5. Inclusion in Disaster Risk Reduction

A multitude of actors, their perceptions, their knowledge base and value commitments (and political interests) are engaged in processes of risk analysis, decision-making, and disaster management.

The stakeholders usually involved in disaster management are:

- Authorities; Public administrations play a prominent role at all levels during disaster and public servants or elected officials have the ultimate responsibility for making top-level decisions.
- Non-governmental organisations: local, national, and international NGOs may also be involved in different aspects disaster. They may be engaged in DRR and in the response phase they may provide emergency and transitional settlement, shelter, water, and sanitation.
- The community; not a single entity but as noted earlier, a highly diverse range of social actors whose voluntary work actually saves and rehabilitates most people in a disaster.
- Emergency services; fire, rescue, emergency medical services and law enforcement represent the first institutional response. They, and other emergency responders, might be involved in tackling the emergency on site, warning, evacuation, and communication.
- Armed forces: in some countries, response to disasters is managed by civil defence or civil protection departments dominated by armed forces personnel. Tasks of the armed forces often include operational and logistical support to civilian teams (Lopez-Carresi et al. (eds) 2013)

In this chapter we ponder what happens when organisational cultures meet when facing an emergency. If they did not know each other all that well before the crisis, misunderstandings, confusion and overload can easily arise. Situational awareness can be substantially improved by understanding the different ways professionals are used to talking to each other, and to disaster-affected people about what's going on. It takes insight in how organisations understand themselves, their place in the network of actors involved in disaster management, and the nature of that network. We provide a method for Social Network Mapping, seeking to capture not only formal but also informal actors – who they are, with whom they communicate, where they tend to get their information from. The 'spider web' this generates (illustrated by L' Aquila and Lorca) helps us prepare better for the next disaster event. The chapter then zooms in on two key but underappreciated actor groups in the response network: volunteers and 'gatekeepers', and how they could be more effective in DRR. Finally, we focus on

the role of the military. We discuss how the difference in culture and organisation between civil and military organisations can complicate disaster CIMIC (civil-military cooperation), and what may be done to make things easier.

5.1. The role of culture in multi-organisational emergency management

Authors: Kees Boersma, Jeroen Wolbers

5.1.1. Challenges with information sharing and coordination in emergency response

One of the most pronounced key challenges in emergency management concerns how to adequately share information and coordinate the rescue efforts of different emergency response organizations. In emergency response various organizations with different backgrounds, specialized operational expertise, and professional jargons try to develop a shared understanding of the situation. In order to do so, they must bridge their jurisdictional and organizational boundaries. This is challenging because each response organization has operational field units at different levels, different functional command structures, and separate back offices for information and resource management. Consequently, emergency management literature often describes failing information management due to problems of information overload, difficulties with information technologies and validation of information, and insufficient attention for data sharing (Comfort and Kapucu, 2006; Kapucu, 2006; Moynihan, 2009; Netten and Van Someren, 2011).

Recently scholars have started to address the cultural dimension in emergency response operations. For example, Morris, Morris and Jones (2007) describe that the success of the US Coast Guard rescue operations in the aftermath of hurricane Katrina was based upon being able to speak the different professional languages of many different stakeholders. In a different analysis of the response to Hurricane Katrina, Moynihan (2012) shows how the Department of Defence performed a culture-switch to adopt to a new multi-stakeholder operational logic. Similarly, Tsai and Chi (2012) argue that cultural distance is the missing link in explaining the gap between desired and perceived effectiveness of Incident Command System in Japan and Taiwan.

Yet, a coherent perspective on the cultural dimension of multi-organisational response operations is missing. The main focus of this chapter is, therefore, to explore the cultural dimension in multi-organisational emergency response coordination. We propose a coherent cultural model, which builds upon and integrates several years of empirical studies into Dutch emergency response organisations (Boersma et al., 2010; 2012; 2014; Wolbers et al., 2012; Wolbers and Boersma, 2013; Treurniet et al., 2016; Wolbers, 2016).

5.1.2. Introducing a culture model: the trading zone

Organisational culture has been described as a pattern of (a) basic, shared assumptions, (b) invented, discovered, or developed by a given group, (c) and instrumental for organisational members to cope with problems and uncertainties (Schein, 1996; Giorgi et al., 2015). It is seen as the social glue that holds the organisational members together. In the case of emergency responders this means that the fire department, police and ambulance services each have distinct cultural characteristics that give the professionals an unique identity, but at the same time can also cause misunderstanding between them as soon as they have to work together.

However, the description of culture as a static set of shared assumptions is an oversimplification of the actual situation. Stories of first responders provide us with a far more complex and dynamic picture, showing that tensions can develop because of cognitive and normative diversity within a particular response organisation. The attribution of meaning (an important part of the cultural process) is complicated and can lead to fragmentation as well as integration, diversity as well as unity. In line with JoAnne Martin's organisational cultural analysis (2002), we argue that a monolithic approach that sees each response organisation as having an own 'culture', neglects the complexity of the cultural dimension. In order to understand the role of culture in the multi-organisational, and dynamic environment in which emergency responders operate, we propose a model that adheres to that complexity. We do so, by addressing the practices of emergency responders from an interpretive perspective, which considers organisational culture:

1) to be a layered phenomenon, which including the values and the deep assumptions within the organisation,

2) to be multi-dimensional since it is not a static, monolithic phenomenon in which each organisation has a distinctive culture (i.e. are

integrated). Instead, these cultures can also be differentiated (i.e. have subcultures) or be fragmentized (i.e. different perspectives can exist within one subculture) and they can change over time,

3) to be an outcome of sensemaking and sensegiving in which organisational members (de/re)construct reality based upon these processes to find out what is going on in times of uncertainty.

In the actual practice of emergency response operations, we have often witnessed professionals from the different response organisations in discussion with one another about the characteristics of the emergency, their actions, and the consequences of the actions for the response operation. This interaction is characterized by a process we regard as negotiation. We propose a model of cultural-in-practice to capture the recurring processes of negotiating actions and interpretations between emergency responders. The negotiation between emergency responders take place in trading zones: situations in which local coordination of ideas and action take place despite differences in the (professional) backgrounds, norms, and routines the first responders (see for this concept: Galison, 1997). A trading zone as a setting that embodies coordination efforts, is an ongoing accomplishment in which diverse groups interact across their boundaries, by agreeing on the rules of the trade, while the objects traded can mean different things to both groups.

The trading zone has four dimensions. First, groups that interact in the trading zone have different professional backgrounds, a phenomenon that we call: epistemics. Second, by developing their own professio-

Figure 5.1.1. A layered cultural model for understanding first response organizations in action

nal knowledge and standards these groups create an own identity. Third, the groups confront their different interpretations by initiating in a negotiation process across their professional boundaries through boundary work. Fourth, this negotiation process occurs by sharing the interpretations of a particular situation by storytelling. We have placed these elements on two axes in a culture model (figure 5.1.1).

The vertical axis in our culture model shows the diverse nature and backgrounds of emergency responders interacting in the trading zone, through their epistemics and identity.

Epistemics refers to the jargon of different professional languages in relation to the organisational practices in which this professional knowledge is developed (Knorr Cetina, 1999). The connection with actual practices is important to understand the relations between the concepts in our layered culture model, as epistemics are made up of patterns of activities that are constructed in daily interaction, that demarcate the existence particular professional fields. By interacting with artefacts the professionals generated knowledge that is seen as particular to that field, which also creates a boundary between different epistemics. In this way the epistemics can be directly related to processes of brokering ideas between different communities.

Identity refers to professionals who tend to identify themselves with their own organisation; especially in situations in which they are confronted with other professional organisations (Tajfel and Turner, 1986). We acknowledge the necessity for the strong identification and loyalty of the members with their operational field. At the same time, in the dynamics of emergency response operations the context in which identification occurs often changes to result in 'identity work' (Alvesson, 2000). This leads to the situated nature of identity, which means that in one context one identifies with being an emergency responder working together with other emergency responders, while in another context one might identify him or herself with being a police officer who has to work together with a fire officer.

The horizontal axis in our culture model focuses on the action and practices of emergency response in-action, in which storytelling and boundary work takes place.

Boundary Work describes the process of sharing information across the boundaries of organisations (Star and Griesemer, 1989) to negotiate actions and interpretations (Kellogg et al., 2006). Boundary spanning occurs when emergency responders interrelate on the basis of

understanding each other's needs and requirements for coordination. Learning how to bring together each other's complementary skills, learning from the experience of others and closely examining information is a key asset for developing cross-boundary coordination. Boundary objects are part of coordination mechanisms by representation, which offer a common referent that people can use to interact, align work and create shared meaning.

Story telling conceptualizes the process of sharing and making explicit the interpretations of emergency responders, in which they describe the situation and their actions (Feldman et al., 2004). The stories told by the first responders have a plot (the main message), characters (what are the relevant actors in the story) and a narrative (what is the story about and how is the story presented). Through sharing their stories implicit, problem conceptualizations are made tangible by signalling potential problems, clarifying misunderstandings and exchanging information.

5.1.3. On methodology and methods: a research agenda

Our trading zone model aims at unravelling the cultural dimension by exploring and understanding sensemaking and sensegiving practices of emergency response professionals (Weick, 1995; Weick et al., 2005; Maitlis and Lawrence, 2007). As sensemaking is a process that describes how actors perceive and enact their environment, we adhere to an interpretative, constructionist perspective (Yanow and Schwartz-Shea, 2006). This perspective focuses on collecting and analysing data in which the stories of the actors involved are central. Storytelling (narrative analysis) as a method enables the researcher to uncover the otherwise hidden assumptions of the emergency responders, as well as their organisational values. Through stories actors implicitly, and sometimes explicitly, negotiate their interpretations and actions. The ethnographic approach (Hammersley and Atkinson, 2004) is very useful in unravelling trading zones since it enables the researcher to follow the real-life conversations and the negotiation of the interpretations of the emergency responders. A typical cultural study based on our model takes place by adopting three methods: observations, interviews and document analysis to come to a triangulation of data.

5.1.4. The emergency responder as reflective practitioner

Negotiation in the trading zone is not a neutral process; it involves power and interests. A such, for emergency response to engage in a trading zone, a stance is required that increases their reflexivity. Reflexivity and knowing in-action (Schön, 1987; Thompson, 2008) can make differences, power, and interests that are embedded in interpretation processes explicit. Increasing reflexivity can be achieved by telling stories about the bottlenecks that emerge in the response operation. This often makes the different interpretations of the situation the actors adhere to explicit. Yet, is not only important to tell the story from one perspective, but it is especially important to include the other professional perspectives as well. Reflexivity allows the emergency responders to make their different professional backgrounds visible to themselves and others, and find new creative solutions to traverse their professional boundaries. This, of course, is a learning process that (literally) needs training and education, in order to let professionals recognize the constraining and enabling characteristics of multi-organisational work. Reflexivity starts with the recognition of a problem, and continues with the development of affective responses and empathy. Therefore, a multi-organisational operation in emergency response involves asking and answering the questions (Yanow, 1997): What do I do? Why do I do it? What does it mean for me, as a professional, and for the other professionals I work with and for? In this way, first responders can create a trust in each other's skills and routines, and work towards a shared process of sensemaking and sensegiving.

5.2. Organisational interaction in emergency management

Authors: Raffaele Giordano, Alessandro Pagano

This chapter aims at supporting emergency managers in enhancing the interaction processes among actors involved in emergency management and response, through a better understanding of the complexity (ramification) of the interaction network, and ambiguity in problem framing and understanding the situation.

The core activity of taking decisions and implementing actions in the complex and highly dynamic environment during and after a disaster often exceeds the ability of a single centralized entity to cope. No single entity can have completely control of these multi-scale, distributed, highly interactive networks, or the ability to evaluate, monitor and manage these emergencies in real time. It is becoming crucial to

overcome the classical emergency management approaches in which institutional organisational structure tends to follow stable boundaries, established authority figures, and protocol driven actions. Nowadays the response to crises has become an emerging, large-scale system consisting of individuals, groups, organisations and jurisdictions that need to coordinate their actions for delivering effective operations. In crises, a "temporary multi-organisation" as defined by Cherns and Bryant (1984) needs to be deployed, implying several difficulties of coordination and shared management of the situation(s). Cooperative response actions need to be carried out in a network form (Abbasi, 2014), and can benefit or be impaired by the connectivity patterns of the different emergency responders (Vespignani, 2011).

Enhancing the coordination effectiveness in case of emergency among the different responders is the main scope of several studies aimed at overcoming the organisational factors hindering cooperation. Up to now, most research has been carried out on what happens within a single organisation under stress, while knowledge is still limited on what happens when multiple organisations need to coordinate in unison to make the best of their capacity in a highly stressful environment. That is, lack of cross-sectoral structures, lack of common goals, lack of common concepts, lack of distribution of information, lack of trust, competitive practices and lack of situational awareness. Although most of the efforts carried out in order to enhance cooperative emergency management have been focused on technological innovation for information sharing, we need a shift toward enhancing the interactions among the different actors in emergency management.

Existing formal protocols of interaction ignore how cultural diversities, with specific reference to organisational culture, influence the way different actors perceive the topology of their own interactional network, and, consequently, their strategies to cooperate with other entities. Empirical evidence demonstrates how some actors assume a strongly hierarchical structure of the interactions (Sorensen and Stanton, 2013). Other actors consider the multi-central structure as the most effective one to allow the rapid exchange of information and cooperation within each level of the organisational structure and between different levels (Smart and Sycara, 2013). Neglecting these differences could lead to the development of ineffective procedures for emergency management, because the actors will not recognize the network through which they collect the information and cooperate as trustable.

The dynamic and complex nature of crisis situations does not allow for a static framework of the crisis responses. Interaction networks chan-

Figure 5.2.1. The city of L'Aquila

ge dramatically during an emergency. Some actors could assume the role of informal leaders, whereas the official responders could be characterized by a low level of trust. The existing institutional protocols for information management in case of emergency seem incapable of adapting themselves to this changing interactional situation.

The experiences in EDUCEN demonstrate that in order to shift cultural diversity from a barrier to an enabling factor for cooperative emergency management, methods and tools are required that enhance the understanding of the dynamic processes influencing the interactions among different actors in the different phases of the DRR.

5.2.1. Mapping network interactions in L'Aquila

For EDUCEN, we mapped the network of interactions among the dif-

Organisational culture in L'Aquila, Italy

The city of L'Aquila experienced a disastrous earthquake in 2009. Different barriers hampering the cooperation among the different actors were registered. The communication limits in the preparatory phases and during recovery gained a lot of attention.

ferent emergency responders, both institutional and non-institutional to analyse the flow of information and cooperation activated during the different phases of the 2009 earthquake emergency.

This event highlighted several limits in the information sharing protocols, and specifically between the institutional actors and the community. These limits had a very negative impact on the level of trust local community had in the emergency managers, with consequences on the acceptability of emergency management and recovery measures. After the earthquake, the local community was forced to abandon the city centre. New towns were developed in safer places, disaggregating the original socio-cultural networks. New networks emerged after the disasters, showing different cultural aspects.

In order to cope with emergencies, the official protocol of interactions among the different actors can be represented as in figure 5.2.2.

As shown in the figure, the protocol is strongly hierarchical and permits little information sharing between actors at the same level in the process. The analysis of the interviews carried out in the case study,

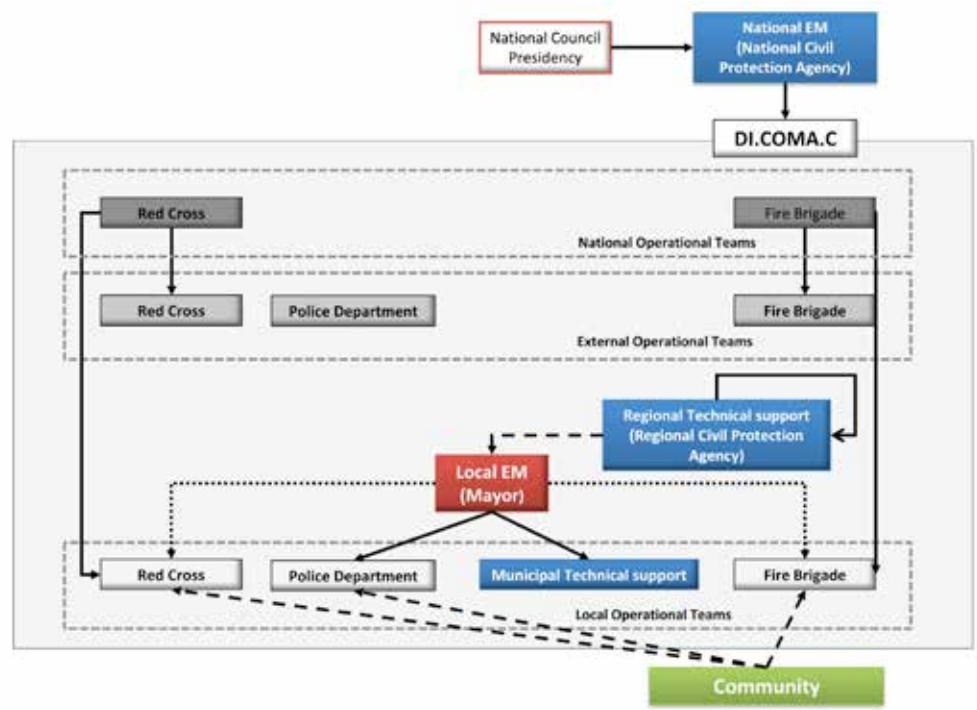

Figure 5.2.2. Official protocol of interaction

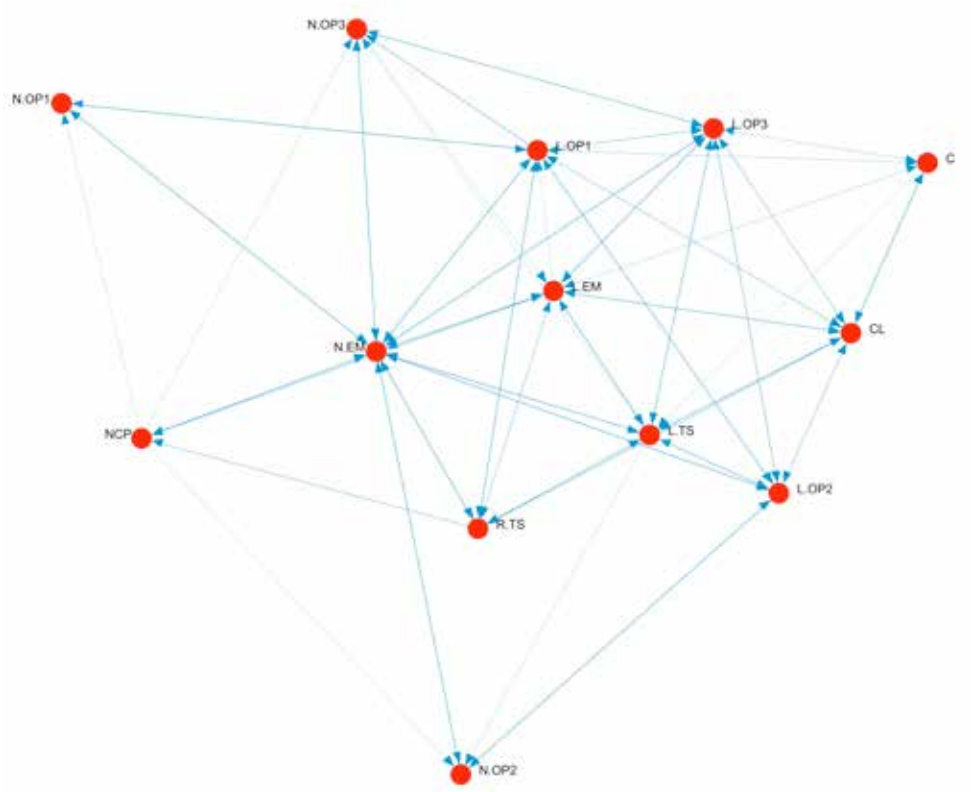

Figure 5.2.3. Map of the interactions network activated during the emergency management phase

involving both official responders and members of the community, allowed the mapping of the actual network of interactions, as shown in figure 5.2.3.

The comparison between this network and that representing the official protocol of interactions in case of emergency demonstrates the inadequacy of the protocols to fully capture the complexity of the interactions. The actual network is far less hierarchical and accounts for informal interactions taking place even among institutional actors. That is, during the knowledge elicitation phase we learned that, besides the official interactions, in case of emergency the institutional actors activated personal relationships to gather important information.

The combination of the different networks allowed the mapping of the complex interactions among the main elements activated during the emergency, i.e. agents, knowledge and tasks (figure 5.2.4).

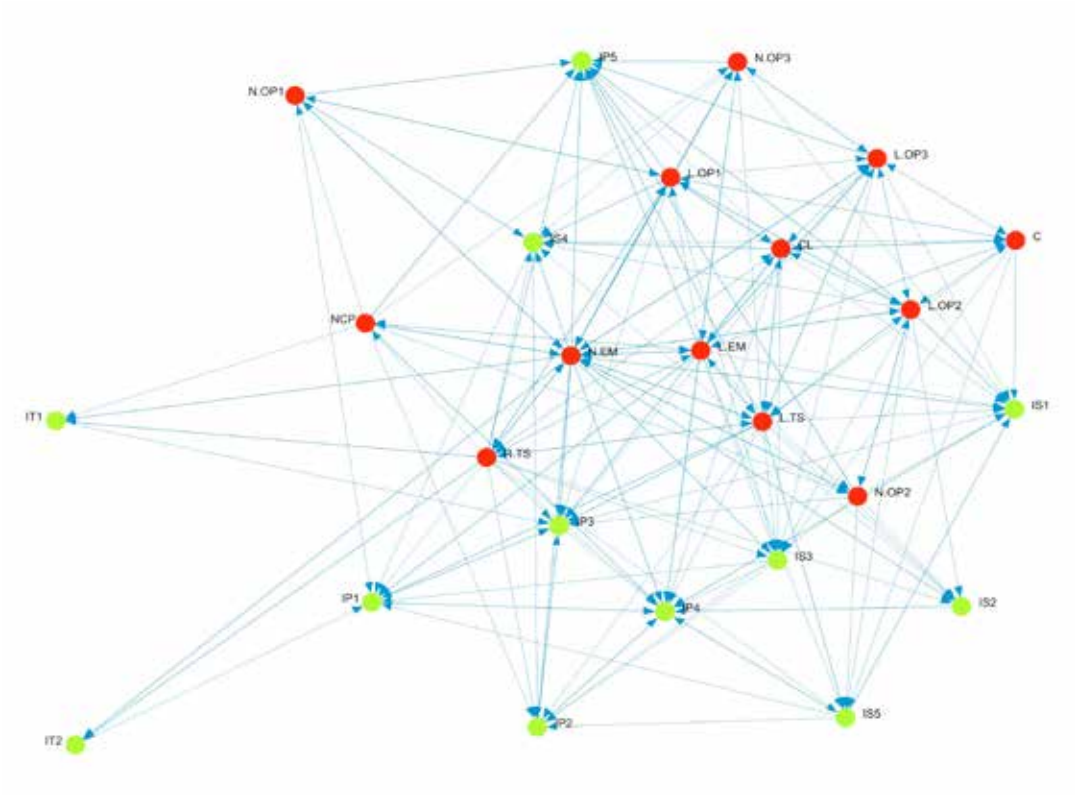

Figure 5.2.4. Network of interaction among agents, knowledge and task according to both experts and local knowledge

The figure shows the actual complexity of the interaction mechanisms supporting the emergency management. Failure in this network – lack of an information, missing cooperation for task implementation, etc. – could provoke uncontrollable cascading effects leading to the failure of the whole emergency management process. Therefore, it becomes crucial for the emergency managers to enhance their comprehension of this complexity, in order to implement actions aiming to increase the effectiveness of the emergency management network and to reduce its vulnerability.

The experiences from the L'Aquila case study demonstrated how the organisational culture influences the way the different organisations perceive the interaction network in which they have to operate in case of emergency. Some institutional actors, such as local emergency managers, considered the multi-central structure as the most effective structure to enable a rapid exchange of information within each level of the organisational structure and between different levels. These le-

Name	Role	Type	l'Aquila
L.EM	Local Emergency Manager	Individual	Mayor
N.EM	National emergency management	Organisation	Di.Coma.C.
L.TS	Local Technical Support	Organisation	Technical Municipal office
R.TS	Regional Technical Support	Organisation	Regional Civil Protection agency
N.TS	National Technical support team	Organisation	National Civil Protection agency
L.OP1	Local Operational Team #1 (Health assistance)	Organisation	Local Red Cross team
N.OP1	National Operational Team #1 (Health assistance)	Organisation	External Red Cross teams (coordinators and operators)
L.OP2	Local Operational Team #2 (Fire Brigade)	Organisation	Local Fire Brigade team
N.OP2	National Operational Team #2 (Fire Brigade)	Organisation	External Fire Brigade teams (coordinators and operators)
L.OP3	Local Operational Team #3 (Police Dept.)	Organisation	Local Police team
N.OP3	National Operational Team #3 (Police Dept.)	Organisation	External Police teams (coordinators and operators)
C	Community	Individual	Members of the community
CL	Community leaders	Individual	Representative of the community

Table 5.2.1. List of stakeholders involved in the L'Aquila case study

vels seem capable to adapt their information collection strategy to different conditions, showing resilience to failures in official protocols of information sharing. Institutional actors with a dense network of interactions – regional emergency management – seemed capable to shift from the formal to the informal network in order to gather the information needed. But the official responders, such as the national civil protection and the fire brigades, assumed a strongly hierarchical structure for information exchange. These actors exclusively trusted information flowing from the top through intermediary, and easily recognizable, levels. This is because they needed to reduce "noise" in information collection. Neglecting these differences can lead to ineffective strategies for information sharing for emergency management. Integrating the city's emergency management into a hierarchically structured network could negatively affect its role as response coordinator. To the contrary, increasing the number of information centres in the responders' networks could paralyze their activities. The experien-

ces gained in L'Aquila suggested that developing effective emergency management strategies requires a clear understanding of the differences among agents' understanding of the interaction network.

Finally, the adopted methodology allowed us to emphasize the role of the community in the emergency management phases, and to make the institutional actors aware of the need to account for the community's understanding of the emergency situation. Specifically, the analysis of the community network allowed us to better comprehend the reasons why the level of trust in institutional information is so low. The community network is strongly polycentric, allowing community members to select the more suitable information sources and activate informal networks of information sharing, as the information provided through institutional channels is not easy for them to comprehend. The analysis of the network allowed to define the central role played by the community leaders in facilitating the flow of information. They represent the actual information centres for the community. This result was considered as crucial for the definition of potential improvements of the emergency management procedure.

5.2.2. Mapping network interactions in Lorca, Spain

An analysis has been done on the interaction network supporting the flood emergency management in Lorca and Puerto Lumbreras municipalities, located in the region of Murcia in South-eastern Spain. The area is highly disaster prone, mainly to floods, but also to droughts and earthquakes. Lorca is the third city within Murcia and the main one in the shire of Alto Guadalentín, a large valley that has become a key agricultural area in Spain. Paradoxically, the area is characterised by a semi-arid climate.

The area has historically suffered serious disaster episodes. Specifically, Lorca's Puerto Lumbreras area is prone to hazards: major events include the Puerto Lumbreras flood in 1973 and St. Wenceslas Flood in 2012. These events caused several fatalities and damages to buildings and infrastructures (e.g. Puentes dam was destroyed twice by flooding).

The flood episodes typically occurring in the area may be extremely dangerous due to their quick onset: the flow rate can increase up to 2000 m3/s within minutes, conveying in two hours approximately the same volume of water that is normally expected in a whole year. Specifically, in the flash flood event of the 2012, the Nogalte wadi, a tributary to the Guadalentín river, changed from a dry riverbed to a wide

Figure 5.2.5. The Puentes dam

and fast-flowing river in less than 20 minutes.

In order to cope with flash flood emergencies, a protocol of interactions was developed aiming at facilitating the coordination and the flow of information among the different institutions and official responders. The following figure schematizes the official protocol of interactions in case of emergency in the Murcia autonomous region.

As shown in figure 5.2.7, the protocol assumes a hierarchical structure concerning the flow of information. The Spanish Meteorological Institute (AEMET) is responsible for disseminating early warning information based on the weather forecasts. According to the level of warning - red, orange or yellow - actions should be taken by Murcia's emergency management unit (Murcia 112). During flood events, two independent monitoring networks collect data:

- the rainfall monitoring system provides real time data to Murcia 112.
- the SAIH, the Segura River Basin monitoring system, provides

Organisational culture in Lorca, Spain

The Lorca municipality has historically suffered serious disaster episodes. The St. Wenceslas Flood (2012) caused several fatalities and damages to buildings and infrastructures. This experience showed some bottlenecks in the "formal" channels of information and data sharing. In particular, the capability of the institutions to provide community with accessible and understandable information on flood risk was strongly questioned and leaded to some conflicts involving community and institutions.

Figure 5.2.6. The St Wenceslas flood of 2012

updated data on rainfall, the level of the water in the riverbeds and the level in the reservoirs.

These two monitoring systems do not exchange information. According to the protocol of interaction, Murcia 112 plays the central role in

Name	Role	Acronym
Spanish meteorological Agency (AIMET)	National technical support	N.WF
Segura river basin authority	Regional technical support	L.TS
Murcia emergency management	Local emergency management	L.EM1
Fire brigades	Local operational team	L.OP1
Military emergency unit (UME)	National operational team	N.OP
National civil protection	National EM	N.EM
National Government	National coordination	N.GOV
Municipality	Local emergency management	L.EM2
Media	Information provider	MC
Other Municipalities	Local emergency managers	L.EM3
Local Police	Road functionality	L.OP2
Network managers	Road functionality	R.OP2
State police	National emergency unit	N.OP3

Table 5.2.2. List of institutional stakeholders involved in flood emergency management

the emergency management. It coordinates the rescue activities of the first responders through Murcia's flood response committee, INUNMUR. On the other side of the interaction network, the Segura river basin authority, in case of warning, activates its internal monitoring and decision-making committee whose main scope is to adopt the needed actions for managing the water in the reservoir according to the flow of water in the riverbeds.

The municipality represents the interface between the emergency management authority and the local community. According to the existing protocol of interventions, its main role is to facilitate the flow of information to the community and to implement the decisions taken by Murcia 112 at local level, e.g. the evacuation of the local population.

Previous experiences have shown bottlenecks in the "formal" channels of information and data sharing. In particular, the capability of the institutions to provide the community with accessible and understandable information on flood risk was strongly questioned and led to some conflicts involving community and institutions. Moreover, ineffective communication among institutional agents was registered, both between the Segura river basin authority and Murcia 112, and between Murcia 112 and the municipality. Based on these experien-

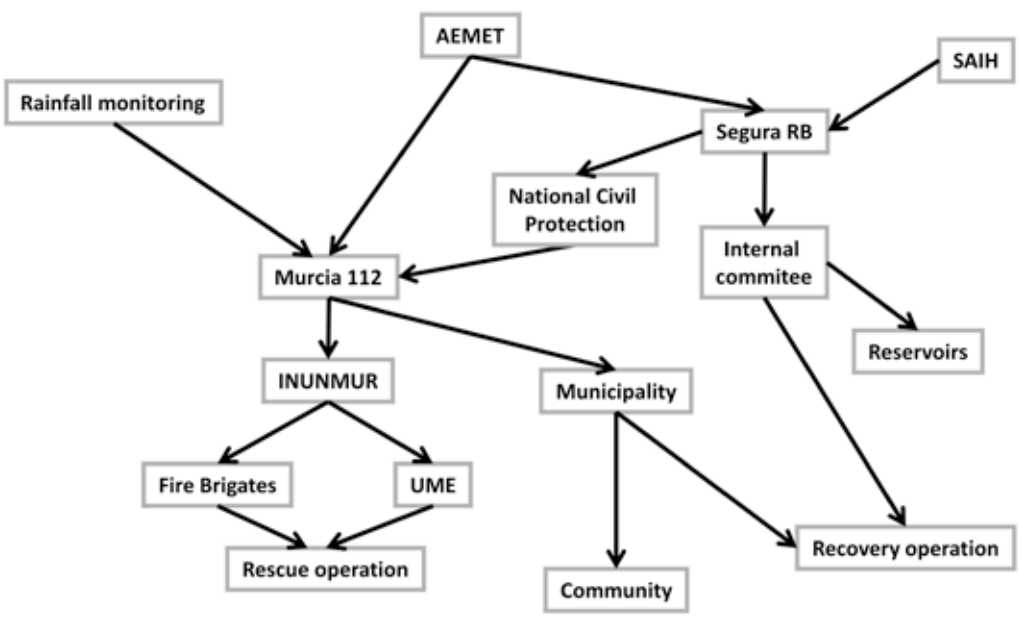

Figure 5.2.7. Protocol of interactions and information flow among the institutional actors in case of emergency in Murcia

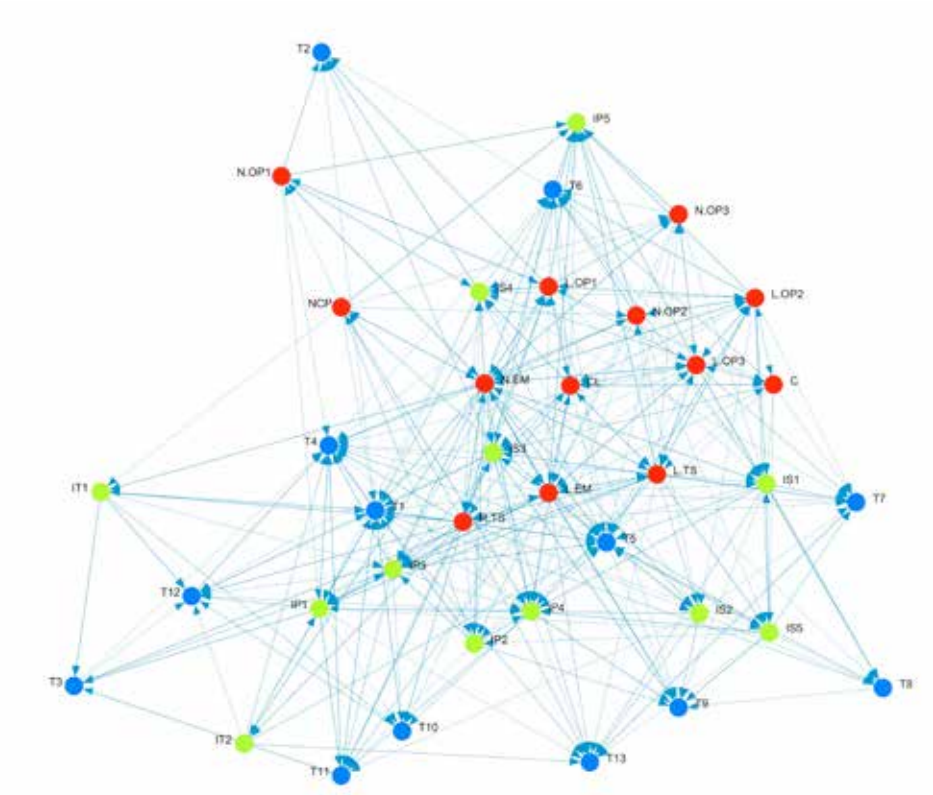

Figure 5.2.7. Protocol of interactions and information flow among the institutional actors in case of emergency in Murcia

ces, negotiations were started to revise the operative protocol. Our analysis aims to support this revision and adaptation process through the analysis of the formal and informal networks of interaction, and the detection of vulnerable elements in the network.

The following pages describe the results obtained through the implementation of this methodology.

The official protocol of interactions to be activated among the institutions in case of emergency has been used as a starting point for the definition of the set of actors to be involved in the knowledge elicitation phase. The table shows the list of the institutional actors involved in the cognitive mapping interviews. A main role was assigned to the institutional actors as well, which can also be useful to generalize the methodology. The acronyms were selected in order to facilitate the development of the network maps, as shown in figure 5.2.8.

The aggregation of the collected narratives allowed to develop the complex maps of interaction, as shown in figure 5.2.8.

The shows the actual complexity of the interaction mechanisms supporting emergency management. Failure in this network – lack of information, missing cooperation for task implementation, etc. – can provoke uncontrollable cascading effects leading to the failure of the whole emergency management process. Therefore, it becomes crucial for the emergency managers to enhance their comprehension of this complexity, in order to implement actions aiming to increase the effectiveness of the emergency management network and to reduce its vulnerability.

Graph theory measures were implemented in order to identify the key elements and the main vulnerabilities of the network. Table 5.2.3 shows the results of the analysis which aimed the identification of key agents in the network.

The analysis allowed us to identify the most crucial agents in the network accounting for the complexity of their relationships with the

Name	Role	l'Aquila
Total centrality degree	National civil protection Municipality	These actors are characterized by a high number of connection (both in- and out-) with most of the other agents in the network.
Betweenness Centrality	Municipality Segura RBA Murcia 112 Community leaders	These actors occur on many of the shortest paths between other agents. This means that these actors can easily move information from one part of the other of the network.
Hub centrality	Segura RBA Murcia 112 Community leaders	Individuals or organisations that act as hubs are sending information to a wide range of others each of whom has many others reporting to them. Therefore, they act as hub of information within the network.
Most knowledge	Segura RBA Murcia 112 National civil protection Media	These actors have access to important pieces of information.
Most task	Murcia 112 Municipality National civil protection Segura RBA	These actors are called to perform the most important tasks.

Table 5.2.3. Key agents in the Lorca flood emergency network

other agents, which affects their capability in moving information from one side of the network to the other. Moreover, the adopted approach assumed that an agent is crucial in the network performance if s/he brings important knowledge and if s/he cooperates in performing important tasks.

The results of the analysis demonstrate the importance of the three most influential institutional actors at local level, i.e. the Segura river basin authority, Murcia's emergency management and the municipality. These actors had a dense network of interactions with the other agents (centrality measures), and had access to a wide set of crucial information, which allowed them to carry out crucial tasks. Beside these results, the analysis of the network emphasizes the actual role in the emergency management of the community leaders and the media. These actors were not mentioned in the official protocol of intervention. Specifically, community leaders could easily act as an interface between the institutional system and the local communities. Their high value of the betweenness centrality and hub centrality demonstrate that these actors could facilitate the sharing of the emergency information.

Similarly, the network analysis showed the role of the media during an emergency. Most institutional actors were in direct contact with media. Therefore, they had access to important information.

The developed network was also analysed in order to identify key vulnerabilities, i.e. those elements that could lead to failures of the emergency management operations and/or to decreasing effectiveness of the responding actions. The key vulnerabilities are described in table 5.2.4.

The results of the analysis were used as basis for the discussion with the local decision-makers and stakeholders. At the beginning of the process, they were aware that improvements in the protocol of interactions were needed. Nevertheless, they were focusing exclusively on the interaction among the institutional actors. The analysis carried out in this work increased their awareness about the role played by the informal interactions, taking place within the institutional system and between institutional actors and the members of the community. Using the results of the key vulnerabilities analysis, participants started discussing about suitable strategies to improve the flood emergency management plan, accounting for the complexity of interactions. The discussion focused specifically on the role of the media. Most institutional actors agreed that enabling a more effective bi-directional communication with the community members through social media would be beneficial for sharing emergency information. The institutional actors

were interested in enhancing the capability of the current media channels to collect, store and analyse the feedbacks from the community. The capability of local communities to contribute to the monitoring of the emergency evolution was deemed important by the participants.

In order to enhance the preparedness for flood emergency management, the need to improve the cooperation between institutional actors and the local community was considered crucial. According to the results of the discussion, this activity could improve the capability of the local population to react in case of emergency in cooperation with the official responders. To this aim, suggestions were made to train the community leaders to be referred to as "agent of change". Participants referred to the results of the "key agents" analysis in order to identify this potential improvement.

Therefore, the first and most important positive result of the used methodology concerns the increased awareness of the institutional actors about the need to shift the focus from investing economic and human resources in developing innovative emergency information collection tools, to enhancing the capability of the different actors to co-operate in case of emergency.

5.3. The role of volunteers and gatekeepers

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The cultural learning component in the EDUCEN project has facilitated a learning process to identify enabling and disenabling factors for culture and social dynamics to be recognized in DRR. The process has led to the identification of volunteers and gatekeepers as important actors in strengthening current DRR strategies and plans in Europe.

5.3.1 The role of volunteers in DRR

Volunteering can mean different things to different people. Here we refer to volunteerism as the planned voluntary behaviour intended to benefit others, taking place within an organisational setting, for a prolonged period (Cumming, 2012). Volunteerism is a fundamental source of community strength and resilience that exists in all societies. It is expressed through a wide range of activities, including traditional for-

ms of mutual aid and self-help, formal service delivery, campaigning and advocacy, as well as other forms of civic participation (UNV, 2011).

The role and contribution of volunteerism is well recognized and highlighted in the Sendai Framework for DRR as crucial for adopting a more people-centred preventive approach to disaster risk. When a disaster happens, volunteers are often the first to act (UNV, 2011). However, the integration of volunteers and civil society organisations throughout the disaster management cycle varies between different contexts. The form and extent of volunteers' integration into formal DRR activities, as well as perceptions on what their role is differ greatly.

During a workshop with stakeholders from five different European cities in Lorca (Spain), L'Aquila (Italy), Kristianstad (Sweden) and Dordrecht (the Netherlands), participants highlighted the role of volunteer organisations as important for mobilizing society, for communicating across sectors and groups, for negotiating amongst competing demands, and for advocating solutions that benefit groups rather than individuals.

While gatekeepers (discussed below) were seen as crucial for reaching particular social groups, volunteer organisations were considered important for mediating between different social groups. Despite positive developments towards increased civil society participation through volunteer organisations, there remain several challenges related to their integration and coordination, as well as level of trust from civil society. "Sometimes volunteers may be a burden and create additional problems. The timing is crucial to determine who should be involved when. If there are too many without having a clear role they will create problems and require resources for food and accommodation" argued a participant. "In the Spanish case, the lack of coordination and proper training of volunteers can create additional problems. The large, organized associations have their own structure and division of roles, however, coordinating between organisations and the 'frugal' volunteers that show up in the face of emergency and the government institutions is complicated and very challenging" argued another participant. "Sometimes people do not trust volunteers: in Spain volunteers are a very heterogeneous group, some are professionals and many know what they are doing, but not all of them. There is a perception that they do not have the knowledge or capacity which is not accurate" argued a participant.

Stakeholders identified volunteers as a heterogeneous group with different capacities, levels of training and availability. These organisa-

tions ranged from well-established volunteer organisations with internal structures such as the Red Cross to more spontaneous volunteers that showed up during an emergency. Authorities often lack knowledge about the different capacities and strengths of voluntary groups and individuals, which can put people at risk. It is a complex task to find where the different capacities fit and at what time. When a group is organized it is easy to collaborate with them, if not, it adds a level of complexity.

Participants highlighted the need for governments and volunteers to co-develop a long term plan and a strategy to have the right people ready at the right time throughout the DRR cycle, and not only during an emergency. In Italy for example, there is often much focus on the emergency phase, but volunteers are needed to work with awareness raising and public opinion as well, for building understanding amongst youth and accessing other groups in society. For this, volunteers would need a different type of training than the one available today, for instance in capacity building on existing legislations for DRR and emergency response.

The experiences in Spain and Italy of past and present hazards have led to continuous improvements on strategies and action plans in DRR and DRM and was believed to be an important factor to engage volunteers as an important group in DRR and DRM. An attempt to improve coordination of volunteers was made both in the Spanish and Italian cases by creating a contact database to keep track of individuals. In Spain, this database only contains contact information of the persons volunteering. In L'Aquila, the database also specifies their main skills, experiences and capacities. However, neither of the countries has established quality controls, assigned budgets or personnel in charge

Less vulnerability coupled with high levels of trust in institutions limits the role of volunteers in DRR

The Netherlands and Sweden have a different experience on the role of volunteers in DRR than the Southern cities in Italy and Spain. The fundamental difference is linked to the fact that neither Sweden nor the Netherlands have much recent experience in disasters. As a result the role of civil society and volunteers remains unclear. During the workshop representatives from Sweden and the Netherlands shared that a key factor that they believe has limited the role of volunteers and civil society in general has to do with trust. In Sweden and the Netherlands there is high level of trust associated with government agencies and people tend to seek information from the government as opposed to civil society.

of maintaining and updating the databases. Thus, the databases are often unreliable and are not used.

We learned that Sweden has extensive experience both nationally and internationally with a long-standing tradition of preventive policies and has a continued presence in supporting international management of disasters (Björngren Cuadra, 2015). However, despite an increasing topicality internationally, volunteer work in Sweden can be said to have a relatively undeveloped role and function in the context of disasters as well as in serious events and crises. There are two potential explanations for this. The first is that in an international comparative perspective, the serious events that Sweden faces are fairly limited in scope. Sweden is geologically and geographically situated in a region that is struck by neither earthquakes nor tsunamis, even though floods, droughts and forest fires have recently caused significant damage. The second is due to that the state assumes all social responsibilities through an encompassing welfare state system which is believed to have hampered the establishment and role of voluntary organisations in DRR and DRM.

In Sweden, while rescue services have the legal mandate to request help from civil society in case of an emergency, there is a stark contrast with the levels of organisation and integration of voluntary work in Italy, where the national organisation and coordination of voluntary work in the country has evolved over several decades of experience in handling disasters. Today civil protection is a complex, surprisingly non-hierarchical, and highly organized agency composed by various voluntary groups across the country and with a clear mandate and jurisdiction to respond to society's needs during times of crises.

Italy has long-time experience of a well-developed voluntary organisation that operates across the country, and which in times of crises can function better and may be more reliably than the government itself. Similarly to Italy, Spain has a long history of different disaster events. Civil society has an important role in DRR. The formal inclusion of voluntary organisations into DRR in Spain has been traced to 1982 following the Tous dam event, which is considered one of the most significant socio-natural disasters in the history of the country during the twentieth century. That event triggered a paradigm change in the way disaster risks were perceived and managed locally and at multiple levels of governance. A concrete result from these changes was, amongst others, increased public participation particularly of voluntary groups to establish a warning system (Serra-Llobet, Tàbara, & Sauri, 2013). In Lorca for example, local associations together with

voluntary organisations and the private sector currently cooperate to create new warning systems through for instance new technologies.

5.3.2. The role of local leaders and gatekeepers in DRR

The concept of local leaders or gatekeepers can be traced back to ethnographic methods where it is understood as an individual who directly or indirectly provides access to key resources, be those resources logistical, human, institutional, or informational (Campbell et al., 2006). Engaging with gatekeepers entails the establishment of an ever-evolving relationship which has deep implications for how a researcher or practitioner understands a particular context and interacts with stakeholders. The opposite is also true. If gatekeepers are key individuals to access people or resources, they can also be obstacles, particularly in contexts where power relationships are reversed, but also in communities where traditional authority structures are in place (Campbell et al., 2006).

The concept of gatekeepers is used in a wide range of disciplines including geography, anthropology, management, urban planning, medicine, but also in disaster studies. In DRR, the concept of gatekeepers is sometimes understood as people who are in positions of power and possess large amounts of information on certain matters in a group. Gatekeepers in this context are deemed important individuals who maintain interactions with other group members in order to transfer information.

The definition of gatekeepers is not static. They act as mediators between culturally or linguistically diverse communities, and between communities and managing institutions. Their role is crucial because people with culturally or linguistically diverse backgrounds often prioritize social networks and informal sources of information, particularly in cases where language barriers exist or when communities mistrust the government (Shepherd and van Vuuren, 2014). The role of gatekeeping has not been adequately investigated in the context of disasters and emergency risk communication. However, some studies (Shepherd and van Vuuren, 2014) suggest that incorporating gatekeepers in DRR activities could contribute towards better emergency management preparation, but this requires an understanding of the cultural constructions of risk.

Stakeholders from L'Aquila highlighted the importance of gatekee-

pers as "cultural mediators" especially in marginal communities and refugee and immigrant populations: "The differences in social networks and groups could be better taken into account in plans and emergency activities through a better inclusion of gatekeepers in planning activities." In contrast, the group from Lorca discussed the importance of gatekeepers in rural versus urban areas, arguing that gatekeepers are particularly important in rural areas as they can act as bridges and canalize information to the population and report back to the authorities. For instance, "farm owners can help evaluating damages, risks and canalizing the information and local needs to the authorities", explained a participant.

In both Lorca and L'Aquila, gatekeepers were only made visible following a disaster event. The role of gatekeepers did not exist until the disasters occurred and there was a need to know about the others and inform neighbourhood associations without the traditional communication channels, which were destroyed or seriously disturbed after the disaster. Both groups agreed that the challenge now is to explore how to include gatekeepers in formal DRR plans and prevention work. They both spoke about the importance of developing and maintaining databases or applications that facilitate communication with gatekeepers. At the same time they argued that the cost of such action would be too high and that local authorities would not see the importance of investing on this action.

All cases agreed that it is important to plan in advance on how to identify gatekeepers. The challenge is how to do this. Crises are different and happen in different ways. For instance, in Lorca leaders during the floods were farmers, but farmers had no responsibility or leadership role during the earthquake. Different disasters gave rise to different leaders, because people were affected in different ways. Lastly, the role of leaders can change over time, and the process of identification needs to be continuous. A leader today might not be a leader tomorrow. Moreover, a positive leader able to unify individuals from a particular group, mediate between them and authorities, and communicate with other groups, could also turn into a negative one. This dynamic role of gatekeepers highlights the need for maintaining close contact with cultural leaders (e.g. persons officially or unofficially representing an ethnic or occupational group), religious leaders, and key actors within age groups (e.g. elderly or young); while at the same time remaining flexible for possible new actors.

Participants from the cities in Spain and Italy highlighted how following a series of disastrous events, there has been an increased recognition

on the role of key individuals in civil society to act as mediators or information nodes between some social groups and managing institutions. In these two countries, DRR approaches are starting to change towards more inclusive management structures due to the realization that civil society participation could fill the vacuum that state agencies have failed to fill. For instance, in cities like L'Aquila, where trust might be greater for key members of civil society than for some governmental institutions, having a mediating actor that enjoys support from both society and the government might be necessary to communicate and mobilize groups; or in Lorca where there are large minority groups with different cultural and linguistic backgrounds. For some of these minority groups, a gatekeeper or leader might play an important role for giving the group visibility and voice. This is important in order to communicate the group's particular needs as may be the case with refugee groups or certain ethnic groups.

In Spain for instance, the history of integrated risk management is more recent than in Italy, with the failure of the Tous dam in 1982 which triggered a more inclusive approach. Despite this, effective civil society participation remains a challenge, and interest to reach society varies greatly within and across managing institutions. In Lorca, for instance, some of the managing institutions have increased and improved their contact with local leaders through the EDUCEN project. This in turn gave institutions a better understanding of the problems, needs and wants of citizens in the area, but also an overview of available capacity amongst individuals which could be crucial for preventing fatalities during risk situations. However, the process driving this change has been met with lack of interest and resistance from some of the institutions, and scepticism from some of the members of civil society in Lorca.

In contrast to the Italian and Spanish experiences, the Swedish and Dutch cases admitted there is very little contact with social groups. In fact, participants were not aware of whether there are local leaders, who these might be, and whether they have a role to play in DRR. The role of local leaders or gatekeepers to build community resilience seems to be a concept often associated with the poorer corners of the world. In an international context, this is reflected in two ways: first, there is far less academic literature on the role of leaders and gatekeepers in countries like Sweden and the Netherlands, than in countries like Bangladesh or Nepal. Studies assessing cooperation across sectors in emergency management typically focus on the role of formal state and non-state institutions, but leave out "informal" leaders like gatekeepers (see for instance Nohrstedt, 2016; Nohrstedt and Bodin, 2014). In fact the only instance where civil society is re-

presented in these studies is through "formal" voluntary associations, which play a minor role in Swedish disaster management, as explained in the section above. Second, donor countries, like Sweden and the Netherlands, have a strong focus in building resilience through local participation in recipient countries but not at home. Despite this, participants from both cities admitted seeing the value of connecting with gatekeepers, but like participants from Spain and Italy, thought it was difficult to identify and contact them.

5.3.3. Working with volunteers and gatekeepers in DRR: recommendations from five European cities

A list of concrete recommendations to improve the work of volunteers in the DRR cycle, and increase the participation of gatekeepers in formal DRR work was produced by participants in the EDUCEN stakeholder workshop held in Stockholm. During the workshop representatives with different occupational backgrounds within DRR identified, described and reflected upon the role of volunteers and gatekeepers in DRR in their own cities. The conclusions emerging from this encounter can help DRR authorities improve their work with awareness raising and public participation, and for building social capital across sectors (public-private) and social groups with different cultural or ethnic backgrounds.

The interaction between stakeholders from different cultural and professional backgrounds demonstrated the importance to share experiences and identify similarities and differences in work on DRR between cities in Europe. The participants confirmed the need for greater attention to the role of volunteers and gatekeepers to build awareness in current policy planning for DRR.

A common message from all the cities is the need for improved involvement of volunteers in DRR. However, the ways to achieve this differed in each of the contexts. Whilst the role of volunteers is to a higher degree institutionalized in DRR in Southern Europe, cities representing Northern Europe shared that the government is the leading agent and civil society continues to play a marginal role. Thus, the potential to improve the role of civil society in Northern European contexts should be further assessed.

The role of gatekeepers is often disregarded in DRR work, despite the recognized benefits of engaging with this type of stakeholders. There

is a need to allocate time within the local government to identify and work with local leaders and other respected individuals in the community, particularly to build awareness and improve ways to ensure effective communication before and during an event. The workshop showed the differences between Lorca and L'Aquila where frequency in disasters have influenced improved communication and led to more sophisticated ways to communicate. For instance, civil society and the private sector in Lorca and Spain have played an important role in the development of new communication gadgets. By contrast, the lack of cultural memory in Sweden and the Netherlands of flood events were emphasized as a limiting factor among communities to demand information and efforts to share information from the government.

5.3.4. Actions for improving DRR in the Italian, Swedish, Dutch and Spanish contexts

After acknowledging the benefits and challenges in volunteer and gatekeeper inclusion

workshop participants collectively made the following recommendations to enhance understanding and action on the role of volunteers and gatekeepers in DRR:

- Increased participation of volunteers during the preparedness phase can be one of the most important and feasible actions for improving DRR work. Besides from creating risk awareness amongst volunteers, this can also enhance trust towards volunteer organisations, as volunteers establish a continuous relation rather than a one-time intervention.
- Improve the existing contact databases of volunteers and complement it with information on individual capacities (e.g. skills, experience, specific training). The main responsibility of managing this action would be on local authorities who would need to designate a budget to identify the different volunteer groups, develop and maintain the database and support the coordination with civil protection.
- Improve training for volunteers to include actions important for the whole DRR cycle, not only the emergency phase, like for instance basic legal and policy knowledge related to DRR; and to diversify sources of funding for training volunteers through for instance the private sector.

- Create one strategy for identification and inclusion of both volunteers and gatekeepers and have a plan on how to use spontaneous (volunteers/gatekeepers) in the best way.
- Engage older people, like the retired, who often have more time to participate in issues concerning their communities. They are also a particularly vulnerable group who might have a personal interest in engaging in DRR questions
- Include religious leaders who often have a well-established relation of trust to a group of the population. They can act as informants and mediators between managing agencies and civil society and between interest groups.
- Improve communication and cooperation with the private sector, particularly insurance companies, who have a good understanding of people's assets and vulnerabilities. In some countries, insurance companies are already integrated in DRR work. In others insurance companies and managing agencies continue to operate in silos. Increased cooperation and information exchange could be beneficial for the government, the companies involved, as well as the clients.
- Establish contact with local or thematic journalists who may hold important information and in some places might have good relations with local populations. They could act as mediators between civil society and managing institutions. Often, information coming from local journalists has higher credibility and reaches society faster than the official information disseminated by official government channels.
- Design a strategy for institutional stakeholder engagement. Some governmental agencies might have a better relation with society than others due to their role and jurisdiction. For instance it is probably easier for civil protection to access and contact gatekeepers than it might be for an organisation like the water managing institutions (Confederación Hidrográfica in Spain) which might be perceived as a "water police" rather than a civil society advocate. With good communication structures in place across managing institutions, several actors might be able to access the information gathered by institutions that lie closer to society.
- Women groups could provide a window of opportunity to access marginalized or foreign groups. However, these groups might not always be labelled "women's group", but could take the form of knitting groups, yoga groups, reading groups, or religious circles. In other places there might be a "gender" organisation or political party.

- Sport organisations can provide a link to youth but also may be able to provide "space" in times of a crisis, for instance by providing access to football fields to build temporary camps, or gyms to provide for temporary shelter. Sport organisations are often used to work in teams and could therefore also contribute with organisational skills during an emergency.

5.4. The role of the armed forces and civil-military interaction

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"While retaining its primary role of safeguarding the country from external threats, the military has become one of the main partners of federal, state, and local agencies in disaster response operations, providing its available resources, logistical capacity, and operational services effectively used against both man-made and natural disasters" (Kapucu 2011, p. 7).

In studying the role of the armed forces in domestic disaster response operations, most attention has been paid to homeland security or counter terrorist activities, in particular in the aftermath of the terrorist attacks on New York, Washington, Madrid, and London.

Relatively little attention, however, has been paid to the role of the armed forces in addressing domestic natural disasters. In such a context, the involvement of the armed forces can be manifold and may include a variety of activities. Sylves (2008, p. 172) lists a great number of these activities including: search and rescue; emergency medical care; emergency transport of people; mass feeding; in-kind distribution of food, clothing, and other necessary commodities; epidemiological work and disease control; decontamination (in hazardous materials or radiological circumstances); temporary sheltering; firefighting; help in restoration of electric power and other utility services; debris removal to reopen roads; and bridge repair or temporary bridge replacement, as well as offer security and property protection aid. Armed forces are frequently requested to contribute to disaster response operations: are usually well organized, trained, mobile, well equipped, and available (Clarke, 2006, p. 1). Kapucu (2011, p. 9) stresses that armed forces:

- have manpower with specific qualifications, skills and expertise;
- forces are capable of a strategic and rapid mobilization;
- have a variety of equipment (e.g. helicopters, aircraft, earth-moving

machinery, respirators, medical supplies, power and lighting equipment, under-water capability) that most other emergency organisations lack.

Moreover, "the military's relative autonomy and efficient bureaucratic structure with hierarchical rules; which are effective in command, coordination, and control of manpower, authority, and regulations, is beneficial in providing effective response actions". (Kapucu, 2011, p. 9)

5.4.1. Requesting military support

When civilian agencies request military support, there are three guiding principles according to Salmon et al. (2011, p. 141):

1. "Military aid should always be the last resort, with the use of mutual aid, other agencies and the private sector all having been considered as insufficient or unsuitable;

2. The civil authority lacks the required capability to fulfil the task and it is unreasonable or prohibitively expensive to expect it to develop one; and

3. The civil authority has a capability, but the need to act is urgent and it lacks readily available resources."

Additional factors that should be taken into consideration when requesting military support are (e.g. Kapucu, 2011; FEMA, 2008; Schrader, 1993):

-1 Legality: whether the legal basis of military involvement aligns with the national laws and regulations that are in place (Kapucu, 2011). Most, if not all, European countries have specified the conditions under which armed forces may support in disaster response operations.

-2 The potential cost of military involvement and its impact on the budget of the Ministry of Defence must be determined. Military assets are more costly than similar assets of civilian emergency responders in light of the reliability, security and robustness of military assets. Wiharta et al. (2008, p. 43), however, also stress that "because military assets are usually kept in a state of readiness for quick deployment, defence ministries already cover their procurement and basic running costs, whether the assets are being used or not. Thus, the idea that deploying military assets is much more expensive than deploying civilian assets should be regarded with caution".

Most western countries have mechanisms in place for sharing the costs of military involvement in assisting to disaster response operations. In the US for example the Federal Emergency Management Agency (FEMA) reimburses the Department of Defence for some of the costs that occurred in disaster response operations (Schrader, 1993).

-3 Lethality: this defines the possibility of the use of lethal force while providing assistance. Although lethality is mainly an issue in cases of homeland security or counter terrorism, it may be important in the context of natural disasters as well. Several historical cases such as the aftermath of Hurricane Katrina have shown that maintaining law and order is an essential task to which armed forces also may contribute.

-4. Potential risks that may threaten the armed forces. Although the armed forces are trained to operate in unsafe places, natural disasters may pose severe risks to the soldiers that are being deployed. These risks may include the collapse of buildings, the danger of asphyxiation in case of (forest) fires or the breaching of dikes.

-5. The extent to which military services and resources are appropriate for providing assistance. Some practitioners and researchers involved argue that just because the military has the capacity to perform a task, it may not necessarily be the most appropriate entity to do so, since

Issues	Recommendations & lessons learned
• Lack of an organisation responsible for surface water flooding; • No clear coordination structure; • Lack of coordination between Meteorological (Met) Office and Environment Agency; • Lack of communication and sharing of key information between agencies; • Lack of mutual aid agreements between civil organisations; • Lack of clarity regarding roles and responsibilities of different organisations; • Ad-hoc systems, structures and protocols; • Lack of leadership at Gold (i.e. strategic) command level; • Instances where Silver (i.e. tactical) command was activated instead of Gold; • Lack of appropriate command HQs.	• Should be a single national organisation with an overarching responsibility for all types of flooding; • Information must be readily shared between agencies in a form that can be used; • Joint warnings issued by the Met Office and the Environment Agency; • Enhanced IT, real time mapping and visualisation tools should be available to every Gold command; • Mutual aid agreements should be established between organisations; • Roles, responsibilities and capabilities of all agencies should be clearly defined and communicated; • Preparedness of HQs (e.g. accommodation, IT and comms systems) should be regularly tested; also purpose built HQs are required; • Communications procedures between agencies should be clarified.

Table 5.4.1 2007 UK floods, Gloucestershire region (Pitt, 2008; adapted from Salmon et al., 2009)

most militaries do not often train their personnel in disaster response. For example, the militaries apply different standards. They are expected to provide high-quality water to small populations rather than adequate water to large populations, as is needed in a natural disaster response (Wiharta, 2008). Also, in case of medical care militaries are mostly equipped to treat young men that are physically fit, while natural disasters may lead to many injuries (e.g. fractured bones) or patients (e.g. elderly, children) that the military is not used to deal with.

-6. The readiness of military forces to provide assistance that will not harm the primary mission of the Ministry of Defence (Kapucu, 2011; Buchalter 2007). In most countries the primary mission of the armed forces is safeguarding the country from external threats. Moreover, the armed forces of many western countries are heavily involved in overseas operations such as in Afghanistan, Iraq or Mali. This focus limits

Issues	Recommendations & lessons learned
• Complete loss of communications hindered the response significantly; • Lack of an appropriate incident command structure; • Lack of coordination between agencies e.g. Urban search and rescue and civil search and rescue; • Lack of a process for a unified response (National Incident Management System (NIMS) & National Response Plan (NRP)) inefficient for large scale catastrophic events); • State and local authorities lacked the ability to communicate with one another; • Command centres had unclear roles and responsibilities; • Secretary of Homeland Security had difficulty coordinating the activities of federal departments and agencies – he lacked situation awareness, both of the disaster and of the response; • Key decision makers at all levels were not familiar with plans or NIMS.	• Need to establish a National Operations Center to coordinate national response and provide situation awareness and a common operation picture for federal government; • Interagency team should review and revise NIMS and NRP; All agencies/departments should align responses to NIMS; • There should a formal NIMS training program for all those responsible for incident management across agencies; • There should be an interagency planning and execution system; • Need to establish a National Information and Knowledge Management System; • Need to establish a National Information Requirements and a National Information Reporting Chain; • Need to establish mutual aid agreements; • Need to establish a national crisis communication system to support information exchange from the President, across the Federal government, and down to the State level; • Need to establish a deployable communications capability; • Need to clearly define roles, responsibilities and capabilities of different agencies.

Table 5.4.1 2007 UK floods, Gloucestershire region (Pitt, 2008; adapted from Salmon et al., 2009)

Organization	Information management	Communication	Situation awareness	Equipment	Cultural issues	Training
Lack of clear and effective leadership	Poor information management	Lack of communication	Inadequate levels of distributed situation awareness	Inadequate communication technology	Incomplete procedures	Lack of multi-agency training exercises
Unclear command and control structure	Lack of an appropriate common operational picture	Communication of inaccurate or incomplete infomation	Inadequate levels of meta-situation awareess	Incomplete communication technology	Lack of understanding of military concepts, processes and procedures	Lack of experience in working with other agencies
Inadequate or inappropriate command and control structure Lack of clarity regarding each agency's rules and responsibilities Inadequate multi-agency response frameworks, or procedures conflicting goals	Lack of clarity regarding MACA requests	Lack of clear communication links between agencies Lack of a common communication structure	Lack of understanding of each agency's roles and responsibilities Lack of understanding of each agency's capability and resources Lack of understanding of each agency's contribution	Poorly equipped command centre	Lack of understanding of civilian concepts, process, and procedures	

Table 5.4.3 Issues limiting civil-military coordination during emergency responses (Salmon et al., 2011, p. 153). MACA stands for ''Military Aid to the Civil Authorities''

the readiness of the armed forces to get involved in domestic disaster response operations.

5.4.2. Civil-military coordination

Due to the growing diversity, complexity, and scale of many disasters, there is an increasing requirement for the military and civilian organisations to adequately coordinate their activities during disaster response operations (Salmon et al., 2011). For example, Hurricane Katrina, the BP Oil Spill in the Gulf of Mexico and the 2007 floods around Gloucestershire in the UK are all recent examples of disaster response operations in which military and civilian organisations worked alongside each other.

Despite its importance, civil-military coordination during domestic disaster response operations remains a neglected research area (Chen et al., 2008). The two tables illustrate the wide variety of issues emerging

when civil and military organisations attempt to work closely together, for two recent cases as well as the recommendations and lessons that were learned during their evaluation.

At a meta-level, Salmon et al. (2011, p. 153) have distilled and structured the issues that influence civil-military coordination during disaster response operations. They have grouped the issues into the following categories: the organisation, information management, communication, situation awareness, equipment, cultural issues and training.