Danger & Opportunity

Contradictions between Resilience & Network Effectiveness in Safety Regions

Master Thesis

Merel Ruiter

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‘When written in Chinese, the word "crisis" is composed of two characters - one represents danger and one represents opportunity’

John F. Kennedy

April 12, 1959

Radboud Universiteit Nijmegen

Universiteit Utrecht

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Summary

Crisis management is of vital importance to our society. It protects us by preventing crises from happening, and when a crisis does occur, it tries to limit the damage. However, the increased complexity and interdependence of today's society increase the difficulty in managing crises. There are two promising solutions for these challenges to modern crisis management: *resilience* and *networks.* In the Netherlands crises are often managed by emergency networks, known as safety regions. When safety regions are able to operate in a resilient manner, they will be better equipped to manage disasters. Additionally, to function optimally as an emergency network, *network effectiveness* is important to safety regions. Thus, in an ideal world, emergency networks operate in an effective and resilient manner. According to the literature, most requirements for achieving resilience and effectiveness are matching, however three contradictions can be found.

This study focused on these contradictions, which were studied within two safety regions. In both safety regions, all three contradictions are present. Firstly, there exists a contradiction between *variety (resilience)* and *limited size & composition (network effectiveness)*. On the one hand, advantages of variety in the network are experienced and highly regarded by the respondents. On the other hand, collaboration with people from many different organisations sometimes affects the effectiveness of the network, for example when they all want to voice their opinion during crisis meetings. The second contradiction is between *decision-making migrating to expertise (resilience) – coordination by a central core agency (network effectiveness)*. Although expertise is highly regarded in the safety regions, eventually decisions are made by the person who is in charge, according to hierarchy. Thirdly there is a contradiction between *flexibility (resilience)* and *rigidity (network effectiveness).* Although safety regions are flexible by giving space to creativity and by respecting different views and opinions, they are also rigid, regarding rules, protocols and accountability.

In general, the safety regions are able to deal with these contradictions. For example, when there is disagreement during a crisis between an expert and the person who is in charge, this is solved during the evaluation of the crisis. This prevents the disagreement from reoccurring during the next crisis.

However, regarding the first contradiction, the resilience requirement of *variety* predominates the effectiveness requirements of *limited size & composition*, since variety seems inherent to crisis networks. In contrast, the network effectiveness requirements overrule

resilience on second and the third contradiction. Most likely this is due to the need for structure and clarity during a crisis, which creates a strong desire for hierarchy and protocols.

With these findings, this research aims to contribute to the improvement of crisis management. Insight into these contradictions helps to implement these requirements in safety regions. If and how the imbalance between resilience and effectiveness requirements affects crisis management, remains to be seen. All the same, awareness of the contradictions can help safety regions to make conscious decisions regarding the requirements of resilience and effectiveness.

Preface

In the first year of the research master I had to choose a tutorial project to practise my research skills. I chose the research project *Managing Crises through Resilient Networks*, which immediately got my attention because of my interest in crises and intergovernmental collaboration. During the tutorial, I conducted a literature study on resilience and network effectiveness, which resulted in a pilot interview at a safety region. My teachers Sandra Resodihardjo and Marieke van Genugten supported and advised me during the research process. After the tutorial, we continued with resilience and network effectiveness by writing an article on *resilience in formal emergency networks.* We presented our initial article at the NIG (Netherlands Institute of Government) Conference in November 2015. This further increased my interest in the combination of resilience and network effectiveness in crisis management. Therefore, I decided to write my master thesis on this topic. As I was mostly interested in situations where resilience and network effectiveness did not seem to be matching, I focused on the contradictions between these theories, and examined whether these contradictions are present in the practice of Dutch safety regions.

With this research, my master thesis, I conclude the two-year Research Master programme, in which I have learned a lot about the ins and outs of (public administration) research. First, I would like to express my profound gratitude to my teachers Sandra Resodihardjo and Marieke van Genugten for sharing their enthusiasm, and encouraging me to reach the best of my abilities. Without their continuous support and advice, I would have been lost in the process of this research. Further, I would like to thank Paul 't Hart for his valuable comments on this thesis. I would also like to sincerely thank the people of Safety Region Gelderland Zuid and Safety Region Gelderland Midden. Without their input in the interviews and observations, this research would not have been possible. Their personal experiences and views are of great value to me, as well as to this research. Furthermore, I am grateful for the advice of my friends: Dominique Smeets, Nicole Brahams, Hester Heins and Kirth van Oeteren. I especially want to thank Scott Clark and Amy Bos for providing great suggestions on how to improve my writing. Finally, I would like to thank my family: my parents, sister and boyfriend for supporting me, and commenting on the concept version of this research.

Merel Ruiter - Nijmegen, 4 October 2016

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Acronyms

BOB	Beeld Oordeel Besluitvorming	Image Judgement Decision-making
GBT	Gemeentelijk Beleids Team	Municipal Policy Team
BRZO	Besluit Risico's Zware Ongevallen	Major Hazard Companies
GGD	Gemeentelijke Gezondheidsdienst	Municipal Health Service
GHOR	Geneeskundige Hulpverleningsorganisatie in de Regio	Regional Medical Assistance Organisation
CoPI	Commando Plaats Incident	Command Place Incident
GRIP	Gecoördineerde Regionale Incidentbestrijdings Procedure	Coordinated Regional Incident Control Procedure
HRO	High Reliability Organisation	
HRT	High Reliability Theory	
IFV	Instituut Fysieke Veiligheid	Institute for Physical Safety
KNMI	Koninklijk Nederlands Meteorologisch Instituut	Royal Dutch Meteorological Institute
LTFO	Landelijk Team Forensische Opsporing	National Team Forensic Investigation
MCCB	Ministeriële Commissie Crisis Besluitvorming	Ministerial Commission Crisis Management
NAO	Network Administrative Organisation	
NGO	Niet-gouvernementele Organisatie	Non-Governmental Organisation
RAV	Regionale Ambulancevoorziening	Regional Ambulance Service
RBT	Regionaal Beleids Team	Regional Policy Team
ROT	Regionaal Operationeel Team	Regional Operational Team
VGGM	Veiligheids- en Gezondheidsregio Gelderland Midden	Safety Region Gelderland Midden
VRGZ	Veiligheidsregio Gelderland Zuid	Safety Region Gelderland Zuid

1 Introduction

Crises have always occurred, and will continue to affect our society. Age-old threats – such as fires, floods and diseases – continue to exist, at the same time new threats – such as terrorism and climate change – have arisen. It is important to adequately manage these crises in order to protect the wellbeing of society. However, in our ever more complex and interdependent world, crisis prevention and preparation no longer seem to suffice. Modern threats have a transboundary nature and increase the range and complexity of crises. For example, in the case of the threat of terrorism, it is unclear when a terrorist attack will happen, what exactly will happen and how many countries will be affected by it. In addition, societies have become increasingly vulnerable to threats, as they are more tightly linked and interdependent, which means that more actors are involved in solving a crisis (Comfort, Boin, & Demchak, 2010). A crisis happening somewhere in the world can have various consequences for local communities around the world (i.e. there is a global-local axis) (Brandsen, Trommel, & Verschuere, 2015). Thus, risks have increased, and have become more uncertain and dynamic. Consequently, managing crises has become increasingly difficult (Wildavsky, Searching for Safety, 2004).

Resilience - the ability to bounce back (from a crisis) - might be the answer for crisis management. Resilience moves beyond the bottom-up approach of crisis mitigation (mainly used in the 1990s) that tries to increase the capacity of organisations and citizens to reduce risks and effectively respond to crises. It goes further than the top-down approach of crisis prevention (used after 9/11), which focuses on government regulation and inspection. Applied to crisis management, resilience could contain the following aspects: 1) prepare for a crisis, 2) prevent a crisis from becoming worse, 3) recover and learn from a crisis (Comfort, Boin, & Demchak, 2010). Although many scholars have tried to create definitions of crisis resilience, there is no clear understanding of its determinants and 'how it can be measured, maintained and improved' (Manyena, 2006, p. 434).

The creation of (*crisis) networks* is seen as another solution to the increased complexity that crisis management faces. Emergency services increasingly share their knowledge and experience in a crisis network, because 'for many crises, no single organisation or jurisdiction has the capacity to offer a comprehensive response' (Moynihan, 2008, p. 361). The need for formalisation particularly exists when the degree of uncertainty a network faces is high (Moynihan, 2008). Accordingly, the Dutch government formalised crisis networks after two

extremely serious crises in the year 2000 – the fireworks explosion in Enschede, and the café fire in Volendam – and divided the Netherlands into 25 safety regions (*veiligheidsregio's)* (Ministry of Home Affairs, 2007).

Safety regions are formal networks in which the emergency services (e.g. fire service and emergency room) of the municipalities in a region are combined. It is their task to prepare, mitigate, end, and learn from crises that have occurred (Ministry of Safety and Justice, 2013b). Safety regions are unique in the sense that they are permanently active, not only when a crisis occurs or during trainings. Their permanent activation allows network actors to become familiar with each other (Kapucu & Hu, Understanding Multiplexity of Collaborative Emergency Management Networks, 2014).

In order to manage crises that are increasingly uncertain and complex, resilience and the effectiveness of the network are important for safety regions. Resodihardjo, Van Genugten and Ruiter (n.d.) determined the requirements that must be met for both resilient and effective crisis networks. For example, a network's effectiveness increases when a *limited number of actors is involved,* as it eases decision-making and coordination (Turrini, et. al, 2010). Resilience requires, for example, being *preoccupied with failure*, meaning that an operation that succeeds 99 times does not necessarily mean it will succeed the 100th time (Weick & Sutcliffe, 2007). Safety regions need to meet both the requirements of resilience and network effectiveness in order to manage crises effectively and limit the effects for society. Fortunately, most of the requirements seem to be matching.

However, Resodihardjo, Ruiter and Van Genugten (n.d.) also find requirements of resilience and effective networks that are possibly conflicting. This research aims to find out if these contradictions appear in safety regions, and if so, how these are dealt with. Firstly, the resilience requirement of to *create teams with people that have a wide variety of experience,* possibly contradicts with the network requirements of a *limited number of actors* and a *limited composition* of the network. Secondly, resilience demands the *migration of decision-making to people with expertise*, whereas an effective network requires decision-making and coordination by *a central core agency.* Finally, resilience requires to *stimulate creative thinking* and *allowing conceptual slack,* while the network effectiveness requires the *formalisation of rules, meetings, agenda and decision-making,* and *accountability.* An elaboration on these contradictions follows in chapter 3.4.2. These contradictions can obstruct effective crisis management. For example, a contradiction may lead to confusion for crisis managers, which can slow down the crisis management. Furthermore, it is possible that a requirement of resilience is prioritised at the expense of network effectiveness, or vice versa.

Moreover, crisis managers might be unaware of these contradictions, which can also impede successful crisis management, for example because they do not make a deliberate choice. This leads to the following question:

To what extent are the contradictions between resilience and network effectiveness found in the practice of Dutch safety regions? If these contradictions are found, how do crisis managers deal with these contradictions?

To answer this research question, the following sub questions are formulated:

1. What is resilience for safety regions?
2. What is network effectiveness for safety regions?
3. What are the contradictions between resilience and network effectiveness?
4. To what extent are these contradictions found in the safety regions?
5. If these contradictions are found, how do the safety regions deal with them?

In order to answer these questions, a case study will be performed. Safety regions consist of many organisations. Thus, in order get an understanding of the contradictions in a safety region, the perspectives of these various organisations need to be taken into account. In order to achieve this, the study is confined to two safety regions. In these safety regions interviews with the employees (hereafter: crisis managers) and observations are conducted. These two methods and the inclusion of the various organisations, help to create a rich understanding of the possible contradictions.

This research is relevant for society, as it will help to understand whether there are contradictions for safety regions that impede their network effectiveness and resilience, and thus obstruct effective crisis management. Effective crisis management is of vital importance, as it bears directly upon the lives of people and the wellbeing of societies. If these contradictions exist in practice, a solution on how to deal with these contradictions can be investigated, thereby enhancing the effectiveness of crisis management. Becoming aware of the contradictions can help crisis managers and policy makers to make conscious considerations and choices regarding these contradictions. Furthermore, Dutch safety regions are unique, as they are permanently active and formal crisis networks. This study can inform other countries whether or not to create similar formal and permanent networks.

Further, this study is of scientific importance, as it contributes to defining and operationalizing resilience. Although the concept of resilience is used widely, its definition still remains vague. Additionally, consensus on how it can be made operational and how it should be defined is still lacking (Klein, Nicholls, & Thomalla, 2004; Manyena, 2006). Furthermore, 'most studies that explore resilience-related ideas have used resilience as a metaphor or theoretical construct' (Carpenter, Walker, Anderies, & Abel, 2001, p. 767). This study moves beyond theoretical understanding, as it examines resilience in the practice of safety regions, by looking at the contradictions between resilience and network effectiveness requirements. Moreover, to the knowledge of the researcher, this is the first study that examines the contradictions between resilience and network effectiveness. Insight in the contradictions can enhance the congruence between the two promising theories for modern crisis management, and thereby improve its effectiveness.

The next chapter informs the reader on the creation, the organisational structure and authority system of safety regions. Chapter three provides the theoretical framework, by outlining crisis management, resilience, and network effectiveness and how these apply to safety regions. Furthermore, this chapter combines the requirements of resilience and network effectiveness and outlines the contradictions that are central to this research. The following chapter describes the research design and methodology. Chapter five presents and analyses the findings of the research. The final chapter gives a conclusion and discussion. This chapter examines the implications of the findings of this research.

2 Safety regions

Before exploring what resilience and network effectiveness entail for a safety region, this section will give an introduction on safety regions to understand their origin, tasks, and their operation and authority system.

2.1 Creation of safety regions

In the first year of the new millennium, the Netherlands faced two major disasters. In May 2000, an explosion in a fireworks factory that was situated in the middle of a residential area caused 22 deaths, among them four firefighters. The material and psychological damage was huge and approximately 950 people got injured (Oosting, et al., 2001, p. 11). Another major disaster happened just in the same year, when people were celebrating New Year's Eve in a pub in Volendam. They used some sparklers that set fire to the Christmas decorations, which subsequently burned down the whole pub. The fire caused the death of 13 people and approximately 250 people got injured (Alders, et al., 2001, pp. 1-5). These disasters had a huge impact on Dutch society and they raised many questions on how they could have happened.

Two commissions of inquiry were installed to investigate what went wrong. Both commissions concluded that mistakes were made with granting licenses and control. Further, more training, education, and instructions were needed for civil servants, as well as a better coordination during a disaster. Moreover, they recommended a regional approach for disaster preparation, as the municipality of Volendam did not possess the required knowledge and expertise for sufficient disaster preparation (Alders, et al., 2001). In answer to these rapports, the government concluded that existing crisis management structures were no longer sufficient to solve the increasingly complex and devastating contemporary crises. Consequently, they created safety regions in 2010 and therewith formalised crisis management (Ministry of Home Affairs, 2007; Ministry of Safety and Justice, 2013b).

2.2 Organisational structure and tasks

The Netherlands is divided into 25 safety regions, in which the emergency services of the region's municipalities are integrated. Their legal task is to protect citizens from crises, prepare for crises, coordinate crisis management, ensure information supply among the emergency services, and advise the authorities about risks (Ministry of Safety and Justice,

2013, art. 10). Apart from being a formalised (in the safety region law) crisis management network, the safety region is a permanent network (Ministry of Safety and Justice, 2013b). The emergency services do not only work together during a crisis or training, but their co-operation is ongoing even when there is no crisis (Van 't Hof, 2009).

The emergency services of the safety region organisation include the fire brigade, GHOR (Regional medical assistance organisation), population care (in Dutch: bevolkingszorg) and the regional emergency room (where 112 calls are handled). However, there are few different ways to demarcate the definition of a safety region (geographical, judicial, organisational and multidisciplinary). This research uses the broadest 'multidisciplinary' definition of safety regions because it includes the network element of safety regions. This means that the ambulance service (part of the GHOR) and the police organisation are also included in the safety region (Andersson Elffers Felix, 2013, p. 91)

Each safety region has a general board in which the municipalities in that region (6 to 26) are represented by their mayors. One of the mayors – usually the mayor of the largest city- chairs the meetings (Ministry of Safety and Justice, 2013, art. 11.2). In addition to the mayors, other actors attend the board meetings. Some actors are invited for all meetings (the chair of the district water authority, the district attorney, and the King's Commissioner), while others are only invited when their expertise is needed (they are known as crisis partners, e.g. the railway maintenance organisation, ProRail). The general board and the emergency services are supported by a central administrative organisation, the safety bureau. The safety bureau is occupied with the planning, policy making, education, training and crisis evaluation of the safety region.

2.3 The GRIP system and authority

In case a disaster or crisis occurs, the so-called GRIP System (*Gecoördineerde Regionale Incidentenbestrijdings Procedure / Coordinated Regional Incident Control Procedure)* is activated. This classification indicates who is in charge of the crisis operation, and who has the administrative authority.

The GRIP level indicates the range of a crisis, ranging from low (GRIP0) to very high (GRIP5 & GRIPRIJK) (IFV, 2014). During a crisis, crisis managers can decide to scale up the GRIP level. At GRIP0 a small incident is handled, which is part of the daily routine of emergency services (e.g. a small fire in a house). At this level, the emergency services collaborate without a predefined structure (the so-called 'engine cover consultation'). During

GRIP1 the emergency services need more coordination to manage the incident or small crisis. Therefore, a coordination team, the CoPI (Commando PlaatsIncident) is installed to coordinate the co-operation of the emergency services. A leader CoPI heads the CoPI team. At GRIP2, the crisis becomes more complex and has a broader range. Therefore, a regional operational team, ROT (Regionaal Operationeel Team) is set, next to one or more CoPIs. The leader ROT heads the ROT. At GRIP3, the crisis becomes even more complex, consequently the mayor needs assistance with his administrative tasks, such as informing the public about the crisis. To support the mayor, a municipal administrative team GBT (gemeentelijk beleidsteam) is installed, besides the CoPI(s) and ROT. At GRIP4 the crisis transcends the authority of the mayor and need a strong administrative approach, the chair of the safety region in question gets in charge of the administrative authority. A regional policy team RBT (regionaal beleidsteam) is installed, next to the ROT and CoPI(s). At GRIP5 the crisis also transcends the boundaries of the safety region, the safety regions that are involved need to decide who is in charge (usually this is the region where the crisis started). The highest GRIP level is GRIPRIJK (GRIP-State), the ministerial commission crisis management (MCCB) (chaired by the minster of safety and justice, or the prime minister) is in charge of both the operational coordination of the crisis management and the administrative authority.

GRIP-System	Operational Authority	Administrational Authority
GRIP0	Daily routine	Mayor
GRIP1	CoPI	Mayor
GRIP2	CoPI(s) + ROT	Mayor
GRIP3	CoPI(s) + ROT +	GBT supports mayor
GRIP4	CoPI(s) + ROT +	RBT supports chair of safety region
GRIP5	CoPI(s) + ROT+	RBT supports chair of source safety region
GRIPRIJK	(CoPIs+ ROT+) MCCB	MCCB supports minister

Table 1: GRIP-SYSTEM

This chapter has outlined the origin of the safety regions, their organisational structure and tasks, and the Grip system that regulates the operational and administrational authority. In the next chapter, the theories that are used in this research are presented.

3 Theoretical background

This chapter addresses the theoretical background of this research. First, crisis management, its stages, and current challenges will be explained. To solve these challenges of crisis management, resilience and network effectiveness provide promising solutions. The second section is about resilience and presents resilience requirements. Thereafter, theory about network effectiveness and its requirements will be presented. In the final section, the resilience and network effectiveness theories are combined. Most requirements seem matching and compatible. However, some requirements might contradict, these contradicting requirements are the focus of this research.

3.1 Crisis management

The core task of safety regions is to protect citizens from crises, by preparing for a crisis and coordinating crisis management. In order to understand what crisis management entails an understanding of the term crisis is needed first. Furthermore, the stages of crises management are described. Finally, the challenges of contemporary crisis management are outlined.

3.1.1 What is a crisis?

The term crisis usually refers to a situation that is undesirable and unexpected. An adversity happens to a person, group, organisation or society, which creates an urgent need for an answer. The unexpectedness causes a high level of *uncertainty*, which raises questions like: *When* will it happen? *How serious* will the consequences be? *How long* will it take before the situation goes back to normal? (Boin, 't Hart, Stern, & Sundelius, 2005; Hollnagel, 2015). The situation becomes even more unpleasant when it is uncertain *what* will happen, in the sense that the crisis may be unusual or has never happened before, which makes it impossible to prepare for it.

It is, however, not always clear how to demarcate the term crisis, since not every undesirable event is a crisis (Hollnagel, 2015). Many crisis definitions incorporate the high-impact, low-probability of an event, and the uncertainty this causes, as well a strong need for a resolution (see: Pearson & Clair, 2008; Bockarjova, 2007). Regarding the unexpectedness, impact and uncertainty of an event, Westrum (2006) and Hollnagel (2015) make a distinction between three types: regular events, irregular events and unexampled events. Regular events are events that happen so often that they are part of the daily routine for an organisation. This

implies that the organisation can recognise the event, can learn how to respond to it and prepare for it (Westrum, 2006). Regular events have a high probability, a low (and mostly known) impact, and there is a low uncertainty about the occurrence and development of the event (Hollnagel, 2015). *Irregular events* are events that happen rarely, and are non-routine (Westrum, 2006). Irregular events have low probability, high impact and high uncertainty about the occurrence and development of the event (Hollnagel, 2015). Finally, *unexampled events* are events that have not happened before, which means there is no example available for these events (Westrum, 2006). Unexampled events are rare, have an extremely high impact and the uncertainty of the event is extremely high (Hollnagel, 2015).
Table 2 provides an overview of the three types of events.

	Regular events	**Irregular events**	**Unexampled events**
Probability	High (daily routine)	Low (non-routine)	Rare (mostly unimaginable)
Impact	Low (mostly known)	High	Extremely high
Uncertainty	Low	High	Extremely High

Table 2:Crisis aspects and event types, based on: Hollnagel (2015, p.23) table 1.

To demarcate what is meant with the term 'crisis' in this research, crisis is defined as: an event with *low probability, high impact* and *high uncertainty.* Therefore, both irregular events and unexampled events are considered crises (see table 2). Regular events are not considered crises, as they are highly probable events that have a low impact, and low uncertainty on how they occur and develop. Regular events correspond to the daily routine or GRIP0 of safety regions (Ministry of Safety and Justice, 2013a).

Furthermore, the Dutch national handbook crisis decision making (Ministry of Safety and Justice, 2013a, p. 11) defines a crisis as a situation where vital interests such as territorial, economic, ecologic, physical and public safety, are threatened. According to Brainich (2004) safety regions are mainly concerned with disasters. The term 'crisis' is often used interchangeably with 'disaster', however, a disaster is an event that disrupts the public and physical safety. Disasters require coordinated efforts to eliminate or reduce the threat (Brainich, 2004). In safety regions this coordination appears at GRIP1 when an CoPI team is installed to coordinate the crisis operation at the crisis site, and at GRIP 2 to GRIPRIJK, where besides the CoPI, an ROT coordinates the regional and administrative aspects of the crisis (Ministry of Safety and Justice, 2013a). Therefore, GRIP1 to GRIPRijk situations will be considered as crises in this research.

In summary, crises are events in which vital interests are threatened, they have a *low probability, high impact* and *high uncertainty,* which corresponds to *irregular* and *unexemplified* events. Furthermore, safety regions deal with a specific kind of crisis: disasters. Disasters need coordinated efforts, and this coordination takes place in GRIP1 to GRIPRIJK by the CoPI and the ROT. Thus the GRIP structure can be used to distinguish a crisis (non-routine event) from a daily routine event (GRIP0).

3.1.2 Crisis management and stages

Although crises have always been a reoccurring fact of life, crisis management is based on the fundamental belief that, at best, some crises can be avoided, or at least that their devastating effects can be limited (Pinkowski, 2008). Crisis management scholars are divided in the number of stages they assign to crisis management. Pearson and Mitroff (1993), for example, distinguish five stages of crisis management: 1) signal detection, 2) preparation and prevention, 3) containment and damage limitation, 4) recovery, 5) learning. Whereas Boin, Comfort and Demchak (2010) describe four stages: 1) prevention and mitigation, 2) crisis preparation, 3) response management, 4) recovery (including learning and accountability). Alas and Gao (2012) combine different approaches on crisis management (as they see an overlap between some stages) in a three stage model: 1) pre-crisis (preparation for the crisis and prevention of the crisis from occurring) 2) crisis (damage containment), 3) post-crisis (assessment of the damage and stabilisation).

In this research the three stage model according to Alas and Gao (2012) will be used, because the other models can be combined and reduced to this trichotomy. Furthermore, this three stage model of pre-crisis, crisis and post-crisis, corresponds to the stages that are used by the safety regions: ‘cold phase’ and ‘hot phase’ (Van 't Hof, 2009). In the ‘cold phase’, there is no crisis and the emergency services work together to prepare for a crisis and prevent a crisis from occurring. Thus the ‘cold phase’ overlaps with the pre-crisis stage. In the ‘hot phase’ a crisis or disaster occurs, and the emergency services do everything within their power to end the crisis. This ‘hot phase’ matches the ‘crisis’ stage. When the crisis ends, the safety region returns to the ‘cold phase’ and tries to take lessons from the crisis. This means that the ‘cold phase’ corresponds to both the pre- and post-crisis stages. Figure 1 represents these crisis management stages applied to safety regions. For safety regions daily routine emergencies are part of the ‘hot phase’. However, in this research the ‘hot phase’ only concerns events that have been previously defined as crises, which excludes the events that are part of the daily routine of the emergency services (i.e. a kitchen fire).

To summarise, the cold phase corresponds to pre-crisis and post crisis, in which the safety region takes care of prevention, preparation and learning. The hot phase corresponds to the 'crisis stage, where they are concerned with containment and determination of a crisis.

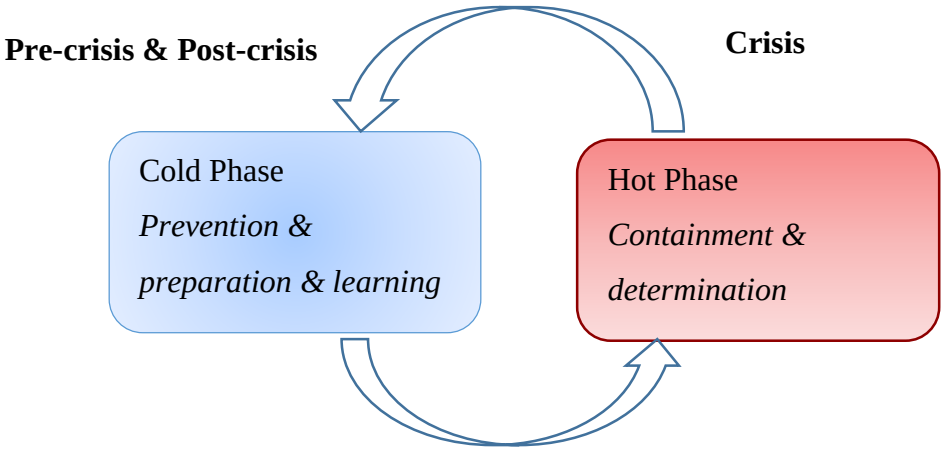

Figure 1: Crisis Management Stages in Safety Regions

3.1.3 Increased complexity and interdependence

Crisis management is increasingly challenging in our ever more interdependent and complex world. Trends such as globalisation, new and potentially dangerous technologies, new forms of terrorism and climate change threaten society. Two trends create an increased uncertainty for crisis management (Boin, Comfort, & Demchak, 2010). Firstly, modern threats have a transboundary nature, as our world has become interdependent. A threat somewhere else in the world can affect our society. For example, the war in Ukraine seemed a remote threat. However, when flight MH17 was shot down above the warzone and killed 298 passengers (mostly Dutch people), the war deeply affected Dutch society (Truijens, et al., 2015). The range of causes and impacts of a crisis has increased, which makes them harder to predict and prepare for.

Secondly, our society has become more complex. The role of government has changed under New Public Management (governmental tasks and decision sovereignty have been placed outside of the government). Semi-public organisations, private organisations, NGOs and multilateral organisations (e.g. EU) play a bigger role in policies (Boin, Comfort, & Demchak, 2010). This increased number of involved actors and the fragmentation of decision making, makes it harder to recognise an impeding threat, and creates ambiguity about who 'owns' the crisis.

In sum, the increased interdependency and complexity creates an inability to predict threats, consequently prevention of a crisis and preparation for a crisis become more difficult.

The next sections clarify two promising solutions, *resilience* and *network effectiveness*, that can help crisis management to face the increased complexity and interdependence. First, *resilience* – the ability to bounce back from a crisis - can be a promising solution, as it moves beyond crisis prevention and preparation. When not all crises be prevented and prepared for, bouncing back from a crisis becomes more important. Secondly, *networks* are a way to combine the expertise of different organisations in order to deal more effectively with the increased complexity of crises and interconnectedness of organisations. As decision making has become more fragmented, an organisation can no longer solve a crisis on its own.

3.2 Resilience

Resilience is a potential solution to the increased complexity and interdependence that crisis management has to deal with. Firstly, the origin of resilience is outlined. Secondly, this research is positioned in the definition debate surrounding resilience. Thereafter, requirements for resilience are described. Finally, resilience with regard to safety regions is discussed and the first sub question is answered: *what is resilience for safety regions?*

3.2.1 Origin of resilience

The word 'resilience' is derived from the Latin word 'resilire" and means bouncing back. (Koslowski & Longstaff, 2015; Boin, Comfort, & Demchak, 2010). Among the disciplines that use the concept of resilience are: ecology, psychology, engineering, safety management, disaster research and organisational studies. In ecology, for example, resilience refers to stability and the ability of (eco)systems to undergo and recover from disturbance and maintain its functions and controls (Gunderson, 2000; Holling, 1973). The term resilience originates from psychology in the 1940s, where it was used to study the ability of people to deal with trauma (see e.g. Werner & Smith, 2001) (Manyena, 2006).

Resilience was first introduced to the social sciences by Aaron Wildavsky (1988), who connected the concept to uncertainty (Boin, Comfort, & Demchak, 2010; Lorenz, 2013). He emphasises resilience as an alternative approach to crisis anticipation and prevention. As crises can no longer be predicted in our uncertain, complex and interdependent world, there is a need for resilience. Resilience has been described by many academic disciplines as a potential answer to move beyond surviving (e.g. a crisis) and even prosper in challenging conditions (Koslowski & Longstaff, 2015). It refers to the ability to learn how to cope with

unanticipated disruptions by having a positive attitude towards failure (Wildavsky, Searching for Safety, 1988; Lorenz, 2013).

3.2.2 Definition problems

Over the past years, resilience has gained much attention in many disciplines. Relatively, the number of scientific articles that used resilience as a keyword grew more than ten-fold since 1995 (Koslowski & Longstaff, 2015). Although resilience has gained much attention, a clear definition or understanding of its meaning is still lacking (Klein, Nicholls, & Thomalla, 2004; Manyena, 2006; Boin, Comfort, & Demchak, 2010). Resilience research is surrounded by ambiguity and a diversity of definitions - regarding its scope, aspects and outcomes-, which is mainly due to use of the resilience concept in a broad range of disciplines (Lorenz, 2013; Koslowski & Longstaff, 2015). This lack of clarity complicates the operationalisation of resilience and its measurement, and consequently hinders the improvement of resilience (Manyena, 2006). Although most definitions (from a wide variety of disciplines) incorporate the basic idea of bouncing back from adversities, and the survival of an individual or system from a surprise or uncertainty (Koslowski & Longstaff, 2015), there is still disagreement among definitions on the following aspects: 1) the severity of the disturbance (or adversity), 2) the time dimension, 3) the resilient outcome (Ruiter, 2015). To clarify the meaning of resilience in this research, the choices made in the definition debate are made clear.

Severity of disturbance

The first choice regarding the definition of resilience is the severity of the disturbance. Resilience can concern all disruptive events (from daily-routine to rare disruptive events) or only include unexpected, non-routine disruptive events (Boin, Comfort, & Demchak, 2010). This research will look at what in the previous chapter has been defined as a crisis - irregular events and unexemplified events, which have a (very) low probability, (very) high impact, and (very) high uncertainty (Hollnagel, 2015). This means that the emergencies that are part of the daily routine of the safety region are excluded.

Time dimension

Secondly, there is disagreement on the *moment* of resilience. The question is when resilience takes place. 1) Is a system resilient before an adversity occurs? 2) Or can we see resilience during a crisis? 3) Or is resilience only visible after a crisis has occurred? (Boin, Comfort, & Demchak, 2010; Westrum, 2006). This also corresponds with the previously defined phases of

crisis management: 1) preparation for a crisis (pre-crisis), 2) preventing a crisis from becoming worse (crisis), and 3) recovering and learning from a crisis (post-crisis).

Resilience is often measured as an outcome (post-crisis), as we do not recognise resilience in the heat of the moment, but we assume it must have been there if a system or individual bounces back from a crisis or disaster (Boin & Van Eeten, 2013). However, the problem of this approach is that a resilient system can still experience a bad crisis outcome, and vice versa. A solution is to consider resilience as a process, which emphasises the human role in 1) preparation, 2) mitigation and 3) recovery (Manyena, 2006). This means resilience takes place in all three phases of crisis management.

Therefore, this research does not approach resilience as an outcome of crisis management, instead treating it as a process. Thus the three phases of crisis management (i.e. both the cold and hot phase) are considered as equally important for resilience.

State of return

There also exists disagreement on what is regarded as a resilient outcome when recovering from a disturbance. Should the system only be able to function again after a disturbance, or return to its old status, or even emerge stronger from the disturbance (Boin, Comfort, & Demchak, 2010)? When the ability to learn and adapt are taken into consideration, resilience can even refer to bouncing forward, instead of only bouncing back (Koslowski & Longstaff, 2015; Klein, Nicholls, & Thomalla, 2004; Manyena, 2006). Some resilience definitions frame resilience as a return to normality or a single equilibrium (Koslowski & Longstaff, 2015). In these definitions, the status quo is strengthened in order to resist change (Klein, Nicholls, & Thomalla, 2004). However, in an increasingly dynamic and uncertain world, adaption to new conditions is more appropriate (especially on the long run) than defending the old state or just bouncing back (Koslowski & Longstaff, 2015).

This research regards resilience as the capacity of a system to adapt to new situations and learn from shocks. The increased complexity and interdependence of modern society create uncertainty for crisis management. This asks for crisis management that is able to learn and adapt, and accept the inevitability of change. New conditions may require new (better fit) answers that move beyond recovery and bouncing back, which means bouncing forward.
To summarise the choices made in this definition debate (see table 3), this research uses the following definition of resilience for safety regions:
The ability to prevent a crisis from happening, the ability to prevent a crisis from becoming worse, and the ability to recover (bounce forward) from a crisis once it has occurred.

Resilience definition for safety regions			
Severity	Disturbances of daily-routine		**Non-routine disruptive events**
Time dimension	Outcome: recovering from		**Process: 1. preparation, 2. response, 3. recovery and learning (pre-crisis, crisis & post-crisis)**
State of return	Function again	Return to previous	**Improvement**

Table 3: Concept Controversy, in bold the focus of this research

3.2.3 Requirements for resilience

In the previous section, a definition of resilience for safety regions was formulated. This subsection will clarify what organisations need to do and what requirements they should meet to incorporate resilience.

Many scholars have used High Reliability Theory (HRT) to define requirements of resilience (e.g. Boin & Van Eeten, 2013; Stephenson, 2010; Weick & Sutcliffe, 2007). High Reliability Organisations (HRO) are organisations that manage hazardous systems that are essential to society, such as water supply (Boin & Van Eeten, 2013). This research also uses HRT principles to formulate requirements for resilience for the following reasons. Firstly, HRT is concerned with organisations that face hazardous conditions (Reason, 2000), which corresponds with safety regions, as they are organisations that face crises. Secondly, high reliability is often used interchangeably with the resilience of organisations (Reason, 2000; Vogus & Sutcliffe, 2007). Thirdly, HRT can be associated with resilience, as it incorporates learning, trial and error, and flexible decision making (Sutcliffe, 2011; Boin, Comfort, & Demchak, 2010). Fourth, this research builds upon the study of Resodihardjo, Van Genugten and Ruiter (n.d.), who have used the five HRO principles of Weick and Sutcliffe (2007) to formulate resilience requirements.

The first three HRO principles of Weick and Sutcliffe (2007) deal with *anticipation.* Anticipation helps the organisation to become aware and act upon unexpected events early on, before the situation becomes entirely out of control. The final two principles are about *containment*, which helps to reduce the crisis, when prevention is no longer possible. Weick and Sutcliffe (2007) call an organisation ‘mindful’ or resilient when it has incorporated these five principles.

Anticipation

The first principle is *preoccupation with failure*. Weick and Sutcliffe (2007) state that in order to avoid failure an organisation should first embrace it. First, embracing failure means to pay close attention to signals of failure, no matter how small. Small failures may be symptoms of larger problems which can have severe consequences. Further, embracing failure means that the organisation spells out errors that people could make (Weick & Sutcliffe, 2007). By spelling out these possible mistakes, people are not paralysed when they make an error, and in addition it eases the reporting of errors (Sutcliffe, 2011). Furthermore, HROs are aware that success can breed complacency, which may lead to a lack of awareness or deviation from the rules for the wrong reasons (Weick & Sutcliffe, 2007). Moreover, people should be encouraged to report failures. Specifically looking for symptoms of malfunctioning enhances the ability of the organisation to prevent these mistakes.

Secondly, an HRO is *reluctant to simplification*. HROs facilitate the expression of opposing views and expectations. Assumptions and expectations simplify the world, which makes it harder to spot evidence that foreshadows unexpected problems. Questioning these assumptions helps to create a more complete and nuanced picture of the situation at hand (Sutcliffe, 2011). Additionally, they create varied teams, with people with a wide range of experience (Weick & Sutcliffe, 2007). A varied team is able to create a more complete picture by bringing more perspectives on issues, problems and decisions, and has a broader range of experiences available. Furthermore, HROs are critical of categories and generalisations, because they impede the creation of a complete picture by abstracting reality and neglecting details (Weick & Sutcliffe, 2007).

The third HRO principle is *sensitivity to operations*. Awareness of operations has three key elements. Firstly, ongoing interaction and information sharing within and between teams is important. Communication does not only help to build trust, it also creates an integrated complete picture of the current situation, and thus helps to prevent errors from accumulating (Sutcliffe, 2011; Weick & Sutcliffe, 2007) Secondly, being aware of operations helps to detect near misses that can be an indication of a failing system. Therefore, people working in an HRO avoid working on autopilot. They are aware of the work they are actually doing, and they know this can differ from what they were supposed to be doing according to the plans and designs. Thirdly, HROs ensure that people feel free to report mistakes and encourage them to speak up. Only when people feel free to do so, important information can reach other people in the organisation and help them to make informed decisions (Weick & Sutcliffe, 2007).

Containment

Commitment to resilience is the fourth HRO principle, and is part of the containment when a crisis has occurred. The HRO is not error free, when errors occur, the organisation is able to detect, contain and bounce back from these errors. In order to respond more effectively to unexpected events, HROs do the following: 1) implement training, 2) hire people with a wide variety of experience, 3) learn from adversity (Weick & Sutcliffe, 2007, p. 14; Sutcliffe, 2011), 4) stimulate creative thinking, 5) and allow conceptual slack[1] (Weick & Sutcliffe, 2007, pp. 71-73). Training, a wide variety of experience, and learning from adversities make people more familiar with problems, and makes it more likely that they will notice, acknowledge and act on new problems. Allowing conceptual slack and creative thinking makes them able to think out of the box and improvise in combining existing response repertoires, to apply to new adversities.

The final HRO principle is *deference to expertise* (Weick & Sutcliffe, 2007). Firstly, during a crisis decision-making needs to migrate 'to the person or people with the most expertise with the problem at hand, regardless of authority or rank' (Sutcliffe, 2011, p. 139). In a crisis, people working at the front line might have more knowledge than people at the top of the organisation. Therefore, decision-making should migrate in tandem with the problem and hierarchical structures should make way for expertise (Sutcliffe, 2011; Weick & Sutcliffe, 2007). Secondly, expertise is often found in informal networks and refers to 'an assemblage of knowledge, experience, learning, and intuitions that is seldom embodied in a single individual' (Weick & Sutcliffe, 2007, p. 78). Awareness of each other's expertise can be used as an advantage when problems arise, because it makes them able to combine their expertise (Sutcliffe, 2011).

In sum, to become resilient, organisations should implement the following five principles: *preoccupation with failure, reluctance to simplify, sensitivity to operations, commitment to resilience* and *deference to expertise.*

3.2.4 Resilience and safety regions

This paragraph answers the first sub question: *What is resilience for safety regions?* The five principles of HROs can also be used by safety regions to incorporate resilience. However,

[1] Conceptual slack: the diversity in analytical perspectives of organisation members, their willingness to question the current situation, and the respect and acceptance for these questions by others, which allows for new solutions (Weick, Sutcliffe, & Obstfeld, 2008, p. 42)

HROs are designed to perform a core task (e.g. energy supply). In this case resilience is needed to deal with disasters (e.g. an explosion) that occur next to their core task, whereas the core task of safety regions is to manage disasters itself (e.g. they mitigate the crisis which the explosion at the power plant has caused).

The implementation of resilience in safety regions is not only applicable to the crisis situation itself (i.e. the hot phase), but also applies to the pre-crisis and post-crisis stages (i.e. the cold phase). Most resilience principles and their corresponding requirements can be performed during both the hot phase (crisis) and cold phase (no-crisis) of crisis management, while other tasks are only confined to either the hot or the cold phase. The following paragraphs and table 4 provide an overview of the principles, their requirements, and corresponding phase of crisis management. As this research builds upon the literature study of Resodihardjo, Ruiter and Van Genugten (n.d.) these paragraphs and table are very similar to their article.

Firstly, *preoccupation with failure* requires: 1) monitoring the occurrence of failures during the hot phase, because it helps to prevent failures from escalating. 2) Frequently communicate which mistakes need to be avoided during the cold phase, because it helps to prevent mistakes in the hot phase (when there is no longer time for this communication). 3) Realise that success can breed complacency (hot & cold phase), because creating awareness in the cold phase diminishes the chance of complacency in the hot phase. 4) Encourage reporting failures (hot & cold phase), because pointing this out in the cold phase helps people to report failures during and after a crisis.

Secondly, *reluctance to simplify* requires: 1) facilitating the expression of opposing views and expectations (hot & cold phase), because this creates a culture where opposing views and expectations are welcomed. 2) Creating varied teams with a wide range of experience (hot & cold phase), because it helps to create a more complete picture and provides a broader range of recourses for both the hot and cold phase. 3). Be critical of categories and loosing details when categorizing (hot & cold phase), because being critical in the cold phase helps to create a more complete picture in the hot phase.

Thirdly, *sensitivity to operations* requires: 1) communicating frequently within the team and outside the team (hot & cold phase), because it helps to build trust and familiarity, which helps to create a complete picture in both the cold and hot phase. 2) Stress the importance of detecting near misses (that might be an indication of a failing system) in the cold phase, because this helps to detect them in the hot phase (hot & cold phase). 3) Ensure that people feel free to report mistakes and encourage them to speak up (hot & cold phase),

because by pointing this out in the cold phase, people will feel free to do so in the hot phase and its aftermath (cold phase again).

Fourth, *commitment to resilience* requires: 1) training in the cold phase, because it increases people's ability to interpret, manage, cope with, and learn from an incident. 2) Hire people with a wide variety of experience (hot & cold phase), because hiring them in the cold phase helps to apply a richer set of resources and see a more complete picture during the hot phase. 3) Learn from adversity (cold phase), because when learning takes place in the cold phase it can help avoid future mistakes. 4) Stimulate creative thinking (hot & cold phase), by stimulating and approving this during the cold phase, it is likely that people will be creative during the hot phase. 5) Allowing conceptual slack (hot & cold phase), because allowing this in the cold phase helps people to exchange richer information in a more respectful manner during the hot phase.

Finally, *deference to expertise* requires: 1) decision-making to migrate to people with expertise to act (hot & cold), because by organizing this during the cold phase, it is likely that decision-making will shift to the people with expertise on the crisis during the hot phase. 2) Establishing informal networks to enhance expertise (hot & cold), because stimulating informal networks during the cold phase, will make people aware of each other's expertise and help them to work together by combining expertise during the hot phase.

To conclude, the first sub question; *what is resilience for safety regions?* is answered. Safety regions can incorporate resilience in their core task (crisis management) by applying the requirements. It has been indicated that most requirements can be applied in both the cold and the hot phase, and some either in the hot or the cold phase. Table 4 provides an overview of the resilience requirements and the corresponding phases.

Resilience requirements			
Principle	**Requirement**	**Phase**	**Why?**
Preoccupation with failure	Monitor the occurrence of failures	Hot	To make sure that failures do not escalate, as even small failures can have severe consequences
	Frequently communicate which mistakes need to be avoided	Cold	By repeatedly pointing this out in the cold phase, mistakes can be prevented in the hot phase.
	Realise that success can breed complacency	Hot & Cold	Creating awareness during the cold phase, will make the occurrence of complacency in the hot phase less likely.
	Encourage reporting failures	Hot & Cold	By repeatedly pointing this out during the cold phase, people will feel free to report failures during the hot phase and its aftermath (cold phase again)
Reluctance to simplify	Facilitate the expression of opposing views and expectations	Hot & Cold	Create a culture where opposing views and expectations are welcomed, so people become comfortable expressing them during the hot phase.
	Create varied teams consisting of people with a wide range of experience	Hot & Cold	Having a team that varies in experience, helps to create a more complete and nuanced picture of what they face, and provides a broader range of resources to apply, which is useful in both the cold and hot phase.
	Be critical of categories and losing details when categorizing	Hot & Cold	Being critical to categories in the cold phase helps to create a more complete picture of the situation during the hot phase.
Sensitivity to operations	Communicate frequently within the team and with people outside the team	Hot & Cold	This helps to build trust and familiarity, and it will help to create a complete picture of the situation (e.g. who is doing what during a crisis) in both the cold and hot phase.
	Stress the importance of detecting near misses, as they can be an indication of a failing system	Hot & Cold	When the importance of looking for near misses is pointed out in the cold phase, chances are near misses will be perceived and escalation can be prevented during the hot phase

	Ensure that people feel free to report mistakes and encourage people to speak up	Hot & Cold	By repeatedly pointing this out during the cold phase, chances are people will feel free to report mistakes and speak up during the hot phase and its aftermath (cold phase again)
Commitment to resilience	Training	Cold	Training during the cold phase increases people's ability to interpret, manage, cope with, and learn from an incident
	Hire people with a wide variety of experience	Hot & Cold	Hiring people with a wide variety of experience (in the cold phase) helps to apply a richer set of resources and see a more complete picture (during the hot phase)
	Learn from adversity	Cold	Evaluating and learning from the events which happened during the hot phase can help to prevent future mistakes
	Stimulate creative thinking	Hot & Cold	By stimulating this during the cold phase chances are people will be creative during the hot phase
	Allow conceptual slack	Hot & Cold	Facilitating conceptual slack in the cold phase helps people to exchange richer information in a respectful manner during the hot phase.
Deference to expertise	Migrate decision-making to (frontline) people with expertise	Hot & Cold	By organizing, planning, and training this during the cold phase, chances are decision-making will shift to those with the expertise to deal with the crises during the hot phase
	Establish informal networks to enhance expertise	Hot & Cold	Stimulating the existence of informal networks during the cold phase, will make people aware of each other's expertise, which helps them to work together more optimally (by combining expertise) during the hot phase.

Table 4: Resilience requirements based on Weick and Sutcliffe (2007: 9-73) and Resodihardjo, Van Genugten and Ruiter (n.d.) combined with the cold and hot phase of emergency management

3.3 Network effectiveness

In addition to resilience, the creation of networks can be seen as another way to address crises that are surrounded by uncertainty in a world that is more complex and interdependent. Firstly, the rise of networks will be explained. Then the challenges that networks face will be described. Subsequently, the characteristics of an effective network will be outlined. Finally, an overview is given of the requirements which safety regions need to meet in order to be an effective network. All of this will provide an answer to the second sub question: *what is network effectiveness for safety regions?*

3.3.1 The rise of networks

Our society increasingly consists of networks that address issues and solve problems that are too complex, costly and intractable to be handled by a single organisation (Provan & Lemaire, 2012). Castells (2000; 2004) claims that we are living in a network society, where the social structure consists of networks powered by electronic information and communication technologies. The increased complexity and uncertainty of today's problems results in the inability of single organisations to solve these problems on their own. The resources, knowledge and solutions needed to solve such a problem are usually spread across different organisations (Provan & Lemaire, 2012). Furthermore, networks are flexible and adaptive as they easily incorporate new organisations, or exclude others that cease to be valuable (Castells, 2000). Thus, organisations start to work together in networks, so they possess more resources and knowledge, and become more adaptive, which increases their ability to solve complex and uncertain problems.

This advantage also holds for emergency organisations, as they are better able to manage crises when they form a network (Kapucu & Hu, 2014). Intergovernmental collaboration has become a common disaster response, as there is a growing need for sharing resources and coordinating efforts. Additionally, the importance of involving private sector actors in emergency management planning, mitigation, response and recovery has been recognised (Gazley, 2013). Recent research indicates that building collaborative networks of public, non-profit and private organisations is crucial for the effectiveness of emergency management (Comfort, Waugh, & Cigler, 2012).

3.3.2 Network challenges

Although the formation of networks is both promising and necessary for managing crises, it is not as simple as just forming a network. Collaboration in a network faces many challenges (Provan & Lemaire, 2012). Firstly, a network consists of many organisational members, who can have a *varied commitment to network goals*. Some organisations are part of the core of the network, while others are only peripherally involved. Secondly, collaboration can be difficult because the different organisations preform different activities and have *different cultures* (Vangen & Huxham, 2006; Provan & Lemaire, 2012). Their cultures might clash as the organisations can differ in their approach to decision making, type of training, and level of professionalism. Additionally, organisations *lose their autonomy* and become interdependent. Network decisions are being coordinated, however, the decisions made can conflict with the interests of one or more organisation(s) that are part of the network. Moreover, the *coordination* of decisions and activities is difficult, as it can take a considerable amount of time and effort to align the organisations in a network (Provan & Lemaire, 2012). Furthermore, there is a *reduced accountability*, as successes and failures are difficult to pin down to one organisation. Managers can take credit for their own success and blame others for failure. Finally, managers are facing *management complexity*, they have to find a balance between the goals of their own organisation and the network. To address these challenges, the network effectiveness needs to be considered.

3.3.3 Effective network requirements

Several studies have examined what characteristics lead to an effective network (e.g. Koppenjan & Klijn, 2004; Provan & Milward, 1995; O'Toole & Meier, 2004). Turrini et al. (2010), analyse the literature on network effectiveness and make a distinction between contextual characteristics, structural characteristics and functioning characteristics. *Contextual characteristics* involve the availability of resources, the degree of uncertainty, and the cohesion and support the network receives from the broader community. *Structural characteristics* include integration and coordination, size and composition, formalisation and accountability, and the inner stability of the network. *Functioning characteristics* involve the quality of the managerial work, and buffering instability and nurturing stability.

This research will use the *structural network characteristics*, as these characteristics are most widely used, because of their great impact on network effectiveness (Provan & Kenis, 2008; Turrini, et al., 2010). Furthermore, the structural characteristics fit the permanent and formalised structure of safety regions. Moreover, the *contextual characteristics* -like the

availability of resources- and the *functioning characteristics* like the quality of management, are beyond the scope of this research. However, these characteristics might be relevant for the network effectiveness of safety regions, and could therefore be considered in future research.

Firstly, *integration and coordination* are important structural characteristics for network effectiveness. Integration through a central core agency – which coordinates the other network organisations - is more effective for large and heterogeneous networks than integration through multi-lateral interactions. It enables stricter control over the network organisations, which improves goal achievement (Provan & Milward, 1995; Provan & Sebastian, 1998; Turrini, et al., 2010). At the subnetwork level, integration needs to be intensive, with multiple links across the organisation. Consequently, network members learn a lot about each other, transaction costs are limited, and relationships are being built based on norms of co-operation and trust (Provan & Sebastian, 1998). Mechanisms that can enhance coordination and integration include common information and communication systems (Provan & Sebastian, 1998), joint staff activities, such as marketing, planning and training (Bazolli, et al., 2003), and partnership synergy –the power to combine perspectives, resources and skills (Lasker, et al., 2001).

Secondly, the structural aspects of *size and composition* are important for network effectiveness. The number of network members influences the network effectiveness. For example, the larger the network, the lower the degree of its perceived effectiveness (Turrini, et al., 2010). Further, the network heterogeneity (composition) affects the network effectiveness. Although a heterogeneous network can enhance creative and holistic thinking (Lasker, et al., 2001), it creates 'significant management challenges in coordination, communication and conflict management' (Hasnain-Wynia, et al., 2003, p. 59). When organisations with different cultures are involved, these cultures might clash, and affect the network effectiveness (Vangen & Huxham, 2006; Provan & Lemaire, 2012). This means that the number of members needs to be limited, or there needs to be a careful selection of which new members to include and exclude (Huxham & Vangen, 2005; Turrini, et al., 2010).

Furthermore, *formalisation and accountability* are characteristics that enhance network effectiveness. Formalised rules, organisation of meetings, a written agenda and decision-making procedures regulate the behaviour of network members (Klijn, Koppenjan, & Termeer, 1995; Turrini, et al., 2010). The formalisation of results makes networks more accountable and transparent to external stakeholders. This in turn enhances the quality of service delivery and the longer-term sustainability of the network.

The *network inner stability* is the final aspect that influences network effectiveness. Indicators of the network's inner stability are the length of the lifetime spend in the network and the management tenure of people working in the network. The length of management tenure enhances the level of integration – and thus the effectiveness- of the network, as it helps to build trust, spread knowledge in the network and keeps continuity in the relationships (Turrini, et al., 2010). Moreover, a low level of competitiveness positively influences the networks inner stability (Conrad, et al., 2003). Furthermore, strong linkages among organisations ease the access to the new technologies, knowledge and learning that have been developed by other organisations, which decreases the risk of adopting a change (Turrini, et al., 2010). Finally, inner stability is enhanced by trust, reciprocity and co-operation norms (Koppenjan & Klijn, 2004; Vangen & Huxham, 2003). Positive outcomes of collaboration can build trust. Each time partners work together, they take a risk and have certain expectations about the outcome and the contribution of the other. When the outcome meets the expectations, trust is reinforced and there is a decreased risk for joint actions in the future (Vangen & Huxham, 2003).

3.3.4 Network effectiveness and safety regions

In this paragraph the second sub-question is answered: *What is network effectiveness for safety regions?* In order to be an effective network, safety regions need to meet the requirements mentioned above. First, to function as an effective network, safety regions have to *create integration and coordination*. A central core agency can create coordination. Safety regions have a central administrative organisation (the safety bureau) that supports the general board and the emergency services (Ministry of Safety and Justice, 2013b). Moreover, integration mechanisms, such as a common information and communication system facilitate integration. Safety regions also perform crisis training exercises, which can enhance integration and coordination. Training includes joint staff activities (Bazolli, et al., 2003), which is likely to enhance partnership synergy because people have to combine perspectives, resources and skills (Lasker, et al.,2001). Kupucu and Hu (2014) argue that relationships are developed during preparation, when different agencies are involved in exercises and trainings. Furthermore, relationships are developed and strengthened during crises when they work towards common goals.

Secondly, to be effective safety regions should *limit the size and composition of their network.* A network with a heterogeneous composition creates challenges in coordination, communication and conflict management. For example, different cultures in the safety region

might clash and affect the network effectiveness. Thirdly, *formalisation and accountability* help to function as an effective network. When regulations, decision-making and meetings are formalised, members can be held accountable to external stakeholders, which enhances the effectiveness of the network. Finally, the *creation of inner stability* helps to increase the network effectiveness. Inner stability can be created by employ people with a long (management) tenure, lowering the level of competitiveness, and by creating trust. Further, inner stability is enhanced by creating strong linkages between network members and supporting reciprocity and co-operation among the members. Table 5 provides an overview of the requirements which safety regions need to meet in order to be an effective network.

Network effectiveness requirements		
Principles	**Requirements**	
Integration and coordination	Coordination by a central core agency	
	Integration mechanisms	Same information and communication systems
		Joint staff activities (e.g. marketing and planning)
		Synergy: combine perspectives, resources and skills
Size and composition	Limited number of actors involved	
	Homogeneous network	
Formalisation and accountability	Formalisation of rules, meetings and decision-making	
	Accountable to external stakeholders	
Network inner stability	Length of life time spend in the network	
	Length of management tenure	
	Low level of competitiveness between network members	
	There is trust (e.g. built through successful co-operation the past) between network members	
	There is reciprocity between network members	
	There is co-operation between network members	
	Strength and continuity of linkages between network members	

Table 5: Network requirements for safety regions (based on Resodihardjo, Van Genugten and Ruiter (n.d.)).

3.4 Resilient and effective network

Resilience and network effectiveness both provide promising improvements for crisis management in an ever more complex and interdependent world. Combining resilience and network effectiveness would be ideal for safety regions, as it makes them able to quickly end a crisis and limit its damaging effects. Furthermore, the combination of resilience and network effectiveness requirements helps to address crises that are too unexpected to prepare and prevent for, and too complex to be solved by a singular organisation. However, there are requirements that contradict, and consequently can have a negative effect on crisis management. First, the matching requirements will be outlined, after which the contradicting requirements will be described. This will provide an answer to the third sub-question: *what are the contradictions between resilience and network effectiveness?*

3.4.1 Matching requirements

When they combined the resilience and network effectiveness, Resodihardjo, Van Genugten and Ruiter (n.d.) found that most requirements are align well with each other. This research adds to their findings by elaborating on what these matches imply, and by addressing the implications of these matching requirements. It is likely that safety regions can easily apply matching requirements, as there are no contradictions that can obstruct the implementation of these requirements. In fact, they will probably reinforce one another.

Firstly, both resilience and network effectiveness requirements stress the importance of *communication*. Resilience requires sensitivity to operations, where communication is important to share information and interact with each other. As previously described, communication within and between teams helps to create a more complete picture of situations and prevent errors from accumulating (Weick & Sutcliffe, 2007). Similarly, network effectiveness requires integration and coordination. Having similar communication and information systems can help integrate the network (Provan & Sebastian, 1998).

The second matching aspect between resilience and network effectiveness requirements, is *training*. The requirement *commitment to resilience*, demands training (Weick & Sutcliffe, 2007). Training and simulation make crisis managers more familiar with problems that can arise, and makes it more likely they will notice, acknowledge and act on new problems. Similarly, the integration and coordination of a network is enhanced by joint staff activities, like training exercises (Bazolli, et al., 2003). Furthermore, training and

exercise help to create partnership synergy and relations, which help to integrate and coordinate the network (Lasker, et al., 2001; Kapucu & Hu, 2014).

Additionally, both resilience and network effectiveness requirements emphasise the value of *trust*. Resilience stresses the importance of being sensitive to operations and thereby support a frequent communication within and between teams. Communication helps to build trust (Weick & Sutcliffe, 2007; Sutcliffe, 2011). When people feel free to speak up information can spread through the network. Trust is also of importance for network effectiveness as it enhances network stability (Koppenjan & Klijn, 2004; Vangen & Huxham, 2003). Positive outcomes of collaboration can build this trust. A manager that has a long management tenure can also help to build trust and thus increase the network's inner stability.

A final similarity is found in the significance of *co-operation*. For resilience, the establishment of informal networks where people work together helps them to become aware of each other's special skills and knowledge. This awareness of each other's experiences and knowledge enhances the co-operation in the safety region, during both the cold and hot phase (Weick & Sutcliffe, 2007). Similarly, network effectiveness requires co-operation to increase the networks inner stability (Turrini, et al., 2010). Managers that have a long management tenure can enhance the co-operation, as they help to build trust, enhance knowledge diffusion and create a continuity in relationships. Moreover, reciprocity, co-operation and strong linkages between network members are important for the network's inner stability.

Table 6 provides an overview of the matching requirements of resilience and network effectiveness. The expectation is that safety regions can implement requirements that are matching, as they are compatible with each other. If they are able to implement a resilience requirement, a matching network effectiveness requirement might be already implemented simultaneously, and vice versa. Furthermore, most requirements are related to expectations on the behaviour of crisis managers, and matching requirements will possibly make it easier for them to meet these expectations. However, there are also requirements of resilience and network effectiveness that contradict each other. These contradictions might cause opposing expectations on how crisis managers should behave. Or the choice for one requirement can come at the expense of another requirement. This means that the contradictions can negatively affect crisis management, hence they are the focus of this research. The next subsection clarifies the contradictions between resilience requirements and network effectiveness requirements.

Matching requirements		
Aspect	**Resilience**	**Network effectiveness**
Communication	Support ongoing communication (sensitivity to operations)	Integration mechanism: Same information and communication systems (integration and coordination)
Training	Train (commitment to resilience)	Integration mechanism: joint staff activities (like training), and training and exercise help to create partnership synergy and relationships. (integration and coordination)
Trust	Support ongoing communication (sensitivity to operations) Ensure that people feel free to report mistakes and encourage people to speak up (sensitivity to operations)	There is trust between network members (network inner stability) Length of management tenure (creates trust) (network inner stability)
Co-operation	Establish informal networks to enhance expertise (deference to expertise) Support ongoing communication within and between teams (sensitivity to operations)	Length of management tenure (creates trust, spread of knowledge and continuity in relationships) (network inner stability) There is co-operation between network members (network inner stability) There is reciprocity between network members (network inner stability) Strong linkages between network members (decrease the risk of change) (network inner stability)

Table 6: Matching requirements of resilience and network effectiveness

3.4.2 Contradicting requirements

In addition to matching requirements, there are contradicting requirements between resilience and network effectiveness. This section answers the third sub question: *What are the contradictions between resilience and network effectiveness?* These contradictions can be problematic for safety regions, as they can obstruct the crisis management. When it is unclear if the safety region should choose for resilience or network effectiveness, doubts may delay the crisis management. Furthermore, when a choice between resilience or network effectiveness needs to be made, this may come at a cost of either resilience or network effectiveness. Resodihardjo, Van Genugten and Ruiter (n.d.) have identified three contradictions between resilience and network effectiveness requirements. This research will elaborate on what these contradictions imply.

Variety - Limited size and composition

The first contradiction exists between *variety* and, a *limited size* and *composition*. While variety is of high value for resilience, it is viewed as a disadvantage for network effectiveness (Resodihardjo, Van Genugten, & Ruiter, n.d.). This forms a contradiction because the network cannot be varied, and be limited in size and composition at the same time.

To be resilient, an organisation should *create varied teams*. Additionally, commitment to resilience requires *hiring people with a wide variety of experience*. Crisis management has become too complex to be comprehended by a single individual, therefore diversity is needed to bring more perspectives on issues, problems and decisions (Sutcliffe, 2011). A broader action repertoire can be created by having a network with a broader range of experiences available. Furthermore, diversity in the network helps to create a more complete picture of a crisis. Lasker, Weiss and Miller (2001, p. 185) state that collaboration brings ‘together diverse people, organisations and sectors and can change the way communities conceptualise and solve problems’.

Network effectiveness, on the other hand, requires a network that is *limited in size* and *composition*. First, the network needs to be *limited in size*, when more actors are involved in the network, coordination, communication and conflict management become more complex and affect the network effectiveness (Resodihardjo, Van Genugten, & Ruiter, n.d.). Therefore, network effectiveness requires a network to involve only a limited number of actors and make a careful selection on which actors to include and exclude. Furthermore, an effective network needs to be *limited in composition*, as a heterogeneous network complicates the coordination and integration of the network. Moreover, the existence of different cultures in a network can

lead to culture clashes, which disturbs network effectiveness (Vangen & Huxham, 2006; Provan & Lemaire, 2012). Thus, variety is seen as a disadvantage for network effectiveness. When there is more variety in a network, this means that more (no limited size) different (no limited composition) organisations get involved.

This contradiction can be linked to the ambiguity surrounding the effects of diversity. The many studies that have been conducted on the benefits and downsides of diversity have yielded non-conclusive results (Richard, et al., 2004; Harzing & Pinnington, 2014). On one hand, studies have found that diversity is beneficial, as it leads to better group and organisational performance (cf. Cox, Lobel, & McLeod, 1991; Watson & Michaelson, 1993). Moreover, heterogeneous teams perform better in terms of innovation and creativity, which is also required for resilience. For example, McLeod and Lobel (1992) find that a divers team performs better in brainstorming tasks, as they produce higher quality ideas, due to their differences. On the other hand, studies have found negative performance outcomes because of intra- and inter-team conflicts and communication problems that arise from differences (cf. Tsui, Egan, & O'Reilly, 1992; Lau & Murninghan, 1998). Diversity is one of the greatest challenges of collaboration as it can lead to tension and conflict and places great demands on leadership, management skills and coordination (Lasker, Weiss, & Miller, 2001).

In addition to the advantages and disadvantages of heterogeneity or diversity, homogenous teams have an advantage. A homogenous team helps to create a strong team culture and shared expectations, which improves communication and effectiveness. Moreover, a strong team culture creates trust and thus fuels performance (Earley & Mosakowski, 2000). Trust is not only beneficial for network effectiveness, but also for resilience, as it can help people to speak up about mistakes and anomalies (Sutcliffe, 2011). Previously, trust has already been described as a matching requirement between resilience and network effectiveness.

Overall, there is a contradiction between variety and limited size and composition. The requirements of resilience, which are to create a varied team and hire people with a variety of experience cannot be met simultaneously with the network requirement of a limited composition of the network. For safety regions this means that they are either a varied network, or that they are limited in composition. Variety can be an advantage for the crisis management of safety regions, as organisations and individuals with diverse perspectives and experience help to create a more complete picture of the crisis. However, variety can also be a disadvantage, as it complicates communication, co-operation and coordination, and thus obstructs the effectiveness of the network. Moreover, a homogenous team can enhance trust,

which is beneficial for reporting errors (resilience). Therefore, the following expectation is formulated for safety regions:

Safety regions experience a contradiction between variety and limited size and composition.

Although homogenous teams can be beneficial for both resilience and network effectiveness, because it creates trust, the focus is of this research is the possible contradiction between the advantages and disadvantages of variety.

Expert decision making – Coordination by central core agency

Secondly, there is a contradiction between *decision-making to migrate to the (frontline) people with expertise* and the network requirement of *coordination by a central core agency*. (Resodihardjo, Van Genugten, & Ruiter, n.d.). Resilience requires that during a crisis, *decision-making should migrate to the people with expertise* on the problem at hand. This deference to expertise requires that 'authority and expertise are decoupled and decision-making to migrate to expertise rather than rank' (Weick & Sutcliffe, 2007, p. 81). Thus, hierarchies and structures need to be put aside in favour of expertise, as people working at the front line may have more expertise (i.e. knowledge, experience, learning and intuition) than people at the top of the organisation. If decision-making is more hierarchical, it is 'less informed by frontline experience and expertise and is more informed by inputs that are coloured by hierarchical dynamics such as uncertainty absorption and withholding bad news' (Weick & Sutcliffe, 2007, p. 77).

By contrast, a large and heterogeneous network requires a *central core agency* that can create integration and coordination of the organisations that are part of the network (Provan & Milward, 1995; Turrini, et al., 2010; Provan & Sebastian, 1998). When a central core agency makes decisions and coordinates the network, this enables stricter control, which improves the goal achievement of the network (Turrini, et al., 2010).

The contradiction between decision making by expertise and coordination by a central core agency, also exists for safety regions. Crisis management requires planning and a coordination structure (Waugh & Streib, 2006). Provan and Kenis (2008) argue that a network of many organisations requires *centralisation of the network* around a network administrative organisation (NAO). The safety region network consists also of many organisations and there is a central administrative organisation. Such a central organisation is more effective in coordinating and making decisions, as all the organisations no longer need to be involved in

all network decisions (which for example can create conflicts and coordination problems) (Provan & Kenis, 2008). During a crisis, decisions need to be made quickly and people need to keep communicating so they can swiftly respond to the evolving crisis. When a crisis gets larger, more people become involved, this means that more information needs to be shared and more effort needs to be coordinated, and therefore there is a need to unify command. However, this also means that participation of professionals in decision-making will be limited. Consequently, the central core agency is not able to make informed decisions. Crisis situations also desire flexibility, as they are unpredictable (Waugh & Streib, 2006). This is recognised by the resilience requirement of *decision-making migrating to the people with expertise* (Weick & Sutcliffe, 2007). Regarding this contradiction, the following expectation for safety regions can be formulated:

Safety regions experience a contradiction between decision-making migrating to expertise, and coordination and by a central core agency.

Flexibility - Rigidity

The third contradiction between resilience and network effectiveness exists between the flexibility of *creative thinking* and *conceptual slack*, versus the rigidity of *formalisation* (of rules, meetings, written agenda and decision making procedures), *accountability*, and a *desire for hierarchy*. Resilience requires organisations to stimulate *creative thinking*. Allowing people to think creatively and deviate from the protocols, will help to address a crisis when it differs from what has been anticipated (Resodihardjo, Van Genugten, & Ruiter, n.d.). Further, commitment to resilience asks for *allowing conceptual slack*, so people are able to question the current situation and are open to new solutions. In this research, this is named flexibility.

Contrary to resilience, network effectiveness demands formalisation of rules and accountability to external stakeholders. Formalised rules, the organisation of meetings, a written agenda and decision-making procedures help to manage the behaviour of network members (Turrini, et al., 2010). Furthermore, formalisation enhances the accountability and transparency to external stakeholders. Thus, both formalisation and accountability enhance the effectiveness of a network. In this research this is named rigidity.

This contradiction between flexibility and rigidity is especially significant for safety regions. First, because crises create a desire for hierarchy, ‘disasters and fear of disasters also generate a strong desire for hierarchy – somebody to take charge, or possibly someone to be held accountable” (Waugh & Streib, 2006, p. 138). According to Waugh and Streib,

hierarchical decision processes obstruct the flexibility that is needed during a crisis, because they are 'neither flexible nor speeding in rapidly changing circumstances' (Waugh & Streib, 2006, p. 136). Therefore, the desire for hierarchy is classified here as part of rigidity. The strong *desire for hierarchy*, can come at the expense of the flexibility of creative thinking and conceptual slack. For example, people might seek comfort in hierarchy or hide behind hierarchy instead of proposing new ideas or expressing dissenting opinions. This might negatively affect resilience, as creative thinking and conceptual slack help to think out of the box and broadens the action repertoire to address crises (Sutcliffe, 2011; Weick & Sutcliffe, 2007). As there is a desire for hierarchy when a crisis occurs, this contradiction is expected to appear during the hot phase. Secondly, the rigidity of *formalised rules* and *accountability* can hinder the flexibility of *creative thinking* and *conceptual slack*. When faced with a crisis, people may become afraid to make mistakes and can have a fear of being held accountable for them. They are likely to adhere to the rules and the security promised by a leader (Waugh & Streib, 2006), instead of *thinking creative* and allowing *conceptual slack*. This paradox is specific to crisis management; on the one hand, managing a crisis requires precise planning and preparation (rigidity), while on the other hand crises are unpredictable and require flexibility and deviation from these plans and preparations (Waugh & Streib, 2006). In line with this paradox, Koslowski and Longstaff (2015, p. 12) argue that 'efforts to increase the stability can lower the adaptability and resilience'. Regarding this contradiction, the following expectation can be formulated for safety regions:

Safety regions experience a contradiction between: flexibility (creative thinking, and allowing conceptual slack), and rigidity (formalisation, accountability and a desire for hierarchy).

The three contradictions result from combining the resilience and network effectiveness requirements. This research aims to find out whether these contradictions are also found in the practice of safety regions and if so, how they deal with the contradictions. Table 7 provides an overview of the contradicting requirements of resilience and network effectiveness. The next chapter explains the research strategy, and describes how the three contradictions will be measured.

Contradicting Requirements		
Aspect	**Resilience**	**Network effectiveness**
Variety – Limited size & composition	- Create varied teams (e.g. people with a wide range of experience) - Hire people with a wide variety of experience	- Limited number of actors involved - Limited composition
Expertise – Central core agency	- Migrate decision-making to (frontline) people with expertise	- Decision-making and coordination by a central core agency
Flexibility - Rigidity	- Stimulate creative thinking - Allow conceptual slack	- Formalisation of rules, meetings, written agenda and decision-making procedures. - Accountability to external stakeholders - *Specific to crisis situations is the desire for hierarchy

Table 7: Contradicting requirements of resilience and network effectiveness

4 Research Strategy

In the previous chapter crisis management, resilience and network effectiveness theories are detailed to arrive at the three contradictions that are the focus of this research. In order to find out to what extent these contradictions are found in the practice of Dutch safety regions, the experiences and practices of people working in safety regions are examined. This chapter elaborates on the research strategy that is used. Firstly, the choice for a case study design will be explained, after which the selection of safety regions as cases will be clarified. Furthermore, the data collection methods will be discussed, and the steps that are taken to collect and analyse the results will be illustrated. The chapter will conclude with an elaboration on the reliability and validity of this research.

4.1 Case study design

To examine the contradictions between resilience and network effectiveness requirements in Dutch safety regions, a case study design is used. A case study can be defined as 'an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident' (Yin, 2009, p. 13). The case study design provides detailed in-depth knowledge of the cases, instead of broad knowledge of numerous cases (Van Thiel, 2007). The case study design is chosen for a number of reasons.

Firstly, case studies are concerned with the complexity and particular nature of the case in question (Stake, 1995; Gillham, 2000). For this research, the context in which safety regions operate is important. The crisis management environment is increasingly complex and the organisations that work together in the safety region are interdependent. Furthermore, the Dutch safety regions have a particular nature, as they are crisis management networks that are permanent and formalised. Thus, a case study is suitable to examine the complex and particular nature of the safety regions, by paying attention to their context.

Secondly, case studies are suitable for studying qualitative elements, for example: 'how people understand themselves, or their setting' (Gillham, 2000, p. 7). They help to study the underlying reasons of people's feelings, perceptions, experiences and behaviour. This research aims to understand to what extent crisis managers of safety regions experience the contradictions between resilience and network effectiveness, and how they deal with these contradictions. Being able to study their behaviour, feelings, perceptions and experiences will

help to understand this. The research needs to understand how crisis managers think and feel about the possible contradictions, and if they experience these contradictions how the behave and act upon them. The case study design helps 'to get to know their world and what they are trying to do in it' (Gillham, 2000, p.11).

Thirdly, this research uses case study design because it has an exploratory nature. It is the first research that aims to see if the contradictions between resilience and network effectiveness requirements that are formulated by Resodihardjo, Ruiter and Van Genugten (n.d.) are found in the practice of safety regions. Case studies are suitable for exploratory research (Gillham, 2000; Yin, 2009). Gillham (2000, p.11) argues that case studies are fit to 'investigate situations where little is known about what is there or what is going on, more formal research may come later'.

The results of a case study are not statistically generalisable, but theoretically generalisable (i.e. analytic generalisation), which means that '[…] a previously developed theory is used as a template with which to compare the empirical results of the case study' (Yin, 2009, p. 33). This means that the generalisations relate to the underlying theoretical implications of the research. These implications might also be applicable to the cases that have not been selected, however, no conclusions can be drawn on these cases (Van Bueren, Jansen, & Verbart, 1999). In this study theoretical contradictions between resilience and network effectiveness (Resodihardjo, Van Genugten, & Ruiter, n.d.) are used to compare with empirical results of two case studies. The next paragraph explains the case selection of this research.

4.2 Case selection

Two considerations are made for the case selection. Firstly, the selection of cases is considered. The term 'case' is mostly associated with a location, like a community or organisation. To select cases, it is important to keep in mind the *domain* for which the cases should be representative (Yin, 2009, p. 23; Van Thiel, 2007, p. 101). The Netherlands is divided into 25 safety regions. In order to arrive at representative conclusions on the contradictions between resilience and network effectiveness in safety regions the selected cases need to be representative for the Dutch safety regions (*representative case selection)* (Yin, 2009; Bryman, 2012). However, the representativeness of a safety region is difficult to determine. On the one hand safety regions are similar, because the safety region law prescribes uniformity (of personnel, training and education), defines the borders of each

region, and states that the organisational structure needs to be a 'public body' (openbaar lichaam in Dutch) (Andersson Elffers Felix, 2013). On the other hand, safety regions differ, because the law leaves room in the construction of the organisation and the way emergency services should collaborate. The freedom of structure is viewed as necessary to meet specific regional circumstances. Besides this information from the evaluation report of the safety region law by Andersson Elffers Felix (2013), not much is known about the differences and similarities between safety regions. Therefore, it is not possible to indicate which differences and similarities are relevant and representative for safety regions. Hence, the safety region 'Gelderland-Zuid' (VRGZ) and safety region 'Gelderland-Midden' (VGGM) are chosen for the practical reasons of proximity access (*convenience sampling)* (Bryman, 2012).

The second consideration is the number of cases that are selected. A case study aims to generate an intensive examination of one or more cases (Bryman, 2012). In order to get a complete picture of one safety region, people from the many organisations (that together form a safety region) need to be interviewed and observed. Regarding this complexity and the time scope of this research, two safety regions will be examined. The next two subsections will describe the two safety regions that are selected for this research.

4.2.1 Safety region A: Gelderland-Zuid (VRGZ)

The safety region Gelderland-Zuid (VRGZ) has 530.000 inhabitants and comprises 16 municipalities: Beuningen, Buren, Culemborg, Druten, Geldermalsen, Berg en Dal, Heumen, Lingewaal, Maasdriel, Neder-Betuwe, Neerijnen, Nijmegen, Tiel, West Maas en Waal, Wijchen and Zaltbommel. The legal entity of the safety region is an arrangement (In Dutch: gemeenschappelijke regeling) between these municipalities, and is part of the extended local government (in Dutch: verlengd lokaal bestuur). The safety region consists of five sectors: the fire brigade, the GHOR, the emergency room, the safety bureau and the ambulance service (VRGZ, 2016). The risk profile of the region describes the risks of waterway 'de Waal', the highways and the railway '*Betuwelijn*' which transports hazardous substances. Furthermore, the region has several companies where hazardous substances are used, defined as 'BRZO' companies. Other risks are flooding and forest fires.

4.2.2 Safety region B: Gelderland-Midden (VGGM)

The safety region Gelderland-Midden (VGGM) has 668.000 inhabitants and comprises 16 municipalities: Arnhem, Barneveld, Doesburg, Duiven, Ede, Lingewaard, Nijkerk, Overbetuwe, Renkum, Rheden, Rozendaal, Rijnwaarden, Scherpenzeel, Wageningen,

Westervoort and Zevenaar. Again, the region is based on the 'gemeenschappelijke regeling' between the municipalities (VGGM, 2016). The safety region consists of the fire brigade, GHOR (ambulance service and GGD). There is no physical safety bureau like the VRGZ has, but a virtual safety bureau, because the administrative staff is employed by either the fire brigade or the public health organisation (VGGM, 2015a). The main risks for the region are: flooding and forest fires, because the region has many waterways and the national park are part of the region (VGGM , 2015b).

4.3 Research methodology

This section describes the methods that are used in the case study. First, the methods to collect the data are explained and choices are clarified. Then, the contradictions between resilience and network effectiveness requirements are operationalised, so they can be measured with the data collection methods. Thereafter, the analysis of the collected data is described.

4.3.1 Data collection

To find out to what extent the crisis managers of the safety regions experience the contradictions between resilience and network effectiveness and how they deal with them, two methods of data collection are used. Firstly, interviews are conducted at both safety regions, with people from the organisations that are part of the safety region. Secondly, the safety regions will be observed in order to see if the contradictions can be observed, during practices of the safety regions.

Interviews

An interview is a conversation in which the researcher collects information on the research subject by asking questions to people (the respondents) (Van Thiel, 2007). Interviews are a flexible way to collect information, because the researcher is able to ask additional questions about backgrounds, explanations and clarifications. However, this flexibility can affect the reliability of the research, when interviews differ too much from each other. Therefore, this research uses semi-structured interviews that are conducted by following an interview guide (see appendix 1) for the interview questions. The use of an interview guide enhances the replicability and thus the reliability of the research (Van Thiel, 2007). Moreover, a semi-structured interview approach gives direction by providing questions and subjects for the interviewee, while at the same time leaving room to ask more in-depth questions and

providing room for the interviewee to elaborate on an answer (Boeije, 2005). The interview questions are based on the operationalisation of the contradictions, which is defined in the next paragraph.

Eighteen semi-structured interviews were held with employees from the organisations of the safety regions. The aim of these interviews is to find to what extent they experience the contradictions between resilience and network effectiveness, and how they deal with these contradictions. To create a complete picture of the two safety regions, it is important to interview people from the different organisations that are part of a safety region: the fire brigade, GHOR, the emergency room, the ambulance service (part of the GHOR), the police, and the safety bureau. In addition to, interviewing people from the different organisations, crisis managers from both the operational and administrative level are interviewed, because their experiences might differ. Table 8 provides an overview of the interview respondents from the two safety regions.

Interview Respondents		
	Safety region A	**Safety region B**
Fire brigade	2 persons (from 2 levels)	2 persons (from 2 levels)
ROT	1 Operational leader	1 Operational leader
GHOR	1 person (management level)	1 person (management level)
- Ambulance service	1 person (operational level)	1 person (operational level)
Safety bureau	1 person	1 person
Population care	1 municipality representative	1 municipality representative
Police	1 Liaison police	1 Liaison police
Emergency room	1 person (operational level)	1 person (operational level)
Total:	**9 people**	**9 people**
	18 interviews	

Table 8: Overview of interviewees

From both safety regions nine people were interviewed. The interviewees were selected by contacting the safety region 'Gelderland-Zuid' and asking to interview people that had been involved in a crisis. Thereafter, safety region '*Gelderland-Midden*' was asked for interviewees that have similar positions to the people that were interviewed in safety region '*Gelderland-Zuid*'. All people contacted through the safety regions were willing to give interviews, which lasted for 45-60 minutes on average. During the interviews, questions on both the hot and cold phase were asked. The respondents were asked to take a crisis (in which

they were involved) in mind when talking about the hot phase. For each contradiction, the separate aspects of the contradiction were discussed first, thereafter the respondents were asked if they experience a contradiction between these aspects.

Observations

Observation is a method in which the researcher observes and interprets events, people and actions to arrive at research findings (Van Thiel, 2007). Observations result in findings about factual behaviour and events, and are therefore less prone to socially desirable answers than interviews. However, contrary to interviews, it is not possible to find the motives behind certain behaviours or events through observations (Baarda & De Goede, 2006).

In addition to the eighteen interviews that are held, this research uses participant observation. These observations are an addition to the interviews, as they are able to expose the factual behaviours and events that occur in safety regions, while the interviews provide insight in the motives and perceptions of these behaviours and events.

Two participant observations were held at the safety regions (see appendix 3). In safety region 'Gelderland Midden' a CoPI training (in which crises are simulated) was observed. A member of the safety bureau introduced the researcher to the participants of the training. During the actual training in the CoPI container, the researcher was not physically present in the container but could watch the training on a screen in the conference room. After each round of training, the participants and the trainers came together in the conference room for an evaluation. During the training rounds, the researcher was able to speak with the trainers who were also observing the training on the screen.

Conducting a similar participant observation at safety region 'Gelderland Zuid' was not possible, because no such training exercises were scheduled during this research. Therefore, an observation was held at the emergency room of 'Gelderland Zuid'. This location was chosen, because it provides insight in how the organisations (ambulance, fire brigade and police) work together in the emergency room. Furthermore, it is the organisation where the first phase of a crisis is managed and coordinated. During this observation the people of the emergency room showed the researcher what happens when they receive an emergency call, and what systems and communication they use to coordinate the emergency response. Moreover, the researcher was able to have short conversations with employees of each of the emergency services that are part of the emergency room.

During both observations the researcher was able to make notes, which were fully transcribed within a few hours after the observation, to capture as many details as possible. In

both observations the central concepts were used to create a focus during the observations, these concepts will be operationalised in the next subsection.

4.3.2 Operationalisation

To find out to what extent the crisis managers of safety regions experience contradictions between resilience and network effectiveness and how they deal with these contradictions, the contradictions need to be operationalised. This section provides definitions of the contradicting aspects of resilience and network effectiveness, and describes how these aspects will be measured. The operationalisation of the concepts is specified in dimensions and indicators; these are displayed in table 8, 9 and 10 of the next section. The interview questions are directly linked to the indicator. Similarly, during the observations the researcher focused her observation by using these dimensions and indicators.

Variety- Limited size & composition

The first contradiction exists between variety and limited size and composition. Variety is viewed as an advantage for resilience, while it forms a disadvantage for network effectiveness. The requirements of *creating a varied team,* and *hiring people with a wide variety of experience* are important for resilience. Variety in experience provides a richer set of resources, which people can draw from during a crisis. Moreover, variety helps to create a more complete picture of what is going on. However, variety also means *variety in* culture. When there are different cultures in the network, these cultures might clash, which is one of the reasons why network effectiveness requires a *limited composition* (Vangen & Huxham, 2006; Provan & Lemaire, 2012). Consequently, variety and limited composition can be seen as two sides of the same coin and are measured simultaneously. This also means that the safety regions can either be varied, or limited in composition.

According to Weick and Sutcliffe (2007, p. 56) *variety in experience* consists of knowledge, and skills and abilities. Therefore, the variety in experience is measured by knowledge background and education, and skills and abilities. In addition to variety in experience, variety at the safety region level can be linked to *variety in culture*. The variety in culture is measured by asking respondents to describe the culture(s) of the safety region and by looking at differences between people from different organisations during the observations.

Furthermore, network effectiveness requires the size of the network to be limited, because the bigger the network, the lower the perceived effectiveness of the network is

(Turrini, et al., 2010). In the interviews the crisis managers are asked with how many organisations they work together, in order to get an idea of the size of the network. The size of the network is related to its composition, as an increase in size (the number of organisations that are involved in the network) would also imply an increase in the composition of the network (e.g. variation in culture).

Since the contradiction between *variety* and *limited composition & size* revolves around variety, this contradiction measured by examining the advantages and disadvantages of variety. Advantages of variety correspond to resilience, while disadvantages of variety might indicate a need for a limited size and composition to enhance network effectiveness. Furthermore, during the interviews there is attention for how crisis managers deal with the contradiction (in case they experience it). However, if they do not experience a contradiction, they are asked why they do not experience it. Table 8 provides an overview of the operationalisation of the contradiction between variety and limited size and composition.

Operationalisation Contradiction 1		
Concept	**Dimensions**	**Indicators**
Variety & *Limited composition* *(hot & cold)*	Experience	Variety in: - Knowledge/ education - Skills & Abilities
	Culture	Variety in Culture
Limited size *(hot & cold)*	Limited number of actors involved in network	Which & how much organisations work together
Contradiction: *Variety – Limited size & composition* *(hot & cold)*	Advantages of variety	- In experience - In culture
	Disadvantages of variety	- In experience - In culture - Size
	Contradiction	Experience contradiction
		If so; how do they deal with this
		If not; why not

Table 9: Variety- limited size and composition; operationalisation

Expert decision making – Coordination by central core agency

The second expected contradiction exists between migrating decision-making to *expertise*, which is required for resilience, and the network effectiveness requirement of coordination *by a central core agency*. On the one hand, the aspect of *deference to expertise* is important for resilience, as the person(s) with the best experience need(s) to make decisions during a crisis. Weick and Sutcliffe measure deference to expertise by using seven statements. To find out if

the crisis managers experience a contradiction, four of these statements seem suitable: 1) If something out of the ordinary happens, people know who has the expertise to respond. 2) It is generally easy to obtain expert assistance, when something comes up that we don't know how to handle. 3) In this organisation, the people most qualified to make decisions make them. 4) People in this organisation value expertise and experience over hierarchical rank. These statements are used to measure the deference to expertise.

On the other hand, the aspect of coordination by a central core agency is required for network effectiveness. Safety regions have a central administrative organisation and a central general board (with the mayors and representatives of involved organisations). When decisions are made by these core agencies integration and coordination are enhanced, which enables stricter control over the network and therewith improves its goal achievement (Provan & Milward, 1995). This coordination by a central agency is measured in the interviews and observations by examining how the decision-making process takes place, how central or decentral this process is, and to what extent there is control by a central authority.

This contradiction between decision-making migrating to experts and coordination by a central core agency is measured with interview questions on: the reasons for whether the contradiction is or is not experienced, and how the contradiction is dealt with. Table 9 provides an overview of the concepts, dimensions and indicators of the contradiction between deference to expertise and decision-making and control by a central core agency.

Operationalisation Contradiction 2		
Concept	**Dimensions**	**Indicators**
Deference to expertise (hot)	Decision-making migrates to the people with expertise	Know who has the expertise
		It is easy to obtain expertise assistance
		The people most qualified to make decisions make them
		Value expertise over hierarchical rank
Coordination by central core agency (hot & cold)	Decision-making central	How are decisions made Central- decentral (scale 1-5)
	Control central	Control from central authority
Contradiction: Deference to expertise - central core agency (hot & cold)	Contradiction	Experience contradiction
		If so; how deal with this
		If not; why not

Table 10; Contradiction Expert decision making – Coordination by central core agency; operationalisation

Flexibility - Rigidity

Thirdly, there is an expected contradiction between the flexibility of *creative thinking* and *conceptual slack*, and the rigidity of *formalisation* (of rules, meetings, written agenda and decision-making procedures), *accountability* and the *desire for hierarchy*. On the one hand, the resilience requirement *creative thinking* helps to deal with a crisis that is different than anticipated (Weick & Sutcliffe, 2007). Creative thinking is operationalised here as being able to come up with new ideas and solutions and apply them to crisis situations. Further, resilience requires allowing *conceptual slack*, this concept can be defined as 'a divergence in organisational members' analytical perspectives about the organisation's […] processes, a willingness to question what is happening rather than feign understanding, and greater usage of respectful interaction to accelerate and enrich the exchange of information' (Weick & Sutcliffe, 2007, p. 73). Thus, conceptual slack is measured by three dimensions: 1) diversity in analytical perspectives, 2) willingness to question what is happening, and 3) respectful interaction. The final dimension is measured by asking how people react to dissenting opinions and ideas, as asking about respect directly could lead to socially desirable answers.

On the other hand, network effectiveness requires a *formalisation of rules, meetings, written agenda and decision-making.* Formalisation helps to manage the behaviour of network members and to anticipate a crisis (Turrini, et al., 2010). This formalisation is measured with four dimensions: rules, meetings, written agenda and decision-making. Furthermore, the formalisation of processes and outcomes increases the *transparency* and enhances the *accountability to external stakeholders*. To measure this concept, interview questions are asked about: to whom and how much people report, to whom they are accountable, and to what extent accountability is formalised in rules. Moreover, the *desire for hierarchy* in the hot phase, is measured by a question on the importance of leadership regarding the hot and cold phase.

The contradiction between flexibility and rigidity, is measured with questions on: whether the contradiction is experienced, why (or why not) it is experienced, and how the contradiction is dealt with. Table 10 provides an overview of the operationalisation of this third contradiction.

Operationalisation Contradiction 3		
Concept	**Dimensions**	**indicators**
Creative thinking (hot & cold)	Come up with new ideas and solutions to deal with a crisis	New solutions New ideas
	Apply new ideas and solutions during a crisis	When applied To what extent applied
Conceptual slack (hot & cold)	Diversity in analytical perspectives (cold)	Analysis of a crisis, diverse analytical perspectives and views are applied.
	Willingness to question what is happening	People ask questions about what is happening - How - About what - How often
	Respectful interaction	Reaction to dissenting opinions and ideas
Formalisation (hot & cold)	Rules	Written and strict rules
	Meetings	Formal procedures during meeting
	Agenda	Agenda is planned
	Decision-making	Decisions made formally
Accountability to external stakeholders (hot & cold)	Transparency to external stakeholders	Reporting - To whom - How much
	Accountability	Accountability - To whom - Established in rules
Desire for hierarchy (hot)	Need for leadership during crisis	- Importance of leadership, compared hot and cold
Contradiction: flexibility- rigidity	Contradiction	- Experience a contradiction
		- If so, how deal with this
		- If not, why not

Table 11; Contradiction between Flexibility - Rigidity; operationalisation

4.3.3 Data analysis

The interviews and observations were transcribed verbatim. The transcripts are treated confidentially. The transcripts were then analysed with NVivo software. A codebook was used to perform the analysis. This codebook was initially based on the operationalisation of the concepts, and new codes were added during the coding process. For example, the code: 'desire for protocols' was added during the coding process, as it identified a new theme that

reoccurred in the interviews and observations. The codebook can be found in appendix 2. During the coding some notable points got the attention of the researcher, therefore these points were used as memos. For example, memos were taken if new ideas or problems were mentioned by the interviewees. After coding each interview and observation separately, the codes were combined into categories (mostly similar to the operationalisation) and these categories were analysed.

In the analysis the respondents are referred to by a letter and a number, for example, A4 for a respondent from safety region A 'Gelderland Zuid' and B4 for a respondent from safety region B 'Gelderland-Midden' (see appendix 3). In this way the quotations cannot be directly linked to the interviewees, which is important for confidentiality. Moreover, the interview quotations are translated from Dutch to English to allow comprehension by non-Dutch speakers. The original Dutch quotes can be requested from the researcher.

4.4 Reliability and validity

To be able to assess the quality of this research, its reliability and validity are discussed. Reliability is concerned with the replicability of the results, whereas validity focusses on the integrity of the conclusions that result from the research (Bryman, 2012, p. 46).

External reliability refers to the consistency of the measures, which means that if the same phenomenon is measured with the same instrument, it should lead to the same outcomes (Boeije, 2010). The replicability of this research is strengthened by the use of an interview guide and by documenting in detail the steps that are made in the case selection, data collection and data analysis (Yin, 2009). Furthermore, the internal reliability refers to the extent to which a measure is consistent in itself (Boeije, 2010). This is enhanced by the operationalisation of the concepts that are measured and by measuring the same concepts through both interviews and observations.

Regarding measurement validity, this research aims to use accurate measurements by carefully operationalizing the theoretical concepts. Furthermore, the validity is enhanced by the use of several theories for the operationalisation of the concepts (theoretical triangulation) (Van Thiel, 2007; Boeije, 2010). The external validity, or generalisability is difficult in qualitative research. As mentioned previously, it is hard to determine if the selected safety regions are representative for Dutch safety regions. However, Yin (2011, p. 100) argues that findings can also be generalisable to theory, which he calls *analytic generalisation*. This research generalises to theory by making a conceptual claim (about the contradictions

between resilience and network effectiveness) and showing how the findings of this study are likely to inform the theoretical constructs (here: resilience and network effectiveness). According to Yin (2011, p. 100): ‘this theory is applied to implicate situations in which similar events might occur’, which is similar to the replication logic of experiments.

The research strategy of this research, and its reliability and validity have been discussed. In the next chapter the results of this research are analysed.

5 Analysis

In this chapter the results of interviews and observations in the two safety regions are combined, since no significant differences between the regions were found, and differences are not the focus of this research. In case there are some differences between the regions, this is mentioned in the analysis. In the interviews the three possible contradictions were treated separately. For each contradiction questions about the cold phase were followed by questions about the hot phase. The respondents were asked to describe a crisis and to think of this crisis when answering the questions about the hot phase. During the observations, the researcher focused on similar concepts as in the interviews. For each contradiction the aspects of the contradiction are discussed first, thereafter the possible contradiction is examined. The chapter concludes with a conclusion on the contradictions.

5.1 Variety- limited size & composition

The first possible contradiction is between variety and limited size and composition. According to the resilience theory, *creating varied teams* and *hiring people with a variety of experience* helps to create a more complete picture of a crisis, and provides a richer set of resources to apply. However, a varied composition can create coordination problems, and the size of the network can affect its perceived effectiveness. Therefore, network effectiveness requires a *limiting the size and composition* of a network.

5.1.1 Variety or limited composition

The concepts variety (resilience) and limited composition (network effectiveness) are measured simultaneously, as they are two sides of the same coin. When there is a high variety, there is no limited composition and vice versa. Firstly, there can be a variety or a limited composition in terms of *experience.* Secondly, there can be a variety or a limited composition in terms of *culture.*

Experience

Variety in experience, is measured with interview questions about variety in education (knowledge background), and variety in skills and abilities. Firstly, the respondents that work multi-disciplinary during the cold phase, describe differences in their *educational backgrounds*. The people they work with have an education that is linked to their

organisational column and function, for example: public administration, nursing, or integrated security (Respondents A2, A4, A7 & B1). Although there is this variety of educational background, people that work as policy makers during the cold phase are mostly homogenous in their level of education, namely a Bachelor or Master Degree (Respondent A7 & B1). Secondly, people's *skills and abilities* differ regarding their function and organisational column. Training exercises address skills that are needed for a certain position, for example leadership skills (Respondents A5, B8 & B6). During the observation of an CoPI training the participants of each organisational column all had their own trainer. For example, a police officer got feedback from a police trainer that focusses on the skills and abilities that are needed for a policeman in an CoPI meeting. Although this implies that a variety of skills and abilities is trained, there was also a general trainer present. The general trainer paid attention to the whole co-operation process and standard skills and abilities. For example, everybody had to apply a decision-making structure. This might develop homogeneity of skills and abilities in the co-operation (observation CoPI training).

During the hot phase the people from the different organisations that are part of the safety region work together in an CoPI or an ROT, which means they all work multidisciplinary in the hot phase. Firstly, a few respondents describe a variety in the *educational background* that affect the co-operation (Respondents A3, B3, B4 & B8). One of them states that the ambulance personnel likes to analyse and think about a crisis because of their educational background (Bachelor) while for example the firemen prefer more direct action (Respondent B8). Furthermore, during the CoPI observation there was a misunderstanding about the meaning of 'code orange' that a firefighter mentioned. For him this code meant dry weather with a high chance of a fire, while a person of the GHOR interpreted this as a code from the weather authority (KNMI) which means that heavy weather and storms are coming (Respondent B4 & observation CoPI training). Secondly, respondents describe differences between *skills and abilities* of people from different organisations. For example, some people are daily confronted with (small) incidents or crises (e.g. firemen, policemen, ambulance personnel), while for others crises and incidents are not a part of their daily work (e.g. Municipality's population care) (Respondents B4 & B7). Moreover, people from the municipality are not used to working in a command structure (like the firemen or police), and they are used to extensive consultation before a decision is made, however, during a crisis there is no time for that (Respondents A2, B8, B7).

Culture

All respondents say that the organisations of the safety region have different cultures. Many of them describe one or more cultures. Firstly, the fire brigade is described as hierarchic (Respondents A3, A6, A7, B6, B7). Regarding this hierarchy, a respondent says the following: 'stripes, stars, spots, but for me it should be about what you are saying and not about your position' (Respondent A7). Furthermore, the fire brigade has many protocols (Respondents B8 & B3). For example, they have a special procedure on how to open a closed door, while the police usually just knock down a door (Respondent B3). Moreover, respondents describe the fire brigade as an organisation that is focused on action, as they need to go towards the danger while other organisations wait until the fire brigade says it is safe (Respondents A1, A3 & B2).

Secondly, the police organisation is also described as hierarchical (Respondents A7 & B7). Furthermore, two respondents mention the impact of the nationalisation of the police organisation (Respondents A4 & B2).

Thirdly, the ambulance service is described as softer and less masculine and macho, compared to the fire brigade and police (Respondents A6, A7, B6). Their focus is on the human side co-operation and on their patients (Respondent A1 & B3). Like the fire brigade, they also have many protocols (Respondents A6 & A7). The description of the culture of the GHOR (Regional Healthcare Organisation) is similar to the ambulance service culture.

Finally, the municipality's population care is described as non-hierarchical. Further, they are used to extensive deliberation, because there is time for this in the municipal organisation (Respondents B8, B4 & B7).

In sum, there is a variety in experience in the safety regions, which means that there is no limited composition. However, there is some homogeneity regarding the educational level in the cold phase, and regarding the training of standard skills and abilities. Moreover, there is a variety in culture between the different organisations that are part of the safety region.

5.1.2 Limited size

The size of the safety region is not limited. The interviewees mention the following organisations in their network in the cold phase: Police, Ambulance, RAV (Regional Ambulance Service), GHOR, (Regional Healthcare Organisation), Fire brigade, Marechaussee (military police), Safety Bureau, Water boards, Liander (electricity company), Vitens (water company), Municipality's people care, Hospitals, GPs, Defence organisation,

Prosecution, Province, AEGON (insurance company), ProRail (railway maintenance company), NS (railway company), Veolia (railway company), Rijkswaterstaat (department of public works) and the GGD (municipal health service). They have training exercises with these organisations and talk about policies and new plans with them. A respondent describes the co-operation in the cold phase as follows: "The law prescribes that they [Liander] have to report the biggest risks beyond their own terrain. We have to prepare for that, as our task is to protect citizens and the environment" (Respondent A6). At the safety bureau people from many organisations work together, some of them work full-time at the safety bureau, while others work part-time for the safety bureau and part-time for their own organisation (e.g. the police). The employees of the safety bureau are all responsible for a few of the account conversations that are held with the thirty organisations in the broader network of the safety region (Respondent A4).

The interviewees mention the same organisations they work with during the hot phase, plus some organisations that were involved in specific crises such as: the animal ambulance, LFTO (forensic research), Search (asbestos specialised company) and the owner of a building (Respondents A1, A3, A5, A6, A7, B4, B5, B6 & B8). Moreover, the core organisations of the safety region all have their own network of organisations (Respondents A4 & B8). 'Actually it is a network organisation of network organisations' (Respondent A4). Many respondents are positive about this network and about getting to know the people from the other organisations (Respondents A5, A7, A9, B3, B4 & B6). However, one respondent believes that the network has become so big, that too many people want a say in the CoPI meetings, which costs too much time (Respondent A2).

Overall, the safety region network has no limited size, they form a network with many organisations. These organisations are involved in both the cold and hot phase.

5.1.3 Contradiction: variety – limited size & composition

The following expectation was formulated: *Safety regions experience a contradiction between variety and limited size and composition*. In the previous sections it became clear that the resilience requirement of *variety* is met, whereas the network effectiveness requirements of *limited composition* and *limited size* are not met. Since the requirements of *variety* and *limited composition* are two sides of the same coin, they cannot be met simultaneously. However, the emphasis on variety (resilience) may come at the expense of the network effectiveness. Therefore, this subsection examines the advantages and disadvantages of variety.

Advantages of variety

People working in a multi-disciplinary team in the cold phase describe advantages of working with a variety of people (Respondents A1, A3, A4, A6, A7, B1, B3, B4 & B7). For example, in the emergency room you can hear your colleagues of another discipline speaking on the phone and see how you can help to address a crisis (Respondents A3 & B3). Further, a varied team gives you access to more expertise and a broader network (Respondent A4). Moreover, many respondents believe that it is helpful to see and to get to know each other at trainings and information meetings, because it helps understand each other's position and expertise (Respondents A1, A2, A3, A7, A9, B1 & B5).

All interviewees see advantages in working together with other organisations in the safety region, during the hot phase. Many of them describe how the co-operation broadens their view (Respondents A8, B4 & B6). For example, a respondent states: 'everybody has a certain tunnel vision, but if you combine five tunnel vision you have a broader vision' (Respondent B4). Another respondent states: 'A hundred people that can all do the same, do not improve your team, it is about using the diversity of expertise to create a great team' (Respondent B9).

Disadvantages of variety

A disadvantage of the variety and size of the safety region, during the cold phase, is that it can take much time before something is decided. Furthermore, it can be bureaucratic when people have trouble to receive support from their own organisation (Respondents A4, A8, B1, B5 & B6). Moreover, during the cold phase differences in interests between organisations are present (Respondents A8 & B4). For example, a respondent describes the interests of the municipality: 'the municipality can spend its money only once, we can choose to spend money on street lighting or on the safety region […] in the cold phase we also look at strategic choices' (Respondent A8).

During the hot phase, when people work in an ROT or COPI structure, some respondents experience that too many people want to say something while there is too little time for all of them to speak (Respondents A2, A4, A5, A7 & B4). This is especially conflicting during the first half hour of a crisis, police, firemen and ambulance service (GHOR) want short meetings, so they can go back to the field as soon as possible, while the municipality or the communication people may want to deliberate more on what to tell the citizenry (Respondents A1, A2 & A4). For example, one respondent states: 'The more different the people you work with, the more agreements you need, which makes the process

slower" (Respondent A4). This means that the leader CoPI and the leader ROT need to manage who can speak and for how long (Respondents A5, A7, A9 & B4).

Dealing with variety

The safety regions are varied, and many respondents see the advantages of this variety (Respondents A1, A2, A3, A4, A6, A7, A9, B1, B3, B4, B5 & B7). However, the disadvantages of the variety and size, that are mentioned, indicate that variety comes at cost of the effectiveness of the network (e.g. variety causes coordination problems) (Respondents A2, A4, A5, A7, A8, B1, B4, B5 & B6). Nevertheless, the safety regions seem to be able to deal with these disadvantages of variety. Many interviewees see training and education as a solution to deal with differences in culture and personalities (Respondents A1, A6, A7, A9, B2, B4, B5, B6, B8 & B9). For example, one respondent explains how knowing each other assists in understanding cultural differences: 'By working and training together we become more aware of the culture of others and we start to understand their position. This means for example that we can address someone's macho attitude and ask them to stop acting like that when it does not help the situation' (Respondent B5). Furthermore, during the CoPI training, special attention was given to the time span of the CoPI meetings and to the efficiency of the decision-making process (Observation CoPI training). Moreover, many respondents state that during the hot phase the differences tend to disappear because there is a common goal (Respondents A3, A4, A8, B1, B4 & B6). Additionally, they say that differences are solved by the hierarchy (Respondents: A2, A5, A6, B1, B3, B4, B6 & B8). One respondent describes this as follows: 'In the hot phase nothing disturbs, we have a common goal and of course the hierarchy counts' (Respondent B1). Further, in safety region A there are some ideas to combine the functions of people in the ROT or CoPI, in order to limit the number of people involved in the crisis meetings (Respondents A2 & A4). However, there are also a few respondents that only see advantages of variety, and believe that finding compromises is a part of life (Respondents A3, A6, A7, A9, B7 & B9).

In conclusion, safety regions are varied and not limited in size nor composition, therefore the resilience requirements overrule the effectiveness requirements on this aspect. Although the variety is highly valued, most respondents see disadvantages of variety. The disadvantages they mention indicate that the variety affects the effectiveness of the network. However, the safety regions have many solutions in place (e.g. training exercises) that ease the disadvantages of variety.

5.2 Expert decision making – coordination by central core agency

The second possible contradiction is between *migrating decision making to people with expertise* and *coordination by a central core agency*. Resilience requires deference to expertise, so the person with the best expertise is able to quickly make decisions during a crisis. However, decision-making and coordination by a central agency improves goal achievement, which is important for network effectiveness.

5.2.1 Expert decision making

In order to let the people with the best expertise decide during a crisis, crisis managers need to know who has the expertise, and they need to be able to reach these people. Firstly, it is clear who has a certain expertise, because tasks of people are clearly described (Respondents A1, A3, A7, A8, B1, B3, B4, B5, B7 & B8). If it is not clear who has the expertise, the crisis managers try to find an expert through their colleagues at the safety region or from their own discipline (Respondents A3, A8, B2, B3, B4 & B8). Moreover, through training, people know what the task and expertise of others is (Respondents A1, A2, A6 & B6). Finally, two respondents of safety region A say that before a crisis meeting starts it is a protocol to check if all the experts that are needed for the crisis are seated at the table (Respondent A4 & A7).

Secondly, many respondents say they are able to reach experts to solve issues that arise during a crisis (Respondents A1, A2, A3, A7, A8, B1, B3, B4, B5, B7 & B8). For example, during the crisis in Ede with mustard gas (a deceased chemistry teacher had stored mustard gas in his basement), they were able to find experts on the prohibited mustard gas, by reaching out to the network of the defence organisation (Respondent B2, B4, B8 & B9). ‘Through our liaison of defence we were able to reach these experts’ says one of the respondents involved in this crisis (Respondent B4).

Thirdly, for resilience it is important that decisions during the crisis can be made by these experts. The respondents say that the experts are not the ones who make the decisions, but the leader (of the operational team, CoPI or ROT) always makes the final decisions (Respondents A1, A3, A4, A7, A8, A9, B3, B4 & B5). One leader describes this as follows: ‘we talk about the solution together, it is team work, but eventually I will make the decision’ (Respondent A9). However, expertise is always taken seriously (Respondents A3, A9, B1 & B4), for example: ‘if the experts says we have to go left, it will not happen that we go right’ (Respondent B4). Moreover, experts are to some extent able to make their own decisions, because they have a mandate (Respondents A1, A2, A4, A7, A8, B5 & B6).

Finally, expertise and experience need to be more important than position and hierarchy, so decision-making during a crisis can migrate to the people with expertise. Although hierarchy can overrule expertise, the respondents believe that expertise and hierarchy are regarded as equally important (Respondents A1, A3, A4, A5, A7, A9, B1, B4, B8 & B9). They say for example, that even though leaders make the final decision, they always listen to the advice of experts and take that very serious (Respondents A1, A3, A4, A5, A6, A7, A9, B1, B4, B8 & B9). A respondent describes this as follows: 'If we knew how to deal with mustard gas ourselves, we wouldn't call the expert. They do not make the decision, but they are the expert and you always listen to them' (Respondent B4). If the experts do not have the mandate to make a decision, the person that is hierarchically in charge makes the final decision (Respondents A1, A2 & A7). Or when two experts disagree, the leader (of the CoPI or ROT) makes the final decision (Respondents A1, A3, A4, A7, A8, A9, B3, B4 & B5).

Overall, people know who has the expertise, and are able to reach these experts. Furthermore, expertise is highly regarded in the safety regions. Although decisions are not always made by the experts, when leaders need to make a decision they always listen to the advice of experts.

5.2.2 Coordination by a central core agency

Network effectiveness requires coordination and control by a core agency. To examine this, the decision making process and control by a central authority are considered.

Decision making

Firstly, decision making during the cold phase is centralised to the central authority, the safety bureau, its managing board and the general and executive board (Respondents A6, A7, A9, B1, B7 & B9). New policies and rules within the safety region are formulated by the safety bureau. On the one hand they implement new laws – for example, every safety region needs a crisis plan. On the other hand, new policies arise from the crisis management field - for example, the idea to improve the support to municipalities during the crisis aftermath (Respondents A4, A6, A7, A8, A9, B1, B3, B4, B5 & B9). Mostly, these new policies stem from the evaluation of a crisis or training (Respondents A6, A8, A9, B1, B4, B5, B7 & B9). These ideas for improvement of the crisis management are then developed in to a plan by the safety bureau, and then the safety managing board presents this plan to the general and executive board, who make the final decision (Respondents A6, A7, A9, B1, B4, B7 & B9).

Secondly, decision making during the hot phase, follows the hierarchic lines of the GRIP structure and is thus also centralised (Respondent A1, A2, A5, A7, A8, A9, B1, B4, B6, B7 B8 & B9, Observation CoPI training). All people have a position in the GRIP structure during a crisis. People from the mono-disciplines (e.g. ambulance service) usually have a task in the CoPI, while people that work at the safety bureau usually take a position in the ROT, which is a higher level (Respondents A2, A4, A9, B4, B6, B7 & B8). The GRIP structure means that the people in the CoPI (eventually the leader CoPI) make the decisions regarding the crisis management on the location of the crisis, while the ROT is responsible for the crisis management in the effect area (e.g. the region) of the crisis, and the mayor has the governmental responsibility (Respondents A4, A5, A8, A9, B1, B4, B6 & B9).

Control by central authority

There is control by the central authority of the safety bureau. Respondents name evaluation reports of crises and trainings as a way of control to improve the crisis management (Respondents A1, A2, A3, A4, A5, A6, A7, A8, A9, B2, B4, B5 B6, B8 & B9). One respondent describes this as follows: 'the management team tells what needs to happen in response to the evaluation […] it's about personal learning and organisational learning' (Respondent B8). In addition to the control by the central organisation, some other means of control are mentioned, like control by: managers, the inspection of safety and justice, the inspection of health, visitation commissions (from another safety region) and official certification after education or training (Respondents A1, A3, B2, B3, B4 & B5).

In summary, decision making is centralised. In the cold phase decision making takes place at the safety bureau and the boards, although it is influenced from both the operational and national level. During the hot phase the GRIP structure creates hierarchy in the decision-making process. Further, evaluation reports are a means of control for the safety bureau.

5.2.3 Contradiction: Expert decision making – coordination by central core agency

The second expected contradiction is: *Safety regions experience a contradiction between decision making migrating to expertise, and coordination by a central core agency.* Almost all interviewees say that deference to expertise and coordination by a central core agency can form a contradiction (Respondents A1, A2, A4, A5, A6, A7, A8, A9, B1, B2, B3, B4, B5, B6, B8 & B9). A respondent gives the following example of the contradiction: "For example, if you want to sound the air raid alarm, you have to ask for permission from a higher echelon,

but that takes time while there are hazardous substances in the air" (Respondent A4). Additionally, sometimes the operational leader, the leader CoPI or leader ROT needs to force a decision when people disagree (Respondent A4, B6 & B8). Moreover, two respondents name crises where the mayor eventually did not follow the advice of the experts (Respondents A2 & B9). For example, when a potential bomb was found at Arnhem Central Station, the bomb expert advised the mayor not to evacuate the station, because he believed the left luggage was not a bomb. However, the mayor decided it was better to be safe than sorry, just after the terrorist attacks in Brussels and he evacuated the station (Respondent B9).

However, sometimes the person in charge can follow the advice of an expert too closely, as became clear during the observation of the CoPI training (Observation CoPI training). In this training a crisis at a dance festival was simulated, many adversities happened during this festival. The organiser of the festival was also present in the CoPI meeting, and advised against cancelling the festival. The leader CoPI followed this advice, however, after the simulation, the trainer pointed out that the leader CoPI should focus on the importance of public safety, and should be aware of the commercial interests of the festival organisation.

Dealing with the contradiction between expertise and central core agency

In general, the respondents believe that the safety regions are perfectly able to deal with the contradiction between expertise and centralisation. Firstly, because people have a mandate for their expertise and are able to make decisions within this mandate (Respondents A1, A2, A7, A8, B5 & B6). One respondent describes this as follows: "You know who is responsible for a task, that's why you can delegate, and that's why hierarchy is very important during the hot phase" (Respondent B6). Secondly, they can deal with this contradiction because hierarchy is considered to be very important during a crisis. When experts disagree, the leader (CoPI or ROT) tries to find common ground for a decision, and he or she eventually has the mandate to take a decision if people still disagree (Respondents A4, A5, A7, A8, A9, B1, B4, B5 & B8). Finally, when there has been a contradiction between expertise and centralisation (for example when two people disagreed during a meeting) there is room to talk about this after the crisis or training, during the evaluation (Respondents A4, A5, A7 & B7).

In conclusion, the contradiction between deference to expertise and centralisation of decision making and control is familiar to almost all respondents. However, crisis managers are able to deal with the contradiction, since; 1) experts have a mandate, 2) hierarchy is considered very important during a crisis, 3) disagreements can be solved after a crisis, during the evaluation.

5.3 Flexibility - Rigidity

The final possible contradiction is between flexibility (creative thinking and conceptual slack) and rigidity (formalisation, accountability, and desire for hierarchy). Resilience requires flexibility of *creative thinking* and *conceptual slack* to deal with crises one cannot prepare for. This flexibility can be jeopardised by the rigidity that is required for network effectiveness. *Formalisation* and *accountability* enhance the network effectiveness. Moreover, crises are characterised by a *desire for hierarchy*, which can obstruct the flexibility of creative thinking and conceptual slack, as people may hide behind their leaders.

5.3.1 Flexibility

Resilience requires *creative thinking* and *conceptual slack.* To measure the flexibility of the safety region, these two requirements are examined.

Creative thinking

The respondents describe several new ideas to improve crisis management. Most of them mentioned that new ideas come from trainings and evaluations of crises (Respondents A1, A2, A3, A7, A8, A9, B3, B4, B8 & B9). A few respondents name new ideas about the structure of the meetings, resulting from evaluations. For example, helping mayors to fulfil their role of chairman during a crisis (Respondent A4, A8 & A9) and reducing the number of people that are involved in a meeting (Respondents A2, A4 & A8). Notably, these people are all from safety region A, so the structure seems to be a topic in this region. Interviewees of safety region B mention new ideas regarding new technology, such as a new computer information system (Respondents B2 & B5) and using drones for the police and fire brigade (Respondents B9 & B2).

Overall, the safety regions are open for new ideas from employees, new trends and developments (Respondents A1, A2, A3, A4, A5, B1, B4 &B5). One respondent describes this as follows: ‘I have the chance to propose new ideas […] they really listen to these ideas’ (respondent A3). However, sometimes new ideas cannot be applied because the safety regions are not able to change national legislation, or the change is slow, or the new idea costs too much money, or simply because it was not such a good idea after all (Respondents A2, A4, A6, B2, B5, B8 & B9). Three respondents from safety region B mention that there is a problem with the capacity of the police to deliver a coordinator for the emergency room. In a

few evaluations this problem became clear, however it has not yet been solved, probably because of the nationalisation of the police organisation (Respondents B3, B6 & B9).

Conceptual slack

Conceptual slack is measured by: applying many different perspectives, the willingness to question what happened, and respect for dissenting opinions and ideas. Firstly, the safety regions use many different perspectives to evaluate crises and trainings. During an evaluation there is attention for the following elements: 1) was there a good co-operation? 2) was there enough room for everybody to propose ideas? 3) where can we improve? 4) did we observe our norms and values? (Respondents A9 & B5). This first evaluation takes place directly after the crisis with the crisis team and if needed, or in case of a GRIP 2 crisis (cf. chapter B3), it is followed by a more extensive multi evaluation (Respondent A1, A2, A4, A8, B2 & B4).

Secondly, people can make a request to evaluate a specific aspect of the crisis (Respondent A4). During the evaluations people that were involved are able to question what happened, and the safety regions focus on what lessons can be learned (Respondents A3, A4, A9, B2, B4 & B9).

Thirdly, there is respect for dissenting opinions and ideas during the cold phase, as there is no time for this during the hot phase. Overall, the respondents say that there is enough room to voice dissenting opinions, and that this helps the organisation to learn (Respondents A1, A2, A4, A5, A6, A8, A9, B1, B3, B4, B5, B8 & B9). One respondent describes this as follows: 'We try to speak up about those things [dissenting opinions] and to learn from it, so people feel free to speak' (Respondent A9). However, it is still hard for people to receive feedback on their own functioning (Respondents A4, A6, B2, B6 & B8). Although there is much attention for this (Respondent A4, A8 & B2), it can still be improved. For example, one respondent says: 'you have to consider the time pressure when you give feedback to a colleague' (Respondent B6). Another way to improve this is by perceiving feedback as a learning opportunity (Respondents A4, A6, B2, B6 & B8).

In summary, the safety regions can be considered flexible. Safety regions are open for *creative thinking* by listening to new ideas, however, sometimes these ideas are not implemented, or the implementation takes a long time. Furthermore, they *allow conceptual slack* as they pay attention to different perspectives and aspects of a crisis, and there is respect for dissenting ideas and opinions. However, the way people give and receive feedback needs continuous attention.

5.3.2 Rigidity

Network effectiveness requires *formalisation* and *accountability.* Moreover, in crises there tends to be a *desire for hierarchy.* To measure this rigidity, these aspects are examined.

Formalisation

The rules, meetings, agenda and decision-making procedures are in the safety regions are highly formalised. Firstly, the respondents mention that there are many rules and protocols, especially in the mono-disciplines, such as the fire brigade (Respondents A1, A2, A3, A4, A5, A6, A7, A8, A9, B2, B3, B4, B6, B7, B8 & B9). For example, the line protocol, when firemen are not allowed to cross a line before they clean and take off their suits (Respondents A9 & A6) Another example is a special computer system from the emergency room, where the information from an emergency call is entered in a standardised way (Observation emergency room). However, the interviewees believe that the protocols and rules cannot cover all situations and that you should be able to deviate from the protocols (Respondents A2, A4, A5, A7, A8, B2, B3, B4, B6 & B7). The protocols are created for a reason, they support the thinking process and provide support during a crisis (Respondents A2, A3, A7, B6 & B9). Thus, the rules and protocols are formal but not absolute.

Secondly, the meetings and agenda are formal. The respondents describe the meetings of the ROT and CoPI during a crisis as formal, because they usually have an agenda structure, themes, a time limit (15 to 20 minutes), and defined roles (Respondents A7, A8, A9, B1 & B5). The people that are involved in these meetings believe that this structure is important because it creates tranquillity and helps to think about all aspects (Respondents A7, A8 &B1).

Finally, the decision-making process is also formal. The respondents mention the use of the BOB-structure (in Dutch: Beeld Oordeel Besluitvorming). The BOB-structure means that during a crisis meeting (CoPI or ROT) there are defined themes, for each theme the participants try to create an image of the situation, then they will judge how to deal with the situation, concluding with the final decision on the theme (Respondents A7, A9, B1, B4 & B5).

Accountability

Accountability is measured by considering to whom people report and how much. Moreover, it is examined to whom people are accountable, how this accountability takes place, and if it is formalised. Firstly, respondents usually report to their manager (Respondents A2, A3, A4, A7 & B3). Furthermore, people write down what they do during a crisis in a logbook, after a

crisis this can help to see what happened or what went wrong during a crisis (Respondents A3, A7, B1, B3 & B9; Observation emergency room; Observation CoPI training). After each large crisis there is an evaluation, mostly resulting in a crisis report (Respondents A4, A6, A7, B4, B4, B6 & B9). Sometimes other people, for example the mayor, or the director, request to also evaluate a smaller crisis (Respondents A4 & B5). Moreover, the inspection of public order safety can ask for clarification on what happened during a crisis (Respondent B9). Evaluations especially serve the educational purpose for the safety region to learn, therefore some sensitive things are not shared with the public, in the final report (Respondent A7).

The respondents see the evaluation reports as a way of being held accountable (Respondents A1, A2, A3, A4, A5, A6, A7, A8, A9, B2, B4, B5, B6, B8 & B9). This is officially established in the rule that every GRIP 2 crisis, or higher, needs to be formally evaluated. In practice all GRIP incidents are evaluated (Respondents A4, A7, B4, B5, B6 & B9). A few respondents describe how they sometimes disagree with the conclusions of an evaluation report (Respondents A2, A3 & A9). One of them describes this as follows: 'The evaluator has six weeks to analyse how the crisis should have been managed, but the commanding officer only has 20 seconds' (Respondent A3). Furthermore, some respondents mention that the media follows closely what happened during crises, which can also be seen as a way of being held accountable (Respondents A4, A9, B2, B4, B5 & B9). Regarding the media one respondent says: 'There is also the media and the social media, everything you do is visible' (Respondent A4).

Desire for hierarchy

Crises create a strong desire for hierarchy, during a chaos situation people seek the comfort of somebody who can take charge, or possibly someone to be held accountable. Many respondents state that leadership and hierarchy are important, especially during a crisis situation (Respondents A2, A4, A6, A9, B1, B3, B6 & B7). For example, a respondent describes the desire for hierarchy as follows: 'Especially when there is tension, noise and bad weather, a communication problem can arise easily, so you need to communicate brief and you need clear responsibilities and tasks, that's why hierarchy is important' (Respondent B6). Another respondent describes the need for structure in the crisis chaos as follows: 'during a crisis you are very much in need of hierarchy, and that it is very clear who does what' (Respondent A4).

In conclusion, there is rigidity, as safety regions have a *formalisation* of rules and protocols, the structure of meetings and the agenda of meetings is formal, and the decision-making in these meetings is formalised. In addition, people are *accountable* to their managers, as they write down what they do in logbooks, which can be used during evaluations. The evaluations and the evaluation reports are seen as a way to be held accountable, although sometimes people disagree with the outcomes. People also feel that the media closely watches what they are doing during a crisis and can hold them accountable for that. Moreover, there is a *desire for hierarchy* during crises, as hierarchy makes clear who is responsible for each task, and it creates structure during the chaos of a crisis.

5.3.3 Contradiction: flexibility - rigidity

The final expectation is: *Safety regions experience a contradiction between: flexibility (creative thinking, and allowing conceptual slack), and rigidity (formalisation, accountability and a desire for hierarchy).* Firstly, many respondents see a contradiction, because on the one hand there are many formal protocols, while on the other hand all crises are different, which sometimes asks for flexibility to deviate from protocols (Respondents A3, A5, A8, A9, B2, B3, B4, B5, B6, B8 & B9, Observation CoPI training). This is described by a respondent as follows: 'I have read all the plans and protocols, however, we never use them during a crisis, for me that marks the contradiction' (Respondent B4). Another respondent says 'protocols are beautiful stories, but they are rigid. A crisis is never rigid and always dynamic' (Respondent B5). However, many respondents feel that the choice between following the protocols and deviating from them is less present at the level of the ROT and management (Respondents A4, A6, A7, A9, B5 & B8). An ROT leader describes this as follows: 'for us there is less time pressure, but a policeman has to decide between life or death to save someone, that's an acute decision he has to make in three seconds, while I can take several minutes to make a decision' (Respondent A9).

Secondly, many respondents believe accountability may hinder people to apply creative solutions to crises (Respondent A3, A4, A5, A6, A7, A9, B2, B3, B5, B7, B8 & B9). However, a few respondents say that they never felt that accountability withheld them to deviate from the rules (Respondent A8, B1, B3 & B7). Some respondents mention that people can cling to the procedures to make sure they are not blamed when something goes wrong (Respondents A4, A5, B2, B8 & B9). The media play a role in the fear for being held accountable when deviating from the rules (Respondents A4, B2 & B9). Furthermore, it is suggested that people can be hesitant to deviate from protocols if they are uncomfortable in

their job (cf. conceptual slack). One respondent says: ‘In case I am experiencing some critique on my functioning, and I have the choice to deviate from the protocols, it is logic that I keep following the protocols, to avoid the risk of accountability’ (Respondent B2). Another respondent believes that people have different personality traits, and therefore some might fear deviating from the protocols, while others are more comfortable doing so (Respondent B8).

Thirdly, during a crisis there is an increased need for structure and clarity which is provided by a hierarchy (Respondent A3, A5, A6, A7, A8, B1, B5, B6 & B8). Deviating from this hierarchical structure and orders can create chaos, because people are expecting that the hierarchy is followed (Respondents A6, A7, A8, B6 & B8). One respondent describes this as follows ‘During a crisis there is no time for haziness, the structure needs to be clear, you should know what you can expect from each other, that’s why we have different colours on our uniforms so I can discern from afar a commander and a head officer’ (Respondent B6).

Dealing with the contradiction between flexibility and rigidity

Crisis managers deal with the contradiction between flexibility and rigidity by writing down what they do and why, so they can motivate why they deviate from the rules (Respondents A3, A8, B2, 2,3, B8 & B9). Further, deviating from the rules and protocols is mostly done on the safe side (Respondents A3, A5, A6, B3, B5 & B6). For example, people of the emergency room sometimes deviate from the rules by sending more fire engines then the protocol prescribes (Respondents A3 & B3, observation emergency room), and firemen only deviate from the rules if that does not endanger the safety of their colleagues (Respondent A6 & B6). Moreover, during a crisis situation people tend to follow the rules, because they are familiar with them (Respondents A5, A7, B4, B5, B6, B8 & B9). For example, during the CoPI training there was a case of a festival, where festival goers got overheated and were advised to cool down. However, the rule was that they were not allowed to enter the river, and the crisis team did not think of changing that rule. In the evaluation of the trainer said that the CoPI should have decided to break this rule so people could find a way to cool down (observation CoPI training).

Flexibility is often overruled by rigidity, because the chaos that arises form crises creates a demand for structure and clarity. Firstly, hierarchy can provide this structure and clarity (Respondent A3, A5, A6, A7, A8, B1, B5, B6 & B8). If people get confused between following the rules or to deviating from the rules, they can look for hierarchy to solve this contradiction. This thus indeed indicates the *desire for hierarchy.* Moreover, the hierarchy is

established in rules, which means that deviating from the hierarchy is deviating from the rules.

Secondly, there seems to be a 'desire for protocols' during a crisis. Protocols provide guidance and structure that are needed in a crisis (Respondents A7, B5, B6, B8 & B9). People expect that the protocols and rules are followed, when their leader decides to deviate from that, he has to communicate that very clearly, which takes time and can lead to communication problems (Respondents A6, A7, B4, B5, B6, B8 & B9). Moreover, the protocols and rules are there for a reason, because they worked in the past. This means that it is often wiser to follow the protocols and rules, than to deviate from them (Respondents A6, A7, B4, B6, B8 & B9). One respondent argues that the fire brigade is mostly structured by hierarchy, while the ambulance service and GHOR are structured with protocols, which provide them a sort of mandate to act during a crisis (Respondent A6).

To conclude, there is a contradiction between flexibility and rigidity. Firstly, the formalised rules and protocols, can withheld people to apply creative solutions to crises. Secondly, people can become reluctant to deviate from the rules because they can be held accountable for it afterwards. How comfortable they feel in the team and their personality can play a role in their concern for being held accountable. Thirdly, people expect and desire hierarchy during a crisis. When this hierarchy is not followed, there is a lack of structure and clarity. Therefore, deviating from the hierarchy by creative thinking or conceptual slack is hard. However, crisis managers deal with the contradiction between flexibility and rigidity by writing down what they do and what choices they make during a crisis. If they deviate from the rules, this is mostly done on the safe side. Moreover, rigidity mostly prevails over flexibility because a crisis demands structure and clarity, which can be provided by hierarchy and protocols.

5.4 Conclusion on the analysis

In this analysis the three contradictions and the aspects they consist of, have been discussed. The first expectation was: *safety regions experience a contradiction between variety and limited size and composition.* Within safety regions there is much variety, especially in culture. This means that their composition is not limited, and neither is their size. Thus, there is a focus on the resilience requirement of variety. Variety is highly valued by the safety regions, and many respondents see advantages of this variety. However, the disadvantages of

variety (e.g. too many people want to voice their opinion during a crisis) indicate that variety can come at cost of the effectiveness of the network. Nevertheless, crisis managers are able to deal with this contradiction, for example through trainings people get to know each other and are better able to understand each other.

The second expectation was: *safety regions experience a contradiction between decision making migrating to expertise, and coordination by a central core agency*. Although expertise is highly regarded, the person in charge is the one who eventually makes the decisions. Furthermore, during the cold phase, decision-making and coordination are centralised in the safety bureau and board. During the hot phase, central coordination is even more important and follows the GRIP structure. Control takes place after a crisis through evaluation reports. Although the contradiction is felt by almost all respondents, they are able to deal with it. First, because they have mandates to make decisions regarding their field of expertise. Moreover, in the hot phase the hierarchy of the GRIP structure is highly regarded, and thus people will follow the orders. If, however, a disagreement appears, this is usually solved later in the evaluation of the crisis or training.

The final expectation was: *safety regions experience a contradiction between flexibility (creative thinking and allowing conceptual slack) and rigidity (formalisation, accountability, and a desire for hierarchy)*. On the one hand, there is room for creativity and respect for dissenting ideas and opinions (flexibility). On the other hand, there are many rules and protocols and a formal agenda and decision-making structure. Regarding accountability, people have to write down what they do and evaluation reports can hold them accountable, as well as the media (rigidity). Further, there is a desire for hierarchy and protocols during crises, as they create structure and clarity during a crisis. Thus, the safety regions are both flexible and rigid. In line with this there is a contradiction between this flexibility and rigidity. Firstly, crises require flexibility, which sometimes asks for deviating from the protocols. Secondly, accountability can withhold people from deviating from the rules, especially when they do not feel comfortable in their job. Finally, the desire for hierarchy conflicts with flexible solutions to a crisis, as people feel comfortable with and expect the hierarchy to be in place. However, people are able to deal with the contradiction between flexibility and rigidity by deviating from the rules on the safe side (only taking extra precautions, and not taking risks). Moreover, because of the desire for hierarchy and protocols, rigidity is mostly preferred over flexibility, during a crisis.

6 Conclusion and Discussion

6.1 Conclusion

Resilience and networks are both considered promising solutions for modern crisis management. This research combined these two concepts and focused on the possible contradictions between their requirements. Contradictions between resilience and network effectiveness requirements can obstruct effective crisis management. For example, a contradiction might confuse crisis managers on how to act, which slows down the crisis management.

Considering the effect these contradictions can have on crisis management, this research answered the following questions: *To what extent are the contradictions between resilience and network effectiveness found in the practice of Dutch safety regions? And if these contradictions are found, how do crisis managers deal with these contradictions?* To answer these questions, the work of Weick and Sutcliffe (2007) was used to identify the requirements for resilience, which safety regions need to meet, while the work of Provan and Lemaire (2012) and Turrini et al. (2010) formed the basis to formulate the requirements for network effectiveness. Building upon the research of Resodihardjo, Van Genugten and Ruiter (n.d.), these requirements were combined, which resulted in matching and contradicting requirements.

Based on the literature, three possible contradictions between resilience and network effectiveness requirements were identified: Firstly, the contradiction between: *variety - limited size and composition*. Resilience requires the creation of varied teams and hiring people with a variety of experience, as this enhances the range of resources to apply, and allows crisis managers to form a more complete picture of the events. In contrast, network effectiveness requires networks to limit their size and composition, because variety impedes coordination, communication and conflict management (e.g. a culture clash). Hence, when a safety region is varied, network effectiveness might suffer, or when it is limited in size and composition, resilience might suffer. The second possible contradiction is between: *decision making migrating to expertise – coordination by a central core agency.* Resilience requires that decisions are made by the person with the expertise for the problem at hand, regardless of their position in the hierarchy. In contrast, network effectiveness requires decision making and coordination by a central core agency, as this enables stricter control and therefore improves the network's goal achievement. The third possible contradiction is between

flexibility – rigidity. Resilience requires the flexibility of creative thinking and allowing conceptual slack, so the safety region is able to deal with unanticipated crises. In contrast, network effectiveness requires the rigidity of formalisation and accountability, as this helps to manage the network members.

In a case study of two safety regions, interviews and observations were conducted to examine whether these contradictions exist in the practice of safety regions and if so, how they are dealt with. Based on this research, the following statements can be made.

Firstly, since the requirements of *variety* and *limited composition* can be seen as two sides of the same coin, their contradiction was measured by examining the advantages and disadvantages of variety. Crisis managers see many advantages of variety, however, they also mention disadvantages which indicate that the focus on variety may hinder network effectiveness. For example, during a crisis, decision-making needs to be quick, but it is slowed down by the number of people who want to voice their opinion during a meeting. However, crisis managers have ways to deal with the disadvantages of variety. For example, during training exercises people with different backgrounds get to know each other, which creates more understanding for the differences.

Secondly, people working in safety regions do experience the contradiction between *decision-making migrating to expertise – coordination by a central core agency*. It is not experts, but the people in charge according to hierarchy that make the final decision. This focus on the network requirement can come at the expense of resilience. However, safety regions are able to deal with this contradiction, because crisis managers usually have the authority (mandate) over their expertise. Furthermore, people in the hierarchy highly regard the advice of experts and mostly follow the advice. Moreover, when there is a disagreement between the expert(s) and hierarchy, this is usually solved during the evaluation, which helps to understand each other and prevents that the disagreement reoccurs in future crises.

Thirdly, the contradiction between *flexibility* and *rigidity* also occurs in safety regions. On the one hand, crises are always different than anticipated, which requires the flexibility of creative thinking and allowing conceptual slack. Within the safety regions there is room for creative ideas and there is respect for dissenting opinions. On the other hand, the rigidity of formalisation and accountability help to find structure in the chaos of a crisis. Moreover, crises create a desire for hierarchy and protocols, as this provides structure and clarity in the chaos of a crisis. Consequently, rigidity often prevails over flexibility. However, crisis managers are able to deal with this contradiction in two ways. First they deviate from the rules while still playing it safe (e.g. sending more fire engines than the protocol prescribes).

Second, they write down the decisions and steps taken during a crisis, so they can be held accountable.

To conclude on the research question, all three contradictions between resilience and network effectiveness requirements are found in the practice of the safety regions. However, crisis managers are able to deal with these contradictions. For example, they are able to deal with the disadvantages of variety because trainings help them to understand each other. The next section provides insight in the theoretical implications of these findings, provides recommendations for the safety regions and reflects on the used methods.

6.2 Discussion

6.2.1 Theoretical implications

The three contradictions between resilience and network effectiveness requirements that previously only existed in theory (cf. Resodihardjo, Van Genugten & Ruiter, (n.d.)), are found in the practice of safety regions. Although these contradictions are experienced, safety regions employ many ways to deal with them, as is described in the previous section. However, the contradictions can hinder effective crisis management when, for example network effectiveness predominates resilience, or vice versa.

Regarding the first contradiction (*variety – limited size and composition*), the safety regions show a variety in experience and culture. Crisis managers mainly see the advantages of variety. However, the experienced disadvantages of variety indicate that variety can come at the expense of network effectiveness. For example, during a crisis meeting, people from many different organisations are involved and want a say, while there is only limited time. Although, variety seems inherent to crisis networks, variety can affect network effectiveness, as it brings about challenges for coordination, communication and conflict management. Therefore, paying attention to network effectiveness by addressing these challenges is important. Safety regions already use trainings that help to improve communication and reduce conflicts because people get to know and understand each other.

Regarding to the other two contradictions (*decision-making migrating to expertise – coordination by a central core agency*, and *flexibility – rigidity)* attention is paid to both the resilience and network effectiveness requirements, although there seems to be a tendency towards the requirements of network effectiveness. Expertise and a flexible approach (creative thinking and conceptual slack) are valued by the safety regions. However, during crises there is a need for structure and clarity, which can be provided by formalisation and

accountability. Moreover, in line with the findings of Waugh and Streib (2006), a desire for hierarchy during crises, is experienced in the safety regions. In addition to the desire for hierarchy, this research finds a desire for protocols. There is a tendency to follow the protocols during a crisis, for two reasons. Firstly, during a crisis people expect that the protocols are followed, therefore, deviating from the protocols can create more chaos and is thus often undesirable. Secondly, because of these expectations, deviating from the protocols needs to be communicated very clearly, which costs extra time, while time is scarce in a crisis.

In general, this indicates that the network effectiveness requirements slightly dominate the resilience requirements, on the second and third contradiction. Most likely this is due to the need for structure and clarity, which seems inherent to crises management. Nevertheless, neglecting the resilience requirements of expertise and flexibility should be prevented. People should be aware that every crisis situation is different, which means that mistakes cannot always be prevented and a flexible approach is needed. In a crisis one should be aware of *danger*, but also recognise the *opportunity.* Whereas the network effectiveness requirements of formalisation, accountability and hierarchy focus on *danger*, the resilience requirements of expertise and flexibility (creativity and conceptual slack) help to recognise the *opportunity.*

6.2.2 Practical implications

In the safety regions, resilience predominates network effectiveness regarding the first contradiction. To address the disadvantages of variety, safety regions can try to manage the number of people involved in a crisis meeting. For example, by combining functions of people who are involved in crisis meetings. For example, the people who are responsible for crisis communication can be linked to the CoPI leader, with whom they can discuss what is communicated to the public. In this way, they do not need to be involved in the first crisis meetings, which can save time and thus enhances network effectiveness. Further, safety regions already apply training exercises that help them to deal with the disadvantages of variety, since people get to know and understand each other during trainings. Therefore, it is recommended that they continue to pay attention to the understanding of (cultural) differences during these trainings.

Regarding the second and third contradiction, network effectiveness prevails over resilience. To take better care of resilience, safety regions are recommended to stress the importance of expertise, creative thinking and conceptual slack. For example, they can improve the way people give and receive feedback in evaluations. In doing so, people will

feel more comfortable (i.e. conceptual slack), and the safety regions are able to focus more on the learning aspects, rather than on the accountability aspects of evaluations.

Generally, when safety regions make crisis managers more aware of the contradictions between resilience and network effectiveness, they will be able to make conscious choices in crisis situations. Now these choices are made less consciously, and can be dependent on personality, or on how comfortable people feel in their job (e.g. whether or not they deviate from the rules). Furthermore, awareness of these contradictions can improve the (number of) ways to deal with the contradictions.

6.2.3 Methodological implications

The case study method proved suitable for this initial and exploratory study of the contradictions between resilience and network effectiveness requirements in safety regions. The case study did justice to the specific context of safety regions that are surrounded by many organisations that can be involved in the crisis management. Further, the case study was useful for providing insights into the qualitative elements, like people's perceptions and experiences, which helped to answer the research question. In the interviews the crisis managers were able to elaborate on personal experiences and perceptions on crisis situations. The observations provided a better insight in how crisis meetings look like, and how people behave in such situations. The observation setting was not disturbed by the presence of the researcher, as the participants were observed through a camera and because they already were observed by their trainers. Although, the training tried to simulate a real crisis meeting as realistic as possible, this situation is of course different from a real crisis, in which there might be more pressure, but in which they are not directly observed by trainers.

Furthermore, through interviews and observations certain nuances became clear that a survey would not have covered. For example, the researcher initially formulated research questions which sometimes used a scale (1-5). People were asked how often new ideas were implemented –ranging from 1) always to 5) never. The scales were quickly eliminated, as the respondents answered that the problem with new ideas was not how often they were implemented, but the amount of time it took to implement them was problematic. These answers would not have been found when a survey design (with strict answer options) was used. However, an online survey would have possibly given the respondents an increased feeling of anonymity. Therefore, it might be less prone to socially desirable answers, and provide a better insight in sensitive subjects and crises. Nevertheless, in this research many respondents did mention sensitive subjects which were not included for confidentiality

reasons. Therefore, the researcher believes that they felt comfortable enough during the interviews to talk about sensitive subjects.

In qualitative research, the analysis of the results depends on the interpretation of the researcher (Boeije, 2010). Therefore, this research tries to be transparent about the interpretations, for example by supporting interpretations with quotes of the respondents. However, sometimes it was hard to interpret the results. For example, most respondents stated that they experienced a contradiction, *but* that the safety region was able to deal with this contradiction. Other respondents stated they did not experience a contradiction, *because* the safety region was able to deal with this contradiction. In this research both were interpreted as the recognition of the contradiction.

To conclude, this case study has been an initial step to examine the combination of resilience and network effectiveness requirements in crisis management. Further research can take a different approach, for example by using storytelling or shadowing techniques, psychological aspects of how people deal with the contradictions can become clear. Some respondents, for example, personality traits could indicate the preparedness to deviate from the rules. Similarly, a comparative case study, which incorporates different countries, can provide insight in the possible advantages (e.g. regular training, trust, communication) of a permanent and formal crisis network (the Dutch safety regions), compared to other crisis management organisations. In general, future research can examine what the effects of the contradictions, that are found in this research, are on the effectiveness of crisis management. This research indicates that in particular, the predomination of resilience requirements over network effectiveness requirements (first contradiction), and the prevalence of network effectiveness requirements over resilience requirements (second and third contradiction) could affect crisis management.

7 Literature

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8 Appendices

Appendix 1 – Interview guide

Introductie:
Bedankt dat u aan mijn onderzoek wil meewerken.
Vindt u het goed dat ik het interview opneem om het later te kunnen uitwerken?

In het interview wil ik graag drie thema's bespreken:
1. De samenwerking binnen de veiligheidsregio.
2. Centralisering & vrijheid om beslissingen te nemen.
3. Creativiteit & regels.

Per thema zullen we eerst de koude fase bespreken en daarna de warme fase.
Wanneer de vraag niet duidelijk is of wanneer u liever geen antwoord geeft, kunt u dat aangeven.

1. Zou u een crisissituatie kunnen beschrijven waarbij u betrokken was? (Een situatie die zelden voorkomt en buiten de dagelijkse routine valt).
- Wat was uw rol bij deze crisis?

Wanneer we het over de warme fase hebben kunt u dan deze crisis in gedachten nemen?

Samenwerking *(variety- limited size & composition)*

Size & composition – variëteit
Eerst gaan we het hebben over de **koude fase** (training, voorbereiding)
1. Met welke organisaties wordt er samengewerkt in de **veiligheidsregio** (**koude fase**)?
2. Hoe is de samenstelling van uw **team** wat betreft
    a. Achtergrond/ opleiding (knowledge)
    b. Ervaring & vaardigheden (skills & abilities)

Tegenstelling?
3. In hoeverre ziet u (in de koude fase) voordelen van samenwerken met een gevarieerd team?
4. In hoeverre ziet u nadelen van samenwerken met een gevarieerd team?
5. In hoeverre ervaart u een tegenstelling tussen deze voor en nadelen?
    a. Ja, hoe omgegaan? b. Nee, waarom niet?

Size & composition – variëteit
Kunt u nu de crisis die u net omschreef in gedachten nemen voor de **warme fase?**
1. Met welke organisaties werd er samengewerkt?
2. Hoe was de samenstelling van organisaties wat betreft:
    a. Achtergrond/ opleiding (knowledge)
    b. Ervaring & vaardigheden (skills & abilities)
    c. Cultuur

Tegenstelling?
3. In hoeverre ziet u voordelen van de samenwerking met verschillende organisaties (in crisis)?
4. In hoeverre ziet u nadelen van samenwerken met verschillende organisaties (in de crisis)?
5. In hoeverre ervaart u een tegenstelling tussen deze voor en nadelen (in de crisis)?

a. Ja, hoe omgegaan? b. Nee, waarom niet?

Centralisering en vrijheid om beslissingen te nemen (*Expertise decision making – Coordination by central core agency)*

Expertise

1. Wanneer zich een crisis zou voor doen, in hoeverre is voor u dan duidelijk wie de expertise (kennis en ervaring) hebben om dit op te lossen?
2. In hoeverre zijn deze personen te bereiken?
3. Worden beslissingen ook door deze persoon genomen?
4. Wat is binnen de veiligheidsregio belangrijker:

Expertise en ervaring Positie en hiërarchie

1 2 3 4 5

Centralisering

5. Hoe wordt een beslissing genomen tijdens de **koude fase**? (door wie?)
6. Hoe ervaart u de besluitvorming tijdens de **koude fase**?

Decentraal Centraal

1 2 3 4 5

7. In hoeverre is er controle vanuit centraal gezag? (wie/ welke organisatie? welke mate?)

Tegenstelling?

8. In hoeverre ervaart u een tegenstelling tussen waar we het net over hadden: (centraal gezag en de mogelijkheid voor mensen met de juiste expertise, om beslissingen te nemen)?
    a. Ja, hoe wordt daarmee omgegaan? b. Nee, waarom niet?

Kunt u weer de crisis die u heeft omschreven in gedachten nemen? (**warme fase**)

Expertise

1. Was het tijdens de crisis duidelijk wie de expertise had om de crisis op te lossen?
2. Waren deze personen te bereiken
3. Namen deze personen met expertise ook de beslissingen?
4. Wat was tijdens de crisis belangrijker:

Expertise & ervaring Positie & hiërarchie

1 2 3 4 5

Centralisering

5. Hoe werden beslissingen genomen tijdens deze crisis? (door wie?)
6. Hoe zou u de besluitvorming omschrijven tijdens deze crisis:

Decentraal Centraal

1 2 3 4 5

7. In hoeverre was er controle vanuit het centrale gezag (wie/ welke organisatie? welke mate?)

Tegenstelling?

8. We hebben het net gehad over in hoeverre mensen met de juiste expertise beslissingen kunnen nemen, en we hadden het over centralisering van beslissingen, in hoeverre heeft u hier een tegenstelling in ervaren tijdens de crisis?
    a. Ja, hoe wordt daarmee omgegaan? b. Nee, waarom niet?

Creativiteit en Regels *(flexibility- rigidity)*

Creativiteit

1. In de koude fase, worden er weleens nieuwe ideeën aangedragen om crisissen beter op te lossen?
    a. Voorbeeld? B. In hoeverre worden deze ideeën toegepast?
2. Wanneer een crisis wordt geanalyseerd, in hoeverre wordt dit vanuit verschillende perspectieven en van verschillende kanten bekeken?
3. Na afloop van een crisis, in hoeverre worden vragen gesteld over wat er aan de hand was?
    a. Veel vragen? B. waarover?
4. Hoe wordt er gereageerd op meningen die afwijken? (respect?)

Formele regels

5. Hoe formeel/vaststaand zijn:
    a. Regels en protocollen? Is er vrijheid om van de regels af te wijken?
    b. Vergaderingen?
    c. De agenda tijdens vergaderingen?
    d. De besluitvorming?
6. Aan wie rapporteren jullie? (ook extern?)
    a. Hoe vaak?
7. Aan wie legt u verantwoording af?
    a. Hoe? B. Is dat vastgelegd in regels?

Tegenstelling:

8. We hebben het gehad over de ruimte voor nieuwe ideeën en over hoe dingen vastgelegd zijn in regels, in hoeverre ervaart u een tegenstelling hiertussen?
    a. Ja, hoe wordt daarmee omgegaan? b. Nee, waarom niet?

Kunt u nu weer de crisis die u als voorbeeld gaf in gedachten nemen? **(warme fase)**

Creativiteit

1. Werden er tijdens deze crisis nieuwe ideeën voorgesteld? Zo, ja werden ze toegepast?
2. Tijdens deze crisis, in hoeverre werden er vragen gesteld over wat er aan de hand was?
3. Hoe werd er gereageerd op afwijkende ideeën. (Indien die er waren?)

Formele regels

4. In hoeverre stonden de regels en protocollen tijdens deze crisis vast? En in hoeverre was er ruimte om hiervan af te wijken?
5. Aan wie werd er na de crisis gerapporteerd/ verantwoording afgelegd?
6. Hoe belangrijk was leiderschap tijdens deze crisis? Verschilt dat van de koude fase?

Tegenstelling:

7. We hebben het gehad over de ruimte voor creatieve oplossingen/ideeën, en de regels en verantwoording, in hoeverre heeft u hier een tegenstelling in ervaren, tijdens deze crisis?
    a. Ja, hoe wordt daarmee omgegaan? b. Nee, waarom niet?

Afsluiting:

Hartelijk dank voor het interview. Heeft u verder nog opmerkingen die u graag kwijt wil?
Mocht ik nog vragen hebben kan ik dan nog contact met u opnemen?
Wanneer de scriptie afgerond is, zal ik deze dan naar u toesturen? → Email?
Vind u het goed als uw naam genoemd wordt in de bijlage met respondenten? De resultaten zullen worden weergegeven zonder naam.

Appendix 2 – Codebook[2]

Variety- Limited size & composition

- Samenwerking organisaties
  - Samenwerking organisaties koud
- Organisaties VR verschillen
  - Opleiding VR
  - Ervaring & Skills VR
  - Cultuur VR
- Tegenstelling Variety- Limted size & composition
  - Voordelen gevarieerde VR
  - Nadelen gevarieerde VR
  - Ervaren tegenstelling
    - Omgaan met tegenstelling variatie
    - Waarom geen tegenstelling variatie
  - **Variatie warm koud**

- CV[3]: Samenwerking organisaties
  - CV: samenwerking organisaties
    - CV: Organisaties verschillen
    - CV: Opleiding
    - CV: Ervaring & Skills
    - CV: Cultuur
  - CV: voordelen samenwerking organisaties
  - CV: nadelen samenwerking organisaties
  - CV: tegenstelling voor en nadelen
    - CV: Omgaan met tegenstelling variatie
    - CV: Waarom geen tegenstelling variatie

Centralisation (coordination by central core agency– Deference to expertise

- Expertise
  - Wie expertise duidelijk
  - Expert(s) te bereiken
  - Beslissingen door expert genomen
  - Expertise & ervaring – positie & hiërarchie
- Centralisering
  - Beslissingen
  - Besluitvorming centraal –decentraal
  - Controle centraal gezag
    - Controle organisatie
    - Controle persoon
    - Mate controle
  - Controle evaluatieonderzoeken en rapporten

[2] In bold codes that have been added during the coding process
[3] CV: Crisis Voorbeeld: Crisis example (Hot phase)

- Tegenstelling centralisering – expertise
    - Omgaan met tegenstelling centralisering – expertise
    - Waarom geen tegenstelling centralisering – expertise
- CV: Expertise
    - CV: wie expertise duidelijk
    - CV: expert(s) te bereiken
    - CV: beslissingen door expert genomen
    - CV: expertise & ervaring – positie & hiërarchie
- CV: Centralisering
    - CV: beslissingen
        - CV: wie beslissingen
    - CV: besluitvorming centraal –decentraal
    - CV: controle centraal gezag
- CV: Tegenstelling centralisering - expertise
    - CV: omgaan met tegenstelling centralisering – expertise
    - CV: Waarom geen tegenstelling centralisering – expertise

Flexibility – Formalisation & accountability (desire for hierarchy)

- Flexibility, Creativiteit
    - Nieuwe ideeën koud
        - Toepassing nieuwe ideeën koud
    - Perspectieven analyse
        - Hoeveelheid perspectieven
    - Vragen na afloop crisis
        - Aantal vragen over crisis
        - Onderwerp vragen over crisis
    - Reactie op meningen die afwijken
        - Respect

- Formalisation & accountability
    - Mate formaliteit
        - Formaliteit regels en protocollen
        - **Vrijheid om van regels en protocollen af te wijken**
        - Formaliteit vergaderingen
        - Formaliteit agenda vergaderingen
        - Formaliteit besluitvorming (1-5)
    - Rapporteren
        - Aan wie rapporteren
        - Frequentie rapporteren
    - Verantwoording afleggen
        - Aan wie verantwoording
        - Hoe verantwoording
        - Regels verantwoording
    - Desire for hierarchy
    - **Desire for protocols**

- Tegenstelling: Flexibility- Rigidity
    - Omgaan met tegenstelling flexibility- rigidity

    - Waarom geen tegenstelling flexibility- rigidity

- CV: Flexibility, Creativiteit
    - CV: nieuwe ideeën
        - CV: toepassen nieuwe ideeën
    - CV: reactie op meningen die afwijken
        - CV: respect

- CV: Formalization & accountability
    - CV: vastheid regels en protocollen
    - **CV: ruimte om van regels en protocollen af te wijken**
    - CV: gerapporteerd aan
    - CV: verantwoording afgelegd aan
- CV: Desire for hierarchy
    - CV: belang leiderschap
    - CV: Belang leiderschap verschil koud-warm
- **CV: Desire for protocols**

- CV: tegenstelling Flexibility - rigidity
    - CV: omgaan tegenstelling flexibility – rigidity
    - Waarom geen tegenstelling flexibility – rigidity

<u>Additional codes:</u>

- **Persoon**
    - **Eigen achtergrond**
    - **Eigen taak**
- **Crisis examples**
    - **O.C. Huisman**
    - **Mosterdgas**
    - **Electrabel**
    - **Boy Geenacker**
    - **Springer**
    - **Oosterhoutsedijk (vierdaagse)**
    - **Cargadoorweg**
    - **Vogelpest**
    - **Bom Huis Ede**
    - **Brand Huis**
    - **Schietpartij**
    - **Waterleiding Ede**
    - **Garagebrand**
- **CV toelichting**
- **Veiligheidsbureau**
- **Communicatie**
- **Herindeling**
- **Opvallend**[4]

[4] These codes are used as memos

Appendix 3 – Information on interviews and observations

Safety region A (VRGZ)	Date of interview	Safety region B (VGGM)	Date of interview
Respondent A1	09-06-2016	Respondent B1	24-06-2016
Respondent A2	09-06-2016	Respondent B2	27-06-2016
Respondent A3	10-06-2016	Respondent B3	23-06-2016
Respondent A4	13-09-2016	Respondent B4	21-06-2016
Respondent A5	14-06-2016	Respondent B5	30-06-2016
Respondent A6	16-09-2016	Respondent B6	24-06-2016
Respondent A7	15-06-2016	Respondent B7	27-06-2016
Respondent A8	27-06-2016	Respondent B8	17-06-2016
Respondent A9	28-06-2016	Respondent B9	21-06-2016

Table 12: overview interview dates

- **Observation Emergency Room**
  - Place: Nijmegen (Safety Region Gelderland Zuid, VRGZ)
  - Date: 2nd of July 2016
  - Time: 10 -13 o'clock (3 hours)

- **Observation CoPI training**
  - Place: Arnhem (Safety Region Gelderland Midden, VGGM)
  - Date: 21st of June 2016
  - Time: 9- 12 o'clock (3 hours)
  - First scenario: Plane Accident Airport Terlet
  - Second scenario: Festival Dreamfields