.g. the social factor 'Communication to the society' needs to be revised for improvement*). To create these two figures (7.4 and 7.5), an analyses indicator by indicator was done. More specific descriptions of those indicators in each capital that deserve to be mentioned are presented in subsequent sections.

7.4.1. Social Capital results

The social capital was assessed as moderately effective (63,75% eG) being not completely effective but very close. Social capital has considerable importance in that MSP, as affirmed by stakeholders in the workshop. That capital includes the factors of participation, trust, knowledge and communication which were considered as significant in the management process. There were 8 indicators evaluated as green, one as yellow and another 8 as red (see table 7.4).

The participation in the decision-making processes was equal for all members of the PDC. The existence of transparent communications processes guarantied the flow of information in the PDC. The historical drought events occurred in the basin have increased the knowledge to lead droughts and the trust on the management of new events. The fact of being a longstanding cooperation (since 1981) also encouraged trust, even though that aspect has been considered moderately effective by the stakeholders, caused by the changing of members involved from one event to another.

The weak points of the PDC regarding the social capital were mainly the factors '*communication and relation to society*' and '*participation*'. Within the 6 indicators of the '*communication and relation to society*' factor only one was evaluated as green, i.e. 'Access by civil society to the last events drought registers in the basin'. Moreover, the existence of platforms or networks for exchanging information, part of the '*Communication and information*' factor, was also a weak point. The PDC presented a clear problem in regard to communication.

Table 7.4 *Assessment of social capital indicators*

Valuation	Green	Yellow	Red
Indicators	All members are equal in decision-making processes.	Existence of longstanding cooperation between the same members which encourage trust (teamwork during years)	Existence of platforms, committees and networks where all representatives can join the process of information exchange.
	Existence of a transparent and well established communication process (*e.g. periodic reports, meetings, etc.*) that guarantees the flow of information		Amount of periodic formal meetings held between members of the Commission.
	Cooperation of partners from different sectors such as public, private and civil, as well as agricultural, energy, tourism, etc.		Implementation of monitoring processes (*e.g. internal or external audits*).
	Percentage of individual members of the Commission or institutions represented in the Commission trained in droughts and prevention management.		Existence of informal boards/groups resulting from cultural-historic development.
	Existence of registration of past droughts events in the basin. Access to these registrations for all members.		Existence of educational programmes in relation to the droughts promoted by the Commission and/or awareness campaigns addressed to civil society.
	Evidence whether knowledge gained from historical events in the basin has influence over the increase in trust to lead new drought events.		Information material on drought management. Presented through different information channels and available in different languages where appropriate
	Experiences of conflict and problem resolution.		Launching of donation initiatives promoted by the Commission to aid in covering losses caused by natural disasters.
	Access of the civil society to the last drought events registered in the basin.		Mobilization of volunteers in the face of risk.
Total indicators	8	1	8

7.4.2. Human Capital results

The highest percentage of effective governance fell on the human capital, which represented 90% eG (see figure 7.4). From the five indicators of this last version, four were assessed as green and one was evaluated as yellow (see table 7.5). Any indicator was evaluated in red by the stakeholders.

The skills and competencies of the PDC were characterized in this implementation by a high degree of educations of members and their innovation capacity. That is opposite to the first version's implementation which considered this indicator as yellow. The social skills of the members were evaluated as medium.

The high percentage of trained members in drought management provided a qualified Commission for governing drought, as well as the high degree of members with experience in the issue.

Compared to the first version's implementation, the human capital represented the major change of governance performance evaluation. The changes in the CAF list benefited this capital providing more relevant information for the evaluation.

Table 7.5 *Assessment of human capital indicators*

Valuation	Green	Yellow	Red
Indicators	Level of education (average academic degree of Commission members).	Valuation of the social skills of the members (*e.g. assertiveness, active participation and listening, decision making, conflict resolutions, etc.*)	
	Innovation capacity of the Commission members. Enterprising spirit.		
	Percentage of membership with training on drought management.		
	Level of member's experience in drought management.		
Total indicators	4	1	0

7.4.3. Political Capital results

The political capital in the PDC received 80,36% eG (see figure 7.4). Only two from the eleven indicators of this capital were valuated as ineffective in governance performance, i.e. the lack of laws to promote the freedom of media and the lack of insurance obligation to protect irrigated land in the face of droughts (see table 7.6).

The inequality of votes in a formal voting process was considered by the valuation assessment as an indicator of ineffective governance performance, but the stakeholders and PDC members did not concur. For them, the non-equal right to vote have never affected the process negatively because the voice of all members has always been heard and they have never needed to exercise their vote.

The decisions within the PDC has been always made on consensus through discussion and consideration of opinions of all members, who all have had voice in the decision making process. The PDC was considered a transparent organism which updates information regarding the submission of new regulations related to the protection against droughts, its management and its revision periodically (updated done through the JRBP during periods of normal conditions).

Similarly to the indicators of the human capital, any political capital indicators was valuated as moderate in governance performance, also characterized by the fact that only one indicator had this option.

Table 7.6 *Assessment of political capital indicators*

Valuation	Green	Yellow	Red
Indicators	Information updating regarding the submission of new laws or decrees related to droughts.		Existence of laws/declarations, etc. in order to provide legal basis that promote the freedom of media.
	Equal vote of all Commission members in processes of formal voting.		
	Equal participation (the right to have voice) of all Commission members involved in decision making.		
Indicators	Percentage of members taking part in internal elections of the Commission (voting participation).		
	Existence of statistical surveys published reflecting the opinions of the actors (Commission members and external representatives of drought management partnerships) in regards to the governance of the Commission.		Existence of obligation to obtain insurance to protect in the face of disasters.
	Existence of comprehensive anti-corruption policy.		
	Periodic revision and updates of laws and regulations concerning the protection against droughts and the management of drought disasters.		
	Existence of emergency plans.		
	Existence and open access (whole public) to risk maps (promoted or not by the Commission).		
Total indicators	9	0	2

7.4.4. Financial Capital results

The financial capital was the one assessed with lesser effectiveness governance (56,25%eG). From the six indicators of this capital, two were valuated as green, two as yellow and two as red. That represents a clear balance between indicator valuations (see table 7.7) but a high imbalance in factors valuation (see figure 7.5). '*Risk of impoverishment*' factor was assessed as ineffective in governance performance while '*disaster funds*' factor was assessed as effective in governance performance.

The effective governance indicators in financial capital were represented by the more than the 50% of public and private investment on disaster funding and the existence of right of compensation offered by the government. This latter issue has been also highly remarked upon in the perceptions of the stakeholders in the questionnaire (see figure 6.26 in chapter 6). Nonetheless, these compensation funds covered less than the 50% of losses.

The deficiencies in the assessment were due to the low percentage of insurances, characterized by the Spanish legislation. In Spain, irrigated agriculture does not yet have an insurance scheme. Therefore, there are no damages as a result of droughts covered by insurance companies which might benefit the financial capital.

This capital might have been considered the most interesting for the stakeholders due to the fact that risk is perceived normally higher when it has economic impacts.

Table 7.7 *Assessment of financial capital indicators*

Valuation	Green	Yellow	Red
Indicators	Proportion of public and private investments on drought funding.	Percentage of the drought expenses covered by the government.	Percentage of households/institutions that have insurance related to the specific threat in basin (*e.g. droughts, floods, etc.*).
	Existence of rights of compensation (offered by the government) to affected population.	Percentage of losses covered by these compensations if they exist.	Percentage of damages that were covered by insurances during the last drought event.
Total indicators	2	2	2

7.4.5. Environmental Capital results

The environmental capital effectiveness at 80% is comparable to the political capital. Four of the seven indicators of this capital were valuated as effective, two as moderate and only one as ineffective (see table 7.8). This one in red responded to the existence of reservoirs and diversions of water (*e.g. water transfer Júcar-Vinalopó*). These kinds of infrastructures might

affect negatively the environment (land and fauna), even though they benefit the distribution of water resource.

The different land use types to minimize drought losses and the protected area within the basin represented a medium-low percentage.

Furthermore, indicators related to the factor 'regeneration of environment' such as the existence of climate change studies which can be used for preparedness strategies and the indicator referring to legal regulation and strict schedules for implementing drought management policies provided the degree of effectiveness of the capital.

Table 7.8 *Assessment of environmental capital indicators*

<table>
<tr><th>Valuation</th><th>Green</th><th>Yellow</th><th>Red</th></tr>
<tr><td rowspan="4">Indicators</td><td>Percentage of ecologic compensation per total area</td><td rowspan="2">Percentage of different land use types within the basin (in order to implement targeted strategies/actions to minimize droughts).</td><td rowspan="4">Existence of big infrastructures that affect the environment (e.g. diversion of water).</td></tr>
<tr><td>Percentage of actions taken by the Commission for environmental regeneration after a disaster.</td></tr>
<tr><td>Existence of climate change studies for preparedness for potential increment of drought events.</td><td rowspan="2">Percentage of protected area within the total basin area.</td></tr>
<tr><td>Binding deadlines/schedules for implementation of drought management processes.</td></tr>
<tr><td>Total indicators</td><td>4</td><td>2</td><td>1</td></tr>
</table>

CHAPTER 8

Discussion

The current chapter presents the discussion of the results obtained in this study with respect to the theoretical background and other analytical studies. The discussion is split into the two research pillars.

8.1. Risk perception discussion

This study had assumed that perception of risk determines risk management. The first step in determining whether risk perception functions as a driver of risk management is the identification of risk culture criteria, corresponding with authors such as Fischhoff et al. (1978), McDaniels et al., (1995), Slovic (2000), Wildavsky and Dake (1990), and Sjöberg (2000). These criteria worked as characteristics to describe cultures of risk in MSPs (*e.g. experience as coping capacity element*).

The description of cultures of risk comprises the patterns of group behaviour, and risk management strategies and decision-making processes have been taken into account more within risk cultures characteristics. Based on the in-depth case study presented, in which the risk perception criteria identified have characterized how the Permanent Drought Commission acts in the face of droughts, some criteria have provided best insights for describing its risk culture more than others. These criteria are: the type of hazard and description, patterns of behaviour, information, knowledge, participation, cooperation, trust, decision-making processes, experiences, preparedness strategies, response planning, recovery, and judgment.

Slovic and colleagues (1982) affirmed that studies in the field of risk perception provide a characterization and evaluation of hazards in order to predict how people will respond to new threats and management strategies. In this study, the interest was whether perceptions might determine management strategies, as opposed to investigating how stakeholders will

respond to management strategies. Any organization in this study that has not perceived a risk has not managed it. Therefore, in this study, MSPs' perceptions do determine the implementation of specific risk management strategies. For instance, stakeholders in the Jucar River Basin (JRB) perceived droughts as a greater natural risk than other natural hazards in the basin and acted consequently to handle them. The establishment of the PDC in the 1980s exemplifies this by assessing, preparing, mitigating and recovering the effects of droughts in the basin. Nevertheless, this does not mean that other risks also perceived are excluded from management. If they are perceived they can be managed. Another example is provided by the case study in the Austrian Alps, also analysed in this work. The greater risk perceived as a consequence of several natural hazards (floods, landslides and avalanches) is the interruption of railways lines which causes transportation issues for passengers at national and international level. Therefore, stakeholders implement management strategies focussed on recovery more than on mitigation (*e.g. building alongside rivers but repair infrastructure damages efficiently*).

Through observing implemented policies, this study has shown that any organization which has not perceived a risk is not managing it. However, some authors disagree (see Wachinger et al., 2013) by providing evidence that, although people have experience in the hazard and, therefore, a high risk perception, they rarely make proper management decisions. The example of the Jucar River Basin, in which stakeholders have a high level of knowledge on droughts management, significant experience in dealing with droughts, as well as high drought perceptions, has shown that all policies implemented have a perceived degree of effectiveness of over 50%.

A potential limitation might be noted in the obtainment of data about effectiveness. Data have been gained through stakeholder perceptions as opposed to more objective data. The intention was exactly this, to base the results on stakeholders' perceptions (subjective assessment). This way of evaluating the strategies' effectiveness highlights the importance of perceptions in decision making processes. This study emphasised several risk management policies considering them as very effective. This may indicate the possibility of them being implemented more in the near future compared to nowadays. The best example is given by insurances as a very effective mitigation policy for 90% of the cases in which it is implemented. If this policy is perceived as very effective in such a big percentage of cases,

that might denote good results. Therefore, areas in which this policy is not currently implemented, could start using insurances due to the effective examples observed.

Most of the research is focused on public perceptions with the aim of developing responses to risk through risk characteristics (Bradford et al., 2012; MCDaniels et al., 1995; Ruin et al., 2007). Also, this study has concentrated on stakeholder's perceptions exclusively to analyse whether the perceptions drive the risk management plans (see also Buchecker et al.,2013; and Raajmakers et al., 2008). This approach has reduced the scope to observe the link between perception and action.

Studies have detected a gap in risk perception literature and consider that a more comprehensive methodology is needed (Sjöberg et al., 2004). Studies using comprehensive methodology, confirmed that the combination of perspectives helps to better explain perceptions (Renn and Rohrmann, 2000). The psychological and the sociological perspectives of risk perception (Fischhoff et al., 1978; Rogers, 1975; Douglas and Wildavsky, 1982) were combined in this study, following authors such as Renn and Rohrmann (2000) and Kasperson et al. (1988).

Not only cognitive factors were included in risk perception criteria, previously enumerated. The sole inclusion of cognitive factors in the analysis has a disadvantage (Rippl, 2002) as they cannot answer questions addressed in a social context. According to Wildavsky and Dake (1990) and Keown (1989), perceptions of risk vary between different cultures. Therefore, risk perception differs depending on cultural biases, and cultural biases determine individual's perceptions.

In a context in which Multi-Sector Partnerships' (MSPs) perceptions, beliefs and experiences determine risk culture, individuals shaping the group might be influenced by this culture. In the JRB, the long tradition in dealing with water issues has created a strong water culture (the Jucar River Basin Partnership has been managing water since 1935) and this culture influences stakeholders, who feel very safe in the face of droughts. In the other European cases analysed, the expert and traditional knowledge (76% and 59% respectively) are considered key elements to promote risk management.

In order to identify patterns that define cultures, cultural comparisons between individuals, and groups of different countries or areas, were done by other researchers (Renn and

Rohrmann, 2000). However, the current study goes further than a cross-cultural research and has highlighted the key aspects that characterize risk cultures in general. This characterization was done by looking at different areas which manage natural hazards (not necessarily the same type of hazard). The highlighted key risk culture aspects facilitated in crystallizing what risk cultures in a European context looks like. This context involved areas perceiving risk and managing it through cooperation of sectors (MSPs). The successful auto-evaluation of these MSPs has demonstrated the high-level confidence in their own partnerships but also the high degree of effectiveness to manage risk by cooperating between sectors.

In this study it has been crucial to deal with group perceptions. Group risk perceptions are generated by individual risk perceptions, but individual risk perceptions are also influenced by group risk perceptions (risk cultures). In order to acknowledge the cognitive factors that interfere in risk cultures, this study included Protection Motivation Theory (PMT) which is part of the above mentioned psychological perspective. PMT is organized along two cognitive mediating processes (adaptation and coping capacity). Other studies have shown that PMT is not only relevant in an individual context but also in group interventions (Floyd et al., 2000; Mulilis and Lippa, 1990; Grothmann and Patt, 2005). The combination of risk perception theories (here the Cultural Theory and insights of the psychometric paradigm) and protective behaviour theory (Protection Motivation Theory in the face of threats) has provided a comprehensive approach in defining and analysing risk management strategies.

Following the characteristics of the modified version of the Dake questionnaire by Marris et al. (1998, p.638), the PDC has been identified with two ways of life: egalitarianism and hierarchy worldviews. Other researches have also questioned the assignation of only one worldview of the Cultural Theory to categorize groups or individuals (see Löfstedt and Frewer, 1998; Marris et al., 1998). PDC responded to an egalitarian way of life in the way that it has represented cooperation in an equal context, promoting the participation of all members in the decision-making process. But it has also been identified as hierarchical, given the importance of traditions, the establishment of the PDC by the national government, and the rigour of the meetings and the normative imposed (*e.g. punishment for not right uses of water provision during droughts periods*).

The Cultural Theory (Douglas and Wildavsky, 1982) sustains that the egalitarian way of life is opposed to the hierarchical way of life. In that line, for the authors, it is not possible to be egalitarian and hierarchical at the same time. However, the culture in the PDC is characterized by components of both cultures. PDC's members respond to egalitarian culture because they promote participation and equality, they trust and support hierarchical structures perceiving risks as manageable, and there is high control of the risk through rules and regulations.

In other studies (see Bradford et al., 2012; Buchecker et al., 2013), phases of the risk management cycle, such as preparedness strategies or prevention measures, were used to define risk perception. In this work, risk assessment measures and risk recovery policies are additionally included to analyse how risk perception drives risk management in a more complete way. This analysis has confirmed the hypothesis that risk perception shapes risk management. But it has also demonstrated that both recent experiences (Ruin et al., 2007) and long traditions in dealing with a specific hazard benefits the management strategies in coping and dealing with that hazard. This confirms the findings of Ruin et al. (2007), who in their study about perception for anticipating flash flood events concluded that risk perception mainly depends on the recent personal experience in the event of a similar nature. This study has additionally shown that long traditions and experiences benefit risk management *(e.g. the Water Court of the Plain of Valencia, dealing with water issues in the Plain of Valencia for more than one thousand years).*

The findings from this study include a list of risk management strategies promoted by the MSP as part of their governance performance that showed how risk perception drives the implementation of strategies, as well as how effectively they are perceived. Moreover, this study has provided a pattern of risk perception description and culture characteristics, shaped by the most highlighted elements in different areas in Europe dealing with natural hazards in general and in particular with droughts in the Jucar River Basin.

8.2. Governance performance discussion

MSPs have been considered the 'collaboration paradigm of the 21st century' in order to handle complex challenges that a single sector might not cover (Austin, 2000, p.44). Natural hazards involve cascading effects that affect different levels, which calls for organizations that encompass different perspectives to manage the risk. In this line, MSPs are a good

example of this combination of management perspectives, which are given by the different sectors that shape the management of natural hazards.

This study has developed and tested a framework for assessing MSPs governance performance with the aim of evaluating whether the governance processes carried out through partnerships are effective. Criteria on effective governance systems identify, amongst others, strong governance conditions (*e.g. community engagements, law enforcement, effective public private partnerships, etc.*), strategies to engage public and private multi-stakeholders across productive sectors, and cooperation at all levels in management mechanism (GPO, 2013).

The assessment of governance performance in MSPs provides knowledge for being able to enhance MSPs governance through the weaknesses detected. Therefore, this assessment highlights weaknesses, but also indicates strengths, providing an outlook on increasing MSPs' effectiveness governance.

In the risk perception pillar, after the general analysis of risk cultures in European MSPs, this study focussed on the PDC of the Jucar River Basin. The PDC, as the in-depth case study, has been also analysed within the governance research pillar. The question as to whether the PDC accomplish the definition of an MSP has been responded to. The analysis has shown that the PDC is a good example of MSPs. This is demonstrated by the inclusion of all MSPs' characteristics described in this study (*e.g. long-lasting; shaped by different sectors; sharing a common goal; with a strong governance system*).

Since the 1990s the number of partnerships focussing on environmental governance has been increased (Surminski and Leck, 2016). Nevertheless, they are still up for debate. Partnerships have been catalogued as experiments in governance (McAllister and Taylor, 2015). For this reason, it has become fundamental to assess how effective governance processes are in MSPs. This study has highlighted the importance of managing risks through MSPs. In accordance with McAllister and Taylor (2015), the limitations associated with MSPs should not exceed their benefit. Nevertheless, MSPs are not a panacea; they should be realistic and, thus, it is important to know when their actions make sense and which governance aspects should be improved.

Partnerships should not substitute the regulation and control from governments. More than a shifting from government to governance should be a sharing of responsibilities (McAllister and Taylor, 2015). It has been observed through this study that the cooperative work between public bodies and private and civil society organizations in the PDC favours the management. Therefore, it is crucial for the appropriate development and implementation of management strategies not to exclude governments in the decision and implementation processes. It is however also very important not to exclude stakeholders, who can provide good knowledge and defend interests of laypeople.

Gaps in MSPs' governance have already been investigated (Biermann et al., 2007; Pinkse and Kolk, 2012). The most remarkable deficits are related to regulatory aspects, participation and implementation. Authors detect limitations to address implementation gap and participation gap at the same time. They claim to focus on implementation and leave the participation deficit. In order to broaden the scope and not only focus on the participation, implementation and regulation topics, this study has taken many more factors that might involve an effective governance process into account. If partnerships involve many aspects: why only focus on one or two? This would not help understand the whole governance performance. For this reason, the Capital Approach Framework (CAF) was developed with its capitals for involving factors that might be of concern when analysing governance performance. In this line, the words of McAllister and Taylor (2015) with regard to the need in seeing partnership instruments in a broader frame refer to the inclusion of social, human, political, financial and environmental assets in a framework. Using the capitals view, each capital represents a level of analysis that comprises factors. Each factor is related to one special item included in the governance performance assessment framework (*e.g. social issues as 'trust'*). Likewise, all those factors shape the big puzzle that describes governance performance.

The CAF is a comprehensive framework developed on the basis of risk governance and capitals approaches. The CAF has the objective to assess and validate governance processes and capitals, factors and indicators that it is composed of. It also includes guidelines for its metrics. The CAF categorizes all factors into five capitals, similarly to other authors (see also Obura et al., 2015). This framework further combines the different types of capitals as suggested in the Sustainable Livelihoods Framework (see DFID, 1999; Scoones, 1998; Brock, 1999).

Obura and colleagues (2015) presented a descriptive analysis of potential threats and opportunities in the Nord Mozambique Channel. The authors do not evaluate the region from the capital perspective, but use the five capitals to describe it for setting the foundation for coastal management governance in the area. Like this study, they also used the term political capital. This term has been used seldom in the capital context but is highly recommended in terms of governance assessment. It is interesting to mention the cross-cutting issues identified by the study on the Mozambique Channel other than the capitals. Here, they included the climate change issue. For this work, this issue has been included in the natural capital.

Even though both studies have used the five capitals for governance concerns, they have been analysed from different perspectives. One is descriptive (Obura et al., 2015) and the other one evaluative (CAF). Nevertheless, both agree that a balance between capitals ensures the growth of management effectiveness. In the case of the MSPs, the maintenance and balance of the five capitals will ensure effective reaction to hazardous environmental events and the subsequent increment towards resilience. Nevertheless, this study considers that the imbalance between capitals does not necessarily imply ineffective governance. Depending on how capitals are perceived by MSPs' members, the level of importance of capitals would vary. The capital's governance in those cases could be considered effective or ineffective, opposite to the evaluation, from the point of view of MSP's members. Nonetheless, it is strongly recommended to maintain and improve the capitals and achieve a balance for better functioning.

The Sustainable Livelihoods Framework proposed a way to assess a range of livelihood resources, considering the capital as these resources (see Scoones, 1998). The concept of 'sustainable livelihoods' is central in environmental management. However, this framework has been used as a basis for developing the CAF. Other studies using this framework have focused on poverty and are centred around people (see DFID, 1999; and Brock, 1999). On the contrary, the CAF has been developed for being centred on institutions. Nevertheless, some similarities in the process could be highlighted. Both investigations have used capitals to open the scope and to include an umbrella of features that describes the strategies to analyse. The reflection about the capitals balance made by DFID (1999) is also interesting. They consider it important to have a balance between capitals and reach equilibrium, meaning that no one of the five capitals should be largely misbalanced to the others. If one

capital is evaluated as very ineffective, that might also affect other capitals (perhaps not evaluated as very ineffective either but as ineffective or moderately ineffective). It would be unrealistic for the financial capital to have a high percentage of effective governance whilst the political capital having a very low percentage. The evaluation of capitals in the PDC, with no big differences between capitals, supports the argument of the DFID.

In addition to capitals, indicators have helped to implement the framework. To ensure effectiveness in governance, Ehler (2003) has developed an indicators' list addressed to Marine Protected Areas. They are classified into general goals, management goals and indicators, which could be identified within the CAF as general goals in the capitals and management goals in the factors. In the Ehler's list, other factors are included, such as resource management, legal structures, strategies for management and equitable representation and participation are included. Besides these it also comprises management strategies, participation, and regulatory framework amongst others. Furthermore, Pomeroy and colleagues (2004) have classified indicators into biophysical indicators, socio-economic indicators and governance indicators. This latter indicator would refer to the political capital indicators. These authors developed a very detailed list with the resources to measure each indicator in a very complex way, which takes long time and effort. Opposed to that, the CAF has been measured using a visual assessment based on the traffic light colours which has facilitated evaluation, making it quick and graphic. An advantage of the CAF is the transfer of the qualitative analysis made by stakeholders in quantitatively measurable results.

The indicators list of the CAF has been responded to by stakeholders themselves. Therefore, a rapid and visual assessment guideline has proved effective. This being a participatory research has also allowed the first-hand perception by stakeholders' participating in the process to those aspects that need to be improved and observed.

Returning to the in-depth case study, the results have shown that the PDC has 74 % of effective governance performance among the five capitals. That places the PDC as very effective. Nevertheless, social and financial capitals have been evaluated as moderately effective. In these cases, looking in detail at the factors and indicators help identify the aspects that should be improved. The analysis showed that there is a need to strengthen indicators such as insurances to cover losses from droughts, the communication with the

society, the promotion of platforms to exchange information, the increment of periodic formal meeting within the commission to improve functioning and others.

In an ideal situation, after corrective measures, the CAF could again be implemented for a dynamic analysis of governance improvement and also to see the impacts of the corrective measures. Thus it is important to highlight the need of continuous evaluation after certain time. This ensures future improvement in the case that particular capitals have shown ineffective governance. The fact that corrective measures are implemented will provide better assessment in the future (see also Brock, 1999). Additionally, this new implementation might provide different assessment even though the previous one was successful as there are no two events with the same conditions, and management strategies do not always work similarly. Therefore, governance assessments must be seen as non-static.

Limitations have been detected during the testing of the framework. On the one hand, the different number of indicators regarding the capitals represents a disadvantage. Some capitals might have a more complete description than others or even the high number of indicators could negatively affect the final results. On the other hand is the certainty of having well allocated indicators for determining a real assessment of that capital. These two limitations might not facilitate the adequate characterisation of the governance performance in that capital. A good example experienced during this study was the Human Capital in the first version of this work. In the implementation of the first version of the CAF, human capital was evaluated with 33% of effective governance. While after modifications, the implementation of the second version showed the percentage rising to around 90%.

Owing to the fact that the governance assessment by CAF is qualitative, it allows adapting it to specific conditions and particularities for other governance structures. This kind of framework is useful for identifying potential limits in governance performance and assessing effectiveness to understand management strategies. Through the indicators used for the CAF implementation, the move from theoretical concepts to tangible results is facilitated.

CHAPTER 9

Conclusions and Outlook

The management of natural hazard calls for collective actions. Single-actors are not able to handle with risk's consequences and their cascading effects on their own. Fulfilling this role, Multi-Sector Partnerships (MSPs) dealing with natural hazards have been presented in this work as very effective governance structures to manage risk event, sometimes even more effective than single-governmental reactions to natural hazards. But what determines this management?

Taking into account that risk differs among context and groups and constitutes different types of attitudes and judgments, this study launched a research question in the form of an objective:

Does risk perception drive risk management in Multi-Sector Partnerships dealing with natural hazards?

In order to answer this question, stakeholders involved in MSPs related to natural hazard management have been theoretically and empirically studied. Especially, the Permanent Drought Commission of the Jucar River Basin (JRB) in Spain has been analysed. A web-based questionnaire facilitated the description of cultures of risk, shaped by the influence of risk perception in risk management strategies and decision-making processes. The design of this questionnaire has been done through risk perception criteria determined by a literature review and interviews with stakeholders in the JRB.

The web-based questionnaire has been responded to by a sample of partnership representatives which in some way manage natural hazard risks in specific areas in Europe. From the responses of the questionnaire, a compendium of criteria has been elaborated that describes in general terms the notion of culture of risk for MSPs. This characterisation provides information about management strategies and about formation criteria. This

analysis detects management policies and their perceived effectiveness as well as other aspects related to the cooperative work within MSPs as major characteristics of cultures of risk. Taking this into account, a shortened questionnaire was answered by stakeholders in the in-depth case study (the JRB). This questionnaire was shaped by specific questions related to management policies and the work in the context of the MSP.

The results of this analysis can confirm that the main characteristics of a risk culture are beneficial to managing a risk. Those characteristics are shaped by the perception of risk of people involved in the partnership, which in turn shapes their risk management.

There is a need for support of these governance structures arising from risk perception in the absence of a proper governmental reaction to hazards. Governments should support the creation of MSPs to manage risks and take advantage of the synergies. This support should be reflected in the legislative field also, including guidelines and criteria for the creation of MSPs that will in turn serve as build-on analysis of the effectiveness of the MSPs.

This study has recognised that MSPs are not only shaped by the hazard characteristics they face, but also by the social, political and historical background of the area where they are. The creation of MSPs in areas dealing with the same hazard for many years will be easier than in areas in which no tradition of particular hazard management exists. MSPs are very likely to occur even in an informal way in regions in which a certain hazard has a recurrent nature, as in the case of the Permanent Drought Commission. Thus, it is important or even necessary to formalise these informal MSPs and thereby supporting effective governance structures that might optimize risk management processes.

In conclusion, the findings of this study have shown that risk perception drives how people will behave and manage a particular risk. Therefore, the understanding of risks from groups of stakeholders, such as Multi-Sector Partnerships, and how they perceive risks, will not only drive their management strategies to address these risks but also will support or hinder the implementation of particular governmental risk policies.

Nevertheless, after this research on MSPs' perceptions and management, one question remains open: *Will MSPs improve the effectiveness to minimize disaster risk and foster new advances in the ability to enhance human and environmental security?*

This question has been reformulated and added to the study objective:

To analyse whether their governance performance is effective, using the MSP 'Permanent Drought Commission' of the Jucar River Basin as an in-depth case study

The purpose of the second research pillar in this study was to analyse the governance performance of MSPs and related participatory governance mechanisms, and in particular to understand the potential positive effects of MSPs on risk management.

To achieve this objective, a framework has been developed, called Capital Approach Framework (CAF). Within this framework, a system of indicators and a guideline assessment tool for assessing the indicators has been elaborated.

In order to test this 'indicators framework' and to assess effectiveness in governance performance, the PDC of the JRB has been analysed. The CAF has assessed in detail the five capitals (social, human, political, financial, and environmental) of the PDC. The assessment provided an overview of the particular features of the MSP regarding its governance structure and functioning. This overview allows the categorization of the strengths and weaknesses as well as the validation of the degree of success in the governance process. Reducing the weaknesses and consolidating the strengths can also be interpreted as best-practice by other similar cases facing similar conditions of risk. The transparency of the PDC compensates certain imbalances created by the relatively high role of the human, political and environmental capital on the effectiveness of governance in comparison with the percentage of financial capital.

Furthermore, the implementation of the CAF allows a guidance to ensure future improvement. This study encourages carrying out an assessment after or during each risk event to guarantee the possibility of enhancing the partnership in the long term.

By analysing the weaknesses and strengths of MSPs and their historical trajectory, this study has moved understanding on how to enhance risk management forward. This work also strives to show that MSPs are a proper risk management governance structure.

Overall, these study findings indicate that the evaluation of governance processes around MSPs have great potential in supporting the coping capacity for managing natural hazards severity increased by climate change. This should be carried out without forgetting that risk

perception analysis is the first step in understanding how MSPs' cultures identify and manage risk.

The inclusion of social sciences and their analytical tools in the national risk management platforms will be crucial in gaining a complete vision of the understanding of risk and managing them efficiently.

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Appendix

Appendix A

MSPs characteristics revised by ENHANCE case studies

(based on Carmona et al., 2014, p.18)

	ENHANCE Case Studies (CS)										
Characteristics MSP	Floods and droughts in the Po river basin (Italy)	Droughts in the Jucar River Basin (Spain)	Risk culture, perception, and storm surge management (North Sea coast)	Flood risk and climate change implications for MSPs. The case of London (United Kingdom)	Health prepared-ness and heat wave response plans (Europe)	Air industry response to volcanic eruptions (Iceland, and Europe)	Insurance and forest fire resilience in Chamusca (Portugal)	Flood risk management for Critical infrastructure in the port of Rotterdam (The Netherlands)	Railway transport resilience to alpine hazards in Austria	Solidarity Fund for earthquakes in Romania	**General**
Voluntary	✔	✔	✔	✔	✔			✔	✔		70%
Enforced by law (mandatory)[58]	✔	✔			✔	✔	✔			✔	60%
Only Public								✔			10%
Only Private											0%
Public-Private	✔	✔	✔	✔	✔	✔	✔		✔	✔	90%
Include Civil society	✔	✔			✔						30%
Enforceable commitment (workable)	✔	✔			✔	✔			✔		50%
Temporary		✔							✔		20%
Long-lasting	✔	✔	✔	✔	✔	✔	✔	✔		✔	90%
Sharing same goal (mutual benefit)	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	100%
Reducing risk (Emergency measures…)	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	100%
Include different productive sectors	✔	✔	✔	✔	✔	✔	✔		✔	✔	90%
Strong governance structures (Coordination, supported by a system of rules, norms, conventions…)	✔	✔	✔	✔	✔	✔	✔	✔			80%

[58] In some cases, the voluntary commitment for some aspects of the MSP does not determine that others are mandatory by official legislation or even the commitments not emerge until the government intervenes.

Appendix B

Profile of the Organisation

1. Name of the organisation you represent

2. Characteristics of the organisation:

Type of organisation	
Institutional Authority	
Public Agency	
Private Organisation	
Research centre	
NGO	
Other:	

Scope	
Transnational	
National	
Regional/district	
Province	
Local	
Community	

Sector/s	
Agriculture	
Industry	
Administration	
Environment	
Tourism	
Emergency/protection	
Other:	
Other:	
Other:	

Country/countries of activity

Region/s of activity

3. Which position do you hold within this organisation?

4. Could you describe the purpose of your organisation?

5. What are key values promoted/held up in your organisation's management? Rank 1-3

Loyalty		Merit	
Traditional knowledge		Equality	
Expert knowledge		Solidarity	
Transparency		Efficiency	

Comments:

6. Who is involved in the decision-making process in your organisation?

All staff	
Only senior staff/department heads	
The head of the organization is able to take decisions by his/her self	
A council elected by the staff	
A council elected by external experts and senior staff	
Other form :	

7. How are decisions made?

Based on consensus	
Based on simple or qualified majority	
The head of the organisation has the decisive vote	
Other form :	

Risk description

The aim of this section is to have an overview about the risk and the past events in your region. Keep in mind that all questions are addressed to you as representative of your organisation.

8. What is the main natural risk your organisation is dealing with? In case you work on more than one please prioritize in a ranking where one means the one that is most important for your work.

Type of natural hazard			
Floods		Volcanic eruptions	
Drought		Heat waves	
Forest fires		Storm surges	
Landslides		Seismic risk	
Windstorms		Avalanches	
Other:			

*The following questions in the questionnaire are focusing on the option you ranked most important in question nine. The word **risk** from here on is referring to the specific risk selected.*

9. Is there systematic monitoring for this risk?

Yes ☐
No ☐

If yes:

Could you be more specific?

	Not effective	Barely effective	Somewhat effective	Effective	Very effective
	1	2	3	4	5
In your opinion is the monitoring approach effective?					

10. Could you please indicate the last relevant risk events which took place in your region? Specify them approximately in time.

Event	Date	Intensity				
		Very low	Low	Moderate	High	Very high
		1	2	3	4	5

11. Did you record data for the last events?

Yes	
No	

If yes, what kind of data?

Data collection	
Empirical analysis	
Participatory sensing	
Remote sensing	
Other:	

Comments:

12. Thinking of the last relevant disaster, what were the main socio-economic impacts?

	Yes	No impact	Very Low impact	Low impact	Medium impact	High impact	Very High impact
			1	2	3	4	5
Loss of life							
Loss of production							
Damage of houses							
Loss of jobs							
Definitive migration							
Work migration							
Health conditions							
Energy efficiency							
Other:							
Other:							

Comments:

13. Thinking of the last relevant disaster, what were the main environmental impacts?

	Yes	No impact	Very Low impact	Low impact	Medium impact	High impact	Very High impact
			1	2	3	4	5
Ecosystem services							
Water pollution							
Water scarcity							
Land degradation							
Deforestation							
Sustainable agriculture							
Other:							
Other:							

Comments:

14. Do you expect an increase in the frequency of these kinds of disasters?

Yes ☐
No ☐

If yes, why?

15. Did the experience from past disasters help to manage subsequent events?

Yes ☐
No ☐

If yes, how did it help? Could you provide some examples? *(e.g. improvement of knowledge, creation of new preparedness plans, etc.)*

16. Did you use measures in the past events that deserve to be mentioned here?

Risk management

In this section we aim to better understand how your organisation manages risk by means of the different policies and instruments in use.

Measures and effectiveness

17. What are the policies and programmes your organisation is implementing to improve risk assessment?

	In use Yes/no	Since when is it in use?	Mandatory Yes/no	Mark the one you consider				
				Not effective	Barely effective	Somewhat effective	Effective	Very effective
				1	2	3	4	5
Risk mapping								
Knowledge and technology transfer								
Climate simulations								
Regular monitoring								
Information and Networking								
Economic monitoring								
Other:								
Other:								

Comments:

18. What are the policies and programmes your organisation is implementing to enhance risk preparedness within your institution?

	In use Yes/no	Since when is in use?	Mandatory Yes/no	Mark the one you consider				
				Not effective	Barely effective	Somewhat effective	Effective	Very effective
				1	2	3	4	5
Risk management strategy								
Evacuation plans								
Evacuation training								
Emergency/contingency plans								
Training on risk management								
Risk knowledge transfer								
Capacity development								
Insurances								
Other:								
Other:								

Comments:

19. Looking to the future, does your organisation expect to be more prepared to manage the risk compared with the last event?

Yes ☐
No ☐

Comments:

20. What are the policies and programs your organisation is implementing to support prevention and mitigation?

	In use Yes/no	Since when is in use?	Mandatory Yes/no	Mark the one you consider				
				Not effective	Barely effective	Somewhat effective	Effective	Very effective
				1	2	3	4	5
Public structural measures								
Subsidies/loans for risk reduction measures								
Awareness raising (information database, information campaigns, etc.)								
Insurance								
Knowledge and technology transfer								
Risk regulations								
Early warning								
Regular inspections								
Protection (Infrastructure investment)								
Other:								
Other:								

Comments:

Ex-post policies

21. What are the policies and programmes your organisation is implementing and obtaining (e.g. governmental aid) to ensure recovery?

	In use Yes/no	Since when is in use?	Mandatory Yes/no	Mark the one you consider				
				Not effective	Barely effective	Somewhat effective	Effective	Very effective
				1	2	3	4	5
Compensation funds								
Reconstruction loans								
Rescue team								
Immediate post-disaster-help (cleaning-up)								
Long term post-disaster help (reconstruction support)								
Capacity building								
Other:								
Other:								

Comments:

Resources

22. Does your organisation have sufficient financial resources to manage a proper and effective working process to face risk?

	Very Insufficient	Insufficient	Barely sufficient	Sufficient	Very Sufficient	N/A
	1	2	3	4	5	
Developing policies/tools/measures						
Implementation of policies/tools/measures						
Monitoring outcomes						

Comments:

23. Does your organisation have sufficient knowledge and skills to manage a proper work process to face risk?

	Very Insufficient	Insufficient	Barely sufficient	Sufficient	Very Sufficient	N/A
	1	2	3	4	5	
Developing policies/tools/measures						
Implementation of policies/tools/measures						
Monitoring outcomes						

Comments:

Disaster Risk strategies

24. Is there a national platform for Disaster Risk Reduction in your country?
(e.g. DKKV in Germany)

Yes ☐
No ☐

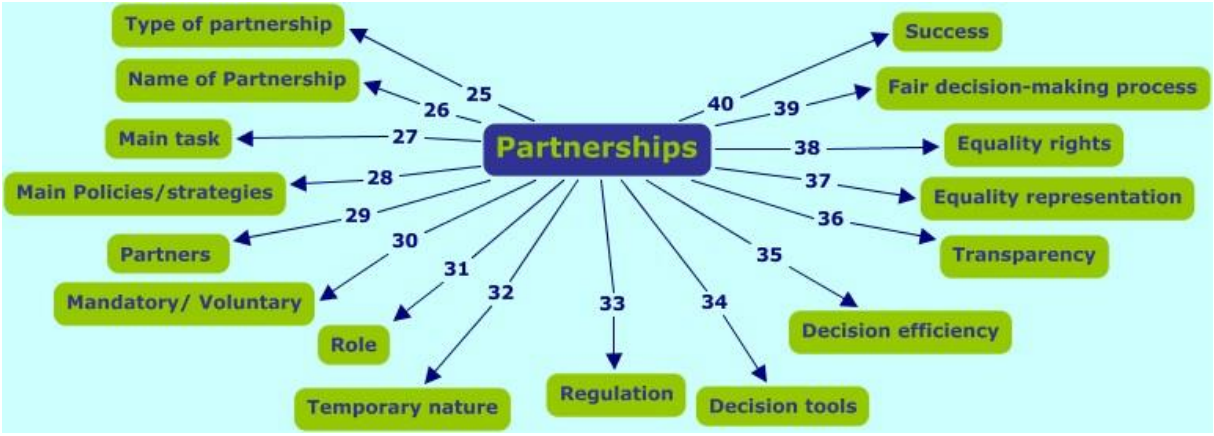
If yes, please answer these following questions.
a. Who is involved? (Stakeholders/partners)

b. What is the relation between the national pblatform and those at local level?

c. What are the coordination mechanisms in use to identify, finance and implement mitigation measures? (Technical, financial and administrative capacity modelling)

Partnership

This section addresses different forms of cooperation among organisations in order to manage risks, including, for example, knowledge exchange, joint policy development and implementation.



25. Does the organisation you represent belong or participate in any of the following forms of partnership regarding the management of the natural risk you mentioned at the beginning?

Network	
Action group	
Round table	
Association	
Committee	
Think tank	
Other:	
Other:	

If you are part of more than one, consider for following questions the more important.

26. What is the name of the partnership you are part of?

27. What is the main task of this partnership?

28. What are the main policies/strategies used by the partnership to achieve this task?

29. Who are the other organisations represented within the partnership?

30. Is belonging to the partnership voluntary or mandated by law? (for the latter, e.g., mandatory home insurances in Spain)

Voluntary	
Mandatory	

31. What is the role of your organisation in the partnership?

32. How long has the partnership been active?

33. Does the organisation and operation of the partnership follow any kind of regulation?

Yes	
No	

If yes, how is regulated?

34. Could you mark the tool or tools used by the partnership to support their decisions? Pleas add if they are not included in the table.

Web-based participation	
Mapping	
Databases	
Early warning system	
Simulation models	

Games	
Round tables	
Public consultations	
Economic instruments	
Cost-benefit analysis	

Evaluation of the partnership

35. Are the decisions made within the partnership efficient?

Very Inefficient	Inefficient	Average	Efficient	Very efficient	N/A
1	2	3	4	5	

Why?

36. Does the decision making process follow a transparent process? Please mark in the following table the most suitable response.

Very opaque	Opaque	Average	Transparent	Very Transparent	N/A
1	2	3	4	5	

37. Are the different members of the partnership equally represented?

Yes ☐
No ☐

Comments:

38. Do the different members of the partnership have equal rights regarding the decision making process?

Yes ☐
No ☐

Comments:

39. Do you consider that the decision making process is a fair process?

Fully disagree	Disagree	Neither agree nor disagree	Agree	Fully agree	N/A
1	2	3	4	5	

Comments:

40. In your own opinion, could the partnership be considered a successful partnership? Please, indicate your opinion in the following scale, where 1 means not successful and 5 means very successful.

1	2	3	4	5	N/A

Comments:

Appendix C

Indicator system in Jucar River Basin: Status index in May 2016 (CHJ, 2016b)

Cód.	Zona	Indicador	31/05/2016
1	Recursos superficiales del sistema del río Cenia	Volumen mensual embalse de Ulldecona	0,65
2	Recursos subterráneos franja costera Cenia-Maestrazgo	Piezómetro 08.11.004 Cabanes	0,53
3	Recursos superficiales Interior Cenia-Maestrazgo	Pluviómetros areales Zona Interior C-M	0,27
4	Recursos alto y medio Mijares	Entradas a Arenós.	0,31
5	Recursos superficiales regulados por Arenós y Sichar	Volumen embalsado en Arenós y Sichar	0,72
6	Recursos subterráneos Plana de Castellón	Piezómetro 08.12.017 Xilxes/Chilches	0,86
7	Recursos alto Palancia	Entradas al Regajo	0,20
8	Recursos superficiales regulados por el Regajo	Volumen embalsado en el Regajo	0,49
9	Recursos subterráneos Plana de Sagunto	Piezómetro 08.21.005 Sagunto	0,52
10	Recursos regulados por el Arquillo de San Blas	Volumen embalsado en el Arquillo de San Blas	0,82
11	Recursos río Alfambra	Estación foronómica 08028 Villalba Alta	*
12	Recursos fluyentes río Guadalaviar	Entradas al Arquillo de San Blas	0,30
13	Recursos medio Turia	Estación foronómica 08018 Zagra	0,51
14	Recursos regulados por Benagéber y Loriguilla	Volumen embalsado en Benagéber y Loriguilla	0,30
15	Recursos subterráneos Liria-Casinos/Buñol-Cheste	Piezómetro 08.23.005 Turia	0,38
16	Recursos subterráneos Plana de Valencia	Piezómetro 08.26.019 Alginet	0,35
17	Recursos alto Júcar	Estación foronómica 08032 Cuenca	0,58
18	Recursos alto Cabriel	Estación foronómica 08090 Pajaroncillo	0,51
19	Recursos subterráneos Utiel-Requena	Piezómetro 08.24.005 Utiel	0,51
20	Recursos ríos Jardín y Lezuza	Estación foronómica 08138 Balazote	0,15
21	Recursos fluyentes Mancha Oriental	Estaciones foronómicas 08144 y 08036	0,66
22	Recursos fluyentes medio Cabriel	Pluviómetros areales Zona Medio Cabriel	0,39
23	Recursos subterráneos Mancha Oriental	Piezómetro 08.29.053 Cenizate	0,38
24	Recursos regulados por el embalse de Forata	Volumen embalsado en Forata	0,08
25	Recursos fluyentes Embarcaderos-Tous	Pluviómetros areales Embalse de Tous	0,32
26	Recursos regulados por Alarcón Contreras y Tous	Suma de volumen en Alarcón, Contreras y Tous	0,63
27	Recursos subterráneos Caroch	Piezómetro 08.28.007. Montesa	0,37
28	Recursos fluyentes del Albaida y Cañoles	Pluviómetros areales Zona L'Ollería	0,25
29	Recursos Subterráneos Sierra Grossa, Sierra de las Agujas y Plana de Gandia	Piezómetro 08.38.019 Gandía	0,43
30	Recursos del sistema Serpis	Volumen embalsado en Beniarrés	0,00
31	Recursos sistema Marina Alta	Pluviómetros areales Marina Alta	0,25
32	Recursos sistema Marina Baja	Volumen almacenado en Amadorio y Guadalest	0,14
33	Recursos alto Vinalopó	Pluviómetros areales alto Vinalopó	0,36
34	Recursos medio Vinalopó-Alacantí	Pluviómetros areales medio Vinalopó	0,44

Appendix D

Composition of the Permanent Drought Commission since its first establishment

Decree name	Composition
RD-Law 18/1981	Civil Governors of the affected provinces Chief Commissar for Water National Government Delegate Director Engineer (or Hydraulic Service Chief) of the JRBP Representatives of ministries of Internal Affairs; Public Works and Urbanism; Agriculture, Fisheries and Food; and Industry and Energy
RD-Law 9/1983	Same as before plus: A representative from each of the Regions within the JRBP territory Two spokes persons from the users council of the JRBP that represent the urban and the agricultural demands
RD-Law 15/1984	Same as before plus: Three additional representatives from each of the Regions within the JRBP territory
RD 134/1994	President of the JRBP Water Commissar Technical Director of the JRBP Exploitation Director of the JRBP Representatives from the ministries of Agriculture, Fisheries and Food; Industry and Energy; and Tourism and Commerce A representative from each region within the JRBP territory One representative for the water uses: urban demand; irrigation; and electricity production
RD 1265/2005	Same as before plus: A representative of associations and organizations for the defence of environmental interests Two representatives from the labour and business unions A representative from the local entities which territory falls total or partially within the JRBP
RD 355/2015	Same as before

Appendix E

Capitals	Factors	No.	Indicators	Units of measure	PDC[59]
Social capital	Equitable treatment of all partners	1	All members have an equal say in decision-making processes. There exist formal norms and rules to foster the democratic process.	Y/N	
		2	(Equal) vote of all partnerships members in processes of formal voting	Y/N	
	Communication and information	3	Extent of a transparent and established communication processes like periodic reports, meetings, etc. guaranties the flow of information	Y/N	
		4	Existence of platforms, committees and networks where all representatives can join the process of information exchange	Y/N	
		5	Information material on risk management e.g. presented on different information channels? Available in different languages?	Y/N	
	Participation	6	Partners from each sectors (public, private, civil) within a collaboration	Y/N	
		7	Amount of periodic formal meetings of stakeholders who are involved in continuous networking processes	1 to 4 yearly 5 to 9 yearly +10 yearly	
		8	Implementation of monitoring processes (e.g. internal or external audits)	Y/N	
	Knowledge	9	Existence of educational programs for participating representatives and/or awareness campaigns for society at large	Y/N	
		10	Percentage of trained individuals/institutions in relation to the target group of the specific program	68 to 100% 33 to 67% 0% to 32%	
		11	Existence of subjects in the curricula dealing with regional risk	Y/N	
	Trust (in stakeholder, other partners)	12	Existence/knowledge about influences on trust/beliefs resulting from historic events or cultural behaviour existing in a risk area	Y/N	
		13	Existence of longstanding cooperation between the same representatives which create trust between them – (medium duration of participation)	Years 1-4 5-9 +10	
		14	Experiences of mutual (successful) conflict and problem solution	Y/N	
	Rules and norms of society	15	Existence of informal boards/groups resulting from cultural-historic development	Y/N	
		16	Existence of the registration of past events in the risk area/access to these registrations for all actors	Y/N	

[59] Permanent Drought Commission assessment.

Capitals	Factors	No.	Indicators	Units of measure	PDC[59]
		17	Solidarity in society, e.g: - Amount of donations given from the society to a specific reason	**Losses in €**[60] 51% to 100% 26% to 50% 0% to 25%	
		18	Mobilisation of volunteers in the face of risk	Y/N	
Human capital	Skills and competencies	19	Level of education (degree of stakeholders)	High Medium Low	
		20	Existence of practical measures taken in private households	Y/N	
		21	Percentage of membership organised in non-governmental and governmental technical aid organisations (fire brigade, red cross, THW, etc)	68 to 100% 33 to 67% 0% to 32%	
Political capital	Transparency and trust in political actions	22	Periodic submission of new laws or decrees in a public document	Y/N	
		23	Percentage of population taking part in elections	68 to 100% 33 to 67% 0% to 32%	
		24	Periodic statistical surveys published - reflecting the opinions of the population in regards to governmental work	Y/N	
		25	Existence of comprehensive anti-corruption policy	Y/N	
		26	Existence of laws/declarations, etc. in order to provide legal basis for the freedom of media	Y/N	
	Regulatory framework: formal rules and norms	27	Permanency of risk related laws/regulations (time period)	Y/N	
		28	Periodic revision and updates of laws and regulations concerning the protection against hazards and the management of disasters	Y/N	
		29	Existence of emergency plans (level of detail)	Y/N	
		30	Existence of obligation to obtain insurance	Y/N	
		31	Existence of risk maps	Y/N	
Financial capital	Disaster funds	32	Amount of disaster expenses of the total environmental budget	More than 21% 11% to 20% 0% to 10%	
		33	Amount of existing disaster funds related to goods and values that exist/are stored in the risk area	68 to 100% 33 to 67% 0% to 32%	
		34	Ratio of public and private investments on disaster funding	**Losses in €**[61] 51% to 100% 26% to 50% 0% to 25%	
		35	Percentage of households/institutions having insurance related to the specific threat in risk areas	68 to 100% 33 to 67% 0% to 32%	
		36	Percentage of damages that were covered by insurances during the last events.	68 to 100% 33 to 67% 0% to 32%	
	Risk of impoverish-	37	Percentage of losses covered by rights of compensations (offered by the government) if they exist.	51% to 100% 26% to 50% 0% to 25%	

[60] Cover with donations the losses of a specific disaster.
[61] Cover losses of a particular disaster

Capitals	Factors	No.	Indicators	Units of measure	PDC[59]
	ment	38	Quality of supply of public goods in general	High Medium Low	
Environ-mental capital	Regeneration of environment	39	Percentage of ecologic compensation area per total area	68 to 100% 33 to 67% 0% to 32%	
		40	Post disaster local actions taken for environmental regeneration	68 to 100% 33 to 67% 0% to 32%	
	Management strategies and planning processes	41	Binding force of legal frameworks/regulation	Y/N	
		42	Binding deadlines/schedules for implementation processes	Y/N	
		43	Amount of environmental public investment in protection strategies	$[62] More than 11% 0% to 10%	
		44	Percentage of different land use types within the risk area (in order to implement targeted strategies/actions)	68 to 100% 33 to 67% 0% to 32%	
		45	Amount of protected area within the total risk area	ha[63] More than 31% 16% to 30% 0% to 15%	

[62] Percentage of protection strategies taking into account the total public investment in environment
[63] Number of hectare (expressed in %) destined to protected area within the total area in risk

Appendix F

Factor	No.	Indicator related to the factor	Units of measure	Assess-ment	Notes
Social Capital					
Equitable treatment of all partners	1	All members are equal in decision-making processes.	Y/N		
Communication and information	2	Existence of a transparent and well established communication process (*e.g. periodic reports, meetings, etc.*) that guarantees the flow of information.	Y/N		
	3	Existence of platforms, committees and networks where all representatives can join the process of information exchange.	Y/N		
Participation	4	Cooperation of partners from different sectors such as public, private and civil, as well as agricultural, energy, tourism, etc.	Y/N		
	5	Amount of periodic formal meetings held between members of the Commission.	1 to 4 yearly 5 to 9 yearly +10 yearly		
	6	Implementation of monitoring processes (*e.g. internal or external audits*)	Y/N		
Knowledge	7	Percentage of individual members of the Commission or institutions represented in the Commission trained in droughts and prevention management.	68 to 100% 33 to 67% 0% to 32%		
	8	Existence of registration of past drought events in the basin. Access to these registrations for all members.	Y/N		
Trust (other members)	9	Evidence whether knowledge gained from historical events in the basin has influence over the increase in trust to lead new drought events.	Y/N		
	10	Existence of longstanding cooperation between the same members which encourages trust (teamwork during years).	Years 1-4 5-9 +10		64
	11	Experiences of conflict and problem resolution.	Y/N		
Communication and relation to the society	12	Existence of informal boards/groups resulting from cultural-historic development.	Y/N		65
	13	Existence of educational programmes in relation to the droughts promoted by the Commission and/or awareness campaigns addressed to civil society.	Y/N		
	14	Access by civil society to the last drought events registered in the basin.	Y/N		
	15	Information material on drought management. Presented through different information channels and available in different languages where appropriate.	Y/N		

[64] Considered by the PDC not green the longstanding cooperation between same members. The structure of the PDC changed in the last years (see Appendix D).

[65] The Water Court of the Plain of Valencia (Tribunal de la Aguas de la Vega de Valencia) it is not here consider as example of informal group as result from cultural-historic development. It is consider formal and more related to water management than drought.

Factor	No.	Indicator related to the factor	Units of measure	Assess-ment	Notes
	16	Launching of donation initiatives promoted by the Commission to aid in covering losses caused by natural disasters.	Y/N		
	17	Mobilization of volunteers in the face of risk.	Y/N		
Human capital					
Skills and competencies	18	Level of education (average academic degree of Commission members)	High[66] Medium Low		
	19	Innovation capacity of the Commission members. Enterprising spirit.	Y/N		
	20	Valuation of the social skills of the members (*e.g. assertiveness, active participation and listening, decision making, conflict resolutions, etc.*).	High Medium Low		
	21	Percentage of membership with training on drought management.	68 to 100% 33 to 67% 0% to 32%		
	22	Level of member's experience in drought management.	High Medium Low		
Political capital					
Transparency and trust in political actions	23	Information updating regarding the submission of new laws or decrees related to droughts.	Y/N		
	24	Equal vote of all Commission members in processes of formal voting.	Y/N		67
	25	Equal participation (the right to have voice) of all Commission members in decision making.	Y/N		
	26	Percentage of members taking part in internal elections of the Commission (voting participation).	68 to 100% 33 to 67% 0% to 32%		
	27	Existence of statistical surveys published reflecting the opinions of the actors (Commission members and external representatives of drought management partnerships) in regards to the governance of the Commission.	Y/N		
	28	Existence of comprehensive anti-corruption policy.	Y/N		
	29	Existence of laws/declarations, etc. in order to provide legal basis that promote the freedom of media.	Y/N		
Regulatory framework: formal rules and norms	30	Periodic revision and updates of laws and regulations concerning the protection against droughts and the management of drought disasters.	Y/N		
	31	Existence of emergency plans.	Y/N		
	32	Existence of obligation to obtain insurance for protection in the face of disasters.	Y/N		

[66] High: University degree. Medium: Technical education. Low: General Certificate of Secondary Education.

[67] Considered by the Commission not red to have only the right to voice instead voice and vote for decision-making processes (marked as green). They have never needed to vote.

Factor	No.	Indicator related to the factor	Units of measure	Assess -ment	Notes
	33	Existence and open access (whole public) to risk maps (promoted or not by the Commission).	Y/N		
Financial capital					
Disaster funds	34	Percentage of the drought expenses covered by the government	68 to 100% 33 to 67% 0% to 32%		
	35	Proportion of public and private investments on drought funding.	68 to 100% 33 to 67% 0% to 32%		
Risk of impoverishment	36	Existence of rights of compensation (offered by the government) to affected population.	Y/N		
	37	Percentage of losses covered by these compensations if they exist.	68 to 100% 33 to 67% 0% to 32%		
	38	Percentage of households/institutions that have insurance related to the specific threat in basin (*e.g. droughts, floods, etc.*).	68 to 100% 33 to 67% 0% to 32%		
	39	Percentage of damages that were covered by insurances during the last drought event.	68 to 100% 33 to 67% 0% to 32%		
Environmental capital					
Regeneration of environment	40	Percentage of ecologic compensation per total area.	68 to 100% 33 to 67% 0% to 32%		
	41	Percentage of actions taken by the Commission for environmental regeneration after a disaster.	68 to 100% 33 to 67% 0% to 32%		
Management strategies and planning processes	42	Existence of climate change studies for preparedness for potential increment of drought events.	Y/N		
	43	Binding deadlines/schedules for implementation of drought management processes.	Y/N		
	44	Existence of big infrastructures that affect the environment (*e.g. diversion of water*)	Y/N[68]		
	45	Percentage of different land use types within the basin (in order to implement targeted strategies/actions to minimize droughts).	68 to 100% 33 to 67% 0% to 32%		
	46	Percentage of protected area within the total basin area	ha[69] 27% to 100% 14 to 26% 0% to 13%		

[68] Attention: Here YES answer is considered red and NO answer is considered green. (Generally, this kind of constructions causes a big environmental impact in land and fauna).
[69] Number of hectare (expressed in %) destined to protected area within the total area in risk

Appendix G

Interviews guideline: risk perceptions and resilience in the Jucar River Basin

A. Communities at risk

Please characterise in a concise way the communities of your case study area, highlighting the typical social tissues, economic standings, and

A1: Population:

a. Number of population (proportion of those of age <15 and >65 age);
b. Population dynamics over time (past 20 years);
c. Concentration in small, medium-size and large towns (< 10.000; 10.000-100.000; > 100.000);
d. Level of soil consumption/urbanisation;
e. Proportion of people at risk of poverty or material deprivation.

A2: Economic sectors and competences (half a page, concise description)

a. Gross domestic product in *purchase power parity* (PPP) per capita in absolute and relative (percentage of EU 27 average) terms;
b. Key economic sectors affected by the risk;
c. Employment level

A3: Collaboration between stakeholders, partnerships (ca. half a page, concise description)

Existence of partnerships (*collaboration between stakeholders for a mutual benefit*) in the case study. *More in detail in item C.*

B. Risk

Risk means different things to different people and actions based on understandings of risks are learned by socially and culturally structured conceptions. *An important aspect is to identify what characteristics are determinant to individuals' and communities' response to natural hazards risk*.

Most risk studies to date tend to focus on single hazard risks (e.g. storms, floods or droughts), but an emerging field in risk management is the analysis of connections and dependencies between different kinds of hazards, and their cascading effects.

Our understanding of catastrophic risk (continuously) varies in time and space due to changing patterns of exposure and vulnerability.

With regard to your understanding,

i) Kind of natural hazards lived through:
   a. key reference events, why they are considered exceptional.

ii) Definition of risk looking at the case study:
   a. How do you understand risk taking into account the case study area.

iii) Knowledge about the risk(s) in the case study:
   a. The history of the risk in the case study area:

      - great events in the past;

      - since when there are references;

      - current teaching programs on the risk;

      - programs of preparedness for the future events (*e.g. awareness campaign for responsible water consumption*).

iv) Reaction of population/stakeholders facing risk events (natural hazards):

   a. Stakeholders:

      - Action taken by stakeholders in past events (as specialist in the issue) (*e.g. new measures of safety facing future risks: dike building*).

   b. Population:

      - Actions taken by citizens before and after risk events (*e.g. having insurance or facing a flood people bailing out water*);
      - Social mobilizations facing risk (*e.g. civil partnerships*).

C. Partnership

It has been demonstrated that teamwork is more effective. We understand partnership as a relationship between two or more groups involved in an activity together for achieving their common interests. In brief, partnership involves cooperation to work or act together, and can be defined as cooperation between organizations in the public or private sector for mutual benefit.

Explain with your own words,

i) What is your understanding of partnership especially in connection with *risk management (see item D).*

   a. Are there limits/pre-conditions in size?

ii) Characterization of a partnership: elements/qualities (positive or negative).

iii) Collaboration between stakeholders (partnership) in the case study area:

If yes,

   a. provide examples;
   b. aims that they achieve (are they beneficial or not);
   c. are they public, private or a combination public-private.

D) Risk Management.

Risk management is the sum of measures instituted by people or organisations in order to reduce control and regulate risks. In other words, it is the identification, assessment and prioritization of risk.

Please characterise the risk management of your case study area,

i) Main entities, which manage, implement measures and make decisions facing natural hazards in the case study ,

   a. name at least the main three;
   b. are these entities Partnerships.

ii) In case of these partnerships make decisions,

   a. how effective are these decisions (in different levels, e.g. international, national or regional level).

iii) Which are the legal requirements facing risk;

   a. official prevention strategy.

vii) Protocol(s) (working process) to follow after disasters in the case study (*e.g.* Emergency plans).