

Risk and vulnerability assessments as input to decision making

An interview study describing how risk and vulnerability assessments are utilised for decision making on the national and regional levels of the Swedish disaster management system.

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Abstract:

Risk and vulnerability assessments are an important part of the Swedish disaster management system and can be used as input for decision making. Today disaster management decisions are made on all levels in Sweden depending on the extent of the decisions. The purpose of this thesis has been to perform a descriptive study of how risk and vulnerability assessments are utilised as input to decision making in the field of disaster management on the national and regional levels in Sweden. Twelve interviews, six with regional respondents and six with national respondents, were performed. The conclusion is that risk and vulnerability assessments are an appreciated tool for decision support. Despite this, the connection between the assessments and risk-reducing measures is weak since it is unclear how suggested measures are implemented and followed-up on. There is also a frustration regarding the system. This frustration is deeper on the national level compared to the regional level.

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Summary

We live in a world that faces the possibility of disasters in many different shapes and with a myriad of interdependencies. In order to develop sustainability these disasters must be managed. It requires an approach to disaster management that has the ability to anticipate, recognise, adapt to and learn from events. Risk and vulnerability assessments are important in order to anticipate further risks as well as to assess them and support the process of adapting to them.

Risk and vulnerability assessments are conducted on all levels of the Swedish disaster management system and are an important tool to support decision making. Decisions are made on all levels of the system depending on their extent. The Swedish system relies on a bottom-up approach, which entails that risk management decisions are mainly made on the level closest to the risk. Today there is a limited knowledge regarding how risk and vulnerability assessments are utilised as an input to decision making on the regional and national levels in Sweden. The purpose of this thesis is to describe how the assessments are utilised.

To do this, an interview study with twelve semi-structured interviews was performed with respondents on the national and regional level of the Swedish disaster management system. The interviews resulted in the conclusion that risk and vulnerability assessments are appreciated as a tool for decision support. Despite this there is a weak connection between the assessments and the risk-reducing measures taken since it is unclear how suggested measures are implemented and followed-up on. Another conclusion is that risk evaluation is not an obvious part of the risk and vulnerability assessments since half of the respondents did not include it when asked about what a risk and vulnerability assessment should contain.

In order to utilise the full potential of the risk and vulnerability assessments it is important that there is efficient and effective communication between the different levels of the Swedish disaster management system. The results from the interviews conducted within this thesis imply that there is less awareness about how the assessments are received and utilised by the level above compared to the level below. A frustration about the process is identified from emotions shown and weaknesses identified during the interviews. This frustration is perceived to be deeper on the national level compared to the regional level of the Swedish disaster management system.

The conclusions drawn from this thesis imply that the work with risk and vulnerability assessments in the Swedish disaster management system can be improved. By reducing the frequency of performing assessments would enable increased possibilities to implement and follow up suggested risk-reducing measures. This together with increased emphasis on risk evaluation and communication between the different levels of the disaster management system will positively impact the society's ability to anticipate and adapt to the uncertainty of the future. Thereby, our society will become more resilient.

Sammanfattning

Vi lever i en värld som hotas av olika katastrofer med olika beroenden. För att samhället ska fortsätta utvecklas på ett hållbart sätt behöver katastroferna hanteras. Det ställer krav på samhällets funktioner att förutsäga, identifiera, anpassa sig till och dra lärdomar från händelser. Ett verktyg som idag används för att göra detta är risk- och sårbarhetsanalyser som har förmågan att förutsäga och utvärdera risker och stödja processen med att hantera dem.

Risk- och sårbarhetsanalyser görs på alla nivåer i det svenska krishanteringssystemet och är ett viktigt verktyg för att stödja beslutsfattande. Beslut rörande katastrofriskreducering tas på alla systemets nivåer. Det svenska systemet är decentraliserat vilket innebär att besluten generellt sett tas av de som har risken inom sitt ansvarsområde. Idag föreligger det oklarheter kring hur risk- och sårbarhetsanalyser används som beslutsunderlag. Detta examensarbete ämnar att beskriva hur situationen ser ut på nationell och regional nivå idag.

För att undersöka hur risk- och sårbarhetsanalyserna används genomförs en intervjustudie bestående av tolv semistrukturerade intervjuer med sex respondenter från den nationella och sex respondenter från den regionala nivån i det svenska krishanteringssystemet. Intervjuerna visar på att risk- och sårbarhetsanalyser är ett uppskattat beslutsstöd. Trots det är kopplingen mellan analyserna och genomförandet av riskreducerande åtgärder svag eftersom uppföljningen av föreslagna åtgärder och deras implementeringsgrad är oklar. Vidare är riskvärdering inte en given del av risk- och sårbarhetsanalyserna då detta endast togs upp som en del av risk- och sårbarhetsanalysen i hälften av intervjuerna.

För att analyserna ska nå sin fulla potential är det viktigt med god kommunikation mellan de olika nivåerna i det svenska krishanteringssystemet. Resultaten från intervjuerna visar på att kunskapen om hur risk- och sårbarhetsanalyserna mottas och används på de högre nivåerna är lägre jämfört med nivåerna under. Det går även att identifiera en frustration kring processen baserat på de känslor som uttrycktes och de svagheter som nämnts under intervjuerna. Frustrationen upplevs som större på den nationella nivån jämfört med den regionala.

De slutsatser som dragits i denna uppsats visar på att processen kring risk- och sårbarhetsanalyser inom det svenska krishanteringssystemet kan förbättras. Genom att minska frekvensen på dessa analyser ges ökade möjligheter till genomförande och uppföljning av föreslagna riskreducerande åtgärder. Detta tillsammans med ökat fokus på riskvärdering och kommunikation mellan de olika nivåerna i krishanteringssystemet skulle utveckla samhällets förmåga att förutse och anpassa sig till framtidens osäkerheter vilket skulle öka vårt samhälles resiliens.

Table of content

1	Introduction	1
2	Theoretical background	3
2.1	Defining risk and vulnerability	3
2.2	Risk and vulnerability assessments	3
2.3	Disaster management and the Swedish disaster management system	6
3	Method	11
3.1	Selection process	11
3.2	The respondents	11
3.3	Interviews	12
3.4	Analysis	13
4	Result	15
4.1	The concept of risk	15
4.2	Risk and vulnerability assessments as an input for decision making	16
4.3	Strengths, weaknesses and points of improvement	18
5	Discussion	21
5.1	Reflections	21
5.2	The use of risk and vulnerability assessments in the decision making process	27
5.3	Observed gaps	30
5.4	Possible biases	30
5.5	Areas of interest for further research	32
6	Conclusions	33
7	References	35
	Appendix A: Introducing letter	I
	Appendix B: Interview guide	III
	Interview guide version 1	III
	Interview guide version 2	IV
	Appendix C: Respondents	V

1 Introduction

We live in a world that is uncertain, complex, ambiguous and dynamic. Societies face the possibility of disasters in many different shapes and with a myriad of interdependencies. Disasters may come in hydrometeorological, geological, biological, accidental or antagonistic form and cross both geographical and organisational borders. These disasters must be managed in order to develop sustainability, which requires an approach to disaster management that can anticipate, recognise, adapt to and learn from these changes and interdependencies (Becker, 2014, pp.147-148). Risk and vulnerability assessments have the ability to anticipate future risk scenarios and assess them to decide on ways to manage the risks. If done successfully, this will contribute to create a society that is less impacted by disturbances and thereby has a larger potential of developing in a way that is desired.

Assessing risks does not necessarily mean that all possible events are identified. There will always be a possibility of surprising extreme events relative to the present knowledge and beliefs (Aven, 2013, p. 49). These events are difficult to anticipate but risk and vulnerability assessments increase the knowledge-base for decision makers. That in turn makes it more likely that relevant decisions are made regarding what risks to address as well as ways to manage them.

It is said that beauty lies in the eyes of the beholder and this can also be applied to risk. The concept of what risk is differs from person to person and creates ambiguities when assessing and presenting risk (Klinke & Renn, 2002, pp. 1072-1073). Risk and vulnerability assessments are structured ways of identifying what might affect the assessed system, what consequences may be expected and the uncertainties regarding for example the likelihood of the events and the extent of the consequences. Thus, the assessors view on what risk is will shape the assessment.

Risk and vulnerability assessments are an important part of the Swedish disaster management system and are supposed to be used as a first step in the process of reducing risk and vulnerability in society as well as to increase the ability to mitigate the effects of, and respond to, extraordinary events (MSB 2011, pp. 5-6). In Sweden risk and vulnerability assessments are made on three different levels; on the local level by municipalities, on the regional level by County Administrative Boards and on the national level by national authorities (MSB, 2015a).

The work with risk and vulnerability assessments is important on all levels in the society. The municipal assessments are the basis for the regional assessments and these regional assessments lay the groundwork to the national assessment (MSB, 2011, p. 17). All levels of the disaster management system need to work satisfactory. The work on the local level is important since the Swedish crisis management system relies on three principles: the responsibility principle, the proximity principle and the equality principle. These three principles could be summarised into that the ones who have the responsibility during normal conditions should keep it during a crisis, the work should take place where the crisis occurs and should be performed by the ones that are closest concerned with as small changes in the organisation as possible (Prop. 2005/06:133). Therefore the local and the regional levels are important stakeholders when the society faces a crisis.

It is stated by law that every national authority in Sweden should analyse their own risks and threats with the purpose to strengthen both their own preparedness as well as the preparedness of the society (SFS 2006:942). In addition to the law the Swedish Civil Contingencies Agency has supplementary regulations about both required headlines included in the risk and vulnerability assessments as well as indicators on disaster management that should be analysed regarding whether they are fulfilled or not (MSBFS 2015:3; MSBFS 2015:5).

Despite the laws and regulations there is a quite strong agreement that the work with risk and vulnerability assessments and the aggregation of information in these has not reached its full potential in Sweden. Hence, there are differences in quality of the assessments in the disaster management

system, which makes the aggregation of assessments on the regional and national level problematic (Abrahamsson & Tehler, 2013, p. 89). This can partly be contributed to the fact that there are many stakeholders who describe the same issues in different ways and use different vocabularies (Månsson, Abrahamsson, Hassel & Tehler, 2015, pp. 8-11). However, the connection between risk and vulnerability assessments and decisions on how to reduce risk is not solely dependent on the possibility to aggregate information. There is a limited knowledge regarding how risk and vulnerability assessments are utilised as an input to decision making and what the professionals working in the field think about them. Today more research is done on the local and regional level compared to the regional and national level, see for example Hassel (2012); Abrahamsson and Tehler (2013) and Lin, Nilsson, Sjölin, Abrahamsson and Tehler (2015). Therefore this thesis will focus on the regional and national level in Sweden.

The purpose of this work is to perform a descriptive study of how risk and vulnerability assessments are utilised as input to decision making in the field of disaster management at the national and regional levels in Sweden.

In order to fulfil the purpose, the following research question will be answered:

- How are risk and vulnerability assessments utilised in the decision making process for disaster management at the national and regional levels in Sweden?

Answering this question will create an understanding about the different views on risk and vulnerability assessments and their importance for decision making on the national and regional levels of the Swedish disaster management system today. On the regional level focus lies on the County Administrative Boards since they have an important coordinating role within the Swedish disaster management system. The national level is represented by national authorities who are also required to perform risk and vulnerability assessments.

2 Theoretical background

A risk and vulnerability assessment is a decision support tool that enlightens risks in an area around which decisions need to be made, for example to decide where to focus funding in order to create a safer society. Risk and vulnerability assessments can be seen as a special case of a traditional risk assessment where more focus is placed on vulnerabilities. A traditional risk assessment contains three steps: risk identification, analysis and evaluation (SS-ISO 31000:2009). A vulnerability assessment can be seen as a natural part of a risk assessment since vulnerability is a part of risk (Aven, 2007, p. 748). Thus a risk and vulnerability assessment should have a clear focus on vulnerabilities in the system. This section defines the concepts of risk and vulnerability used in this thesis and covers the basic parts of a risk and vulnerability assessment. The assessments will look different depending on in which context they are utilised, their purpose and the approach to risk used by the assessor and will thereby give different inputs to decision makers (Klinke & Renn, 2002, pp. 1072-1073).

2.1 Defining risk and vulnerability

Today there is no consensus on how risk is defined in the engineering context (Aven, 2012, p. 33). Thereby, it could be problematic to define a meaningful probability model which is the case with risk and vulnerability assessments. Risk is unknown, not because of the degree of knowledge, risk is unknown because the future cannot be foreseen (Aven, 2011, p. 518). Therefore a definition that includes the uncertainty associated to the event and its consequences is used in this thesis. The approach used is the ACU-framework proposed by Aven (2011, pp. 1080-1082):

Risk = (A, C, U)

A: What can go wrong? (the initiating events)

C: The consequence of these events if they should occur.

U: Associated uncertainties. Will A occur and what value will C take?

This framework also enables concepts such as vulnerability and capabilities to be included.

Vulnerability can be seen as a combination of possible consequences and associated uncertainties given a hazard (Aven, 2007, p. 747). A hazard is an occurrence that, when interacting with a vulnerability, has adverse effects (Coppola, 2011, p. 176). As an example, the hazard hurricane can be used, which if it occurs on a desert island creates no adverse effects while if it strikes a populated island could result in a disaster depending on the islands vulnerability to hurricanes.

The ACU-framework of risk and vulnerability allows a broad definition of uncertainty, not only as frequencies or probabilities. Such quantitative measures of uncertainty are uncommonly used in risk and vulnerability assessments in Sweden (Månsson, Abrahamsson, Hassel & Tehler, 2015, pp. 2-3).

2.2 Risk and vulnerability assessments

As stated before, risk and vulnerability assessments will look different depending on the approach to risk used by the assessor and will thereby give different inputs to decision makers (Klinke & Renn, 2002, pp. 1072-1073). The ACU-framework uses an approach to risk that can be related to the classic risk triplet named by Kaplan and Garrick (1981) including identification of events, their likelihood and the consequences if they happen.

2.2.1 Risk identification

A risk and vulnerability assessment has to start with an identification of the risks relevant for the system analysed. In this part of the assessment the first question in the risk triplet is answered. The question is:

- What can happen?

Consequently, the A in the ACU-framework is defined. In order to identify risks within a system, a clear definition of the system and its context is necessary in order for the assessment to be of a manageable magnitude. This definition should be done before the assessors start with the risk identification. This step is one of the most critical steps of the assessment since the risks that are not identified will not be taken into consideration during the assessment. The identification phase is a systematic process with the goal of identifying all possible events in order to get a complete picture of the current situation and to recognise those risks that need to be researched further (MSB, 2011, p. 41).

After identifying risks, they need to be analysed to be of use in supporting decisions.

2.2.2 Risk and vulnerability analysis

In this part of the assessment the last two questions in the risk triplet are answered regarding all risks identified in the risk identification phase. This part is related to the C and U in the ACU-framework. The questions asked are (Kaplan & Garrick, 1981, p. 13):

- How likely is it that the event will happen?
- If it does happen, what are the consequences?

Since risk is ambiguous and uncertain, the analysis should show this and aim to reduce the uncertainties stemming from lack of knowledge of the risk in question. Uncertainties from the natural variability that cannot be foreseen are not treated. It is important to clearly show what assumptions have been made and what effect they might have on the result of the analysis. The answers to the questions above can be presented in many different forms; from entirely qualitative to entirely quantitative likelihoods and consequences depending on the available knowledge, available time and the purpose of the assessment (SS-ISO 31000:2009, p. 18).

Analysing vulnerability concerns a more detailed analysis of how the system is affected by a specific hazard from the perspective of critical functions of the system (Totalförsvarets forskningsinstitut, 2011, p. 34). The analysis results in identified vulnerabilities related to a certain hazard, which is identified in the risk analysis (MSB, 2011, pp. 53-54).

2.2.3 Risk evaluation

When having analysed the risks the results need to be evaluated regarding their acceptability and manageability. This is preferably done by the risk assessors together with those affected by the risk to address their concerns as well as the assessed magnitude of the risk (Klinke & Renn, 2002, p. 1076). Risk-reducing measures should be evaluated regarding their effect on the risk levels (MSB, 2011, p. 50). Depending on the background of the assessors and their approach to risk the evaluation may look different. Therefore, evaluation criteria should be decided before the identification and analysis takes place (Coppola, 2011, p. 162). Still, the assessors' approach to risk will affect the evaluation.

There are two main opposing approaches to risk; the constructualist and the realist approach (Klinke & Renn, 2002, pp. 1072-1073), which can influence the evaluation. These approaches are extremes and in reality professionals tend to lean towards one or another. The constructualists consider risk as a mental construction and that risk and vulnerability assessments thereby are subjective while the

realists argue that risk can be quantified and the risk and vulnerability assessments are a true representation of the reality. The realists argue that the decision making process requires a quantitative way of expressing risk to help the decision makers to prioritise risks compared to the costs and benefits (Kaplan, Garrick, 1980, p. 11). On the other hand, a risk assessor has to choose the way to measure risk, present it and determine levels of exposure and since there is no right frame to do this risk becomes subjective (Slovic, 2011, pp. 20-21).

Depending on the assessors' and the decision makers' approaches to risk, different aspects of the risk will receive different amount of attention. People perceive risk differently depending on the source of the risk and its characteristics. Depending on whether the exposure to the risk is voluntary or involuntary people are more or less willing to accept it. The same thing applies to for example whether risk is old or new or if there are consequences for future generations (Slovic, 1987, p. 282).

A widely used way of describing and evaluating risk is using risk matrices where the likelihood and consequence of an event forms the axes of a matrix and the events are plotted into the matrix. An example of a risk matrix can be seen in figure 1. This helps visualising and comparing different risks as well as the effects of risk-reducing measures. A risk matrix can be a very effective tool for decision makers prioritise between different risks. The results displayed in a risk matrix can easily be manoeuvred depending on the level of detail used when describing it. Despite this it is a useful tool to visualise a coarse snapshot of the identified risks (MSB, 2011, p. 53). Another important thing to keep in mind when using risk matrices is that consequences exist in different areas that are hard, if not impossible, to compare such as human, environmental and economic consequences.

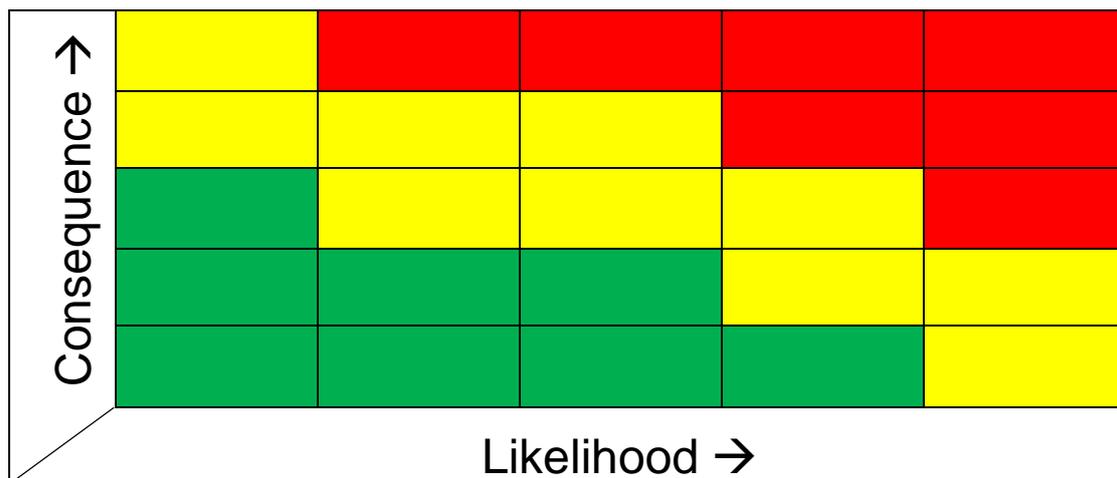


Figure 1. Schematic image of a risk matrix. The consequences can differ between for example human, environmental and economic but they would have to be separated between different matrices. Likelihoods can be described in different ways, from qualitative to quantitative.

In addition to risk matrices Coppola (2011) writes about the SMAUG approach to risk evaluation, where each identified hazard is evaluated against the five parameters *seriousness*, *manageability*, *acceptability*, *urgency* and *growth* presented in table 1 (pp. 164-165). This way of evaluating risk provides decision makers with different aspects of risk and is a good complement to risk matrices since it provides different angles of evaluating risks and anticipates the development of the risks over time.

Table 1. A description of the parameters within the SMAUG approach to risk evaluation. Based on Coppola (2011, p. 165)

Parameter	Answers the question
Seriousness	How severe are the consequences of the risk?
Manageability	Is the risk manageable or not?
Acceptability	Is the risk acceptable from a social, political, legal, environmental or economic point of view?
Urgency	Is there an urgent need to manage the risk or could it be managed later with little or no repercussions?
Growth	Will the risk increase over time or will it remain static?

The risk evaluation is the part of a risk and vulnerability assessment that provides the most important input to decision makers. Utilising snapshots of risk provided by risk matrices in collaboration with more transient pictures such as those provided by using the SMAUG approach when evaluating risk contributes to anticipate and adapt to the possible unwanted events of the future.

2.3 Disaster management and the Swedish disaster management system

The aim with the Swedish disaster management system is to protect life and health, infrastructure and values of societal importance from risks and hazards. The aim is met through planning, preparedness, prevention, response and recovery (MSB, 2015b). This section will describe functions for reducing disaster risk, principles of the Swedish disaster management system as well as the laws and regulations governing it.

2.3.1 Functions for managing disaster risk

Risk and vulnerability assessments are used as a decision support tool when working to reduce disaster risk. Societies have always been vulnerable to hazards and consequently in need of creating a safer environment either by reducing the occurrence of hazards (reducing likelihood) or by reducing the severity of their impact (reducing consequence). Risk and vulnerability assessments help identifying the likelihoods and consequences of a hazard and thereby also identifying ways to reduce the risks. The reduction is mainly done in two different ways; mitigation and preparedness. The disaster management concept also contains the reactive functions of response and recovery (Coppola, 2011, p. 10), which are not directly applicable in the context of this thesis and will therefore not be treated. The disaster management concept is a parallel process as illustrated in figure 2.



Figure 2. The disaster management concept contain four parallel processes. Mitigation and preparedness are the proactive parts and response and recovery are the reactive parts.

Mitigation is often seen as a cornerstone of disaster management and is - together with preparedness - the proactive part of disaster management. It concerns reducing the likelihood or consequence of hazards (Coppola, 2011, p. 209). Preparedness is extremely important to create effective response and recovery when a disaster strikes. It concerns actions taken in anticipation of a hazard to increase the ability to respond to and recover from its consequences (Coppola, 2011, p. 251).

The borders between the four functions are quite diffuse and one does not reach its full potential without the others. These activities are used by Becker (2014) to describe the adaptive function of the resilience concept. Although he separates what here has been called mitigation into prevention and mitigation to differ between reducing the likelihood and reducing the consequence of hazards. Becker defines resilience in a human-environment system such as a society:

[...] [R]esilience [is defined] as the capacity of a human–environment system to continuously develop along a preferred expected trajectory, while remaining within human and environmental boundaries. [...] [S]uch resilience is an emergent property determined by the ability of the human–environment system to anticipate, recognize, adapt to and learn from variations, changes, disturbances, disruptions and disasters that may cause harm to what human beings value.
(Becker, 2014, p. 150)

The key point of the resilience concept relevant to this thesis is that these adaptive functions must be supplemented with functions to anticipate potential unwanted events, recognise that there are imminent or actual unwanted events taking place as well as to learn from all sorts of experience gathered throughout the system. A risk and vulnerability assessment is an anticipatory tool that has the potential to be of great importance in the process of creating resilience in a society since it can provide input to all of the functions mentioned, in particular the adaptive function. In Sweden risk and vulnerability assessments are mandatory for governmental as well as the regional and local authorities which creates one possibility to develop a more resilient society.

2.3.2 Three principles in Crisis Management in Sweden

Crisis management in Sweden relies on three principles (Prop. 2005/06:133):

The responsibility principle: Those who have the responsibility under normal conditions also have the responsibility during a crisis.

The proximity principle: The work during a crisis should be done where the crisis takes place and by the ones that are closest concerned.

The equality principle: Changes in the organisation should not be larger than required during a crisis. The aim is as far as possible to organise the work in the same way during crisis as under normal conditions.

These three principles result in that a lot of the work with risk-reducing measures should be done at a local level and thereby the decisions too. To enable relevant decisions the knowledge has to be shared between all levels in the society.

2.3.3 Organisation of the Swedish disaster management system

The political system in Sweden is divided into three levels: local, regional and national, shown in figure 3. The basis for the work is on the municipal level. Today, Sweden has 290 municipalities (Sveriges Kommuner och Landsting, 2015). In *The Swedish Civil Contingencies Agency regulations concerning municipalities' risk and vulnerability assessments* it is stated that every fourth year all municipalities should analyse their own risks and threats. The assessment should be revised and updated annually until the next assessment (MSBFS 2015:5).

The next level of the system is the regional level represented by the 21 County Administrative Boards. They compile the assessments from the municipalities in their county to a regional assessment (MSB, 2011, p. 17). The County Administrative Boards and national authorities yearly send their risk and vulnerability assessment to the Swedish Civil Contingencies Agency and the Government Office (MSBFS 2015:3), which is comprised by the different departments (SFS 1996:1515). The assessments are summarised by the Civil Contingencies Agency into a national risk and vulnerability assessment, which is sent to the Department of Justice (Försvarsdepartementet, 2014). Every country should also send their national risk and vulnerability assessment to the European Union every third year (MSB, 2014).

Sweden has 20 publically elected County Councils which, for instance, are responsible for the health care. They are also involved in the work with risk and vulnerability assessment but since they only focus on a specific part of the disaster management system they are not treated specifically in this thesis.

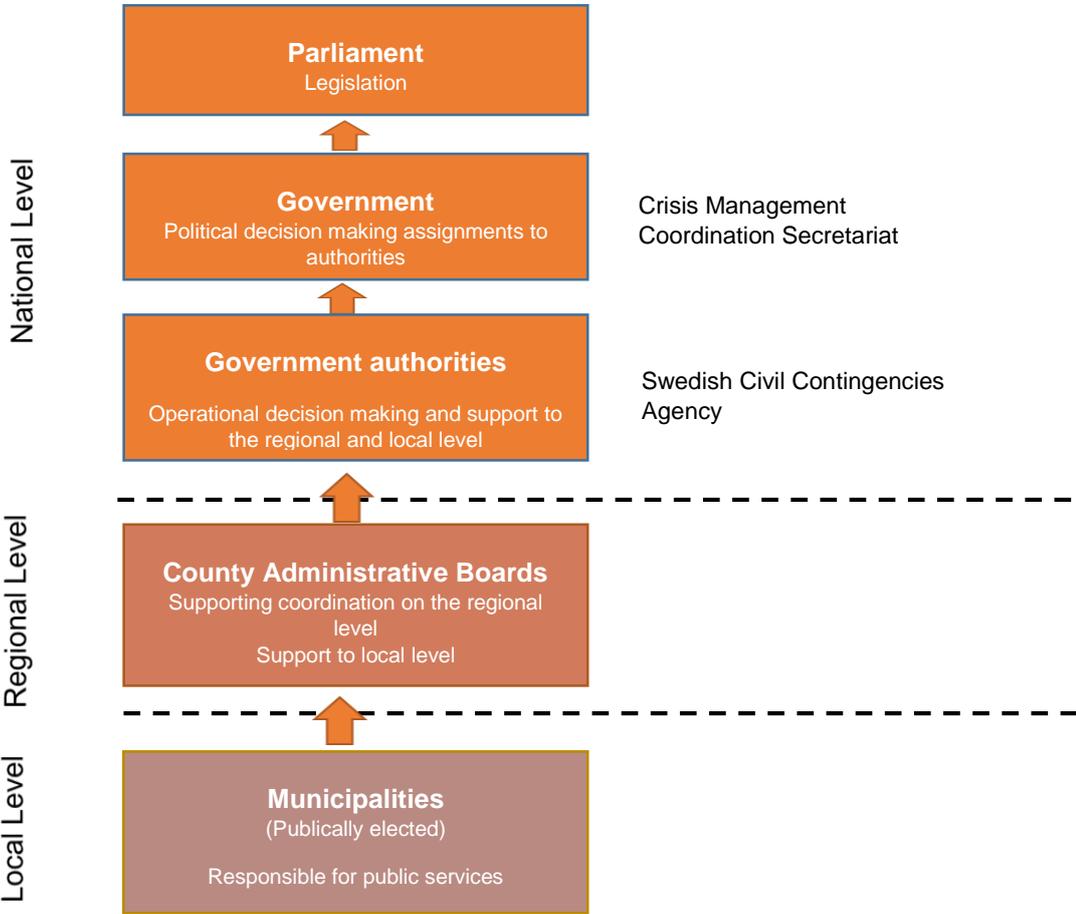


Figure 3. Organisational chart over the Swedish disaster management structure (European Commission, 2014). The system is divided into three parts: the local level with municipalities, the regional level with County Administrative Boards and the national level with national authorities and the government.

In the *Regulation of Emergency Preparedness and Increased Preparedness* (SFS 2006:942) it is stated that every authority should annually analyse their own risks and threats with the purpose to strengthen both their own emergency preparedness and the preparedness of the society. The national authorities are divided into areas of cooperation with the aim to further analyse synergies and critical dependencies (MSB, 2015c, p. 4). The authorities should take the following points into account in their analyses and present them in their risk and vulnerability assessment (SFS 2006:942):

1. Situations that appear rapidly and unexpected or circumstances where there is a threat or a risk that such a situation will develop.
2. Situations that require fast decisions and cooperation with other stakeholders.
3. That the most necessary and important functions can be maintained during a crisis.
4. The ability to handle severe situations that are in line with the responsibilities of the authority.

The Swedish Civil Contingencies Agency has supplementary regulations for the executions. National authorities should, according to 9§ *SFS 2006:942: The Regulation of Emergency Preparedness and Increased Preparedness*, present their analysis with the following headings (MSBFS 2015:3):

1. Description of the authority and its remit.
2. Description of the working process and the method.
3. Identified essential critical infrastructures within the responsibility of the authority.
4. Identified critical dependencies related to the identified essential services.
5. Identified and analysed threats and risks within the responsibility of the authority.
6. Estimation of the general emergency preparedness of the authority using predetermined indicators.
7. Description of identified vulnerabilities and flaws in emergency preparedness within the authority and its responsibilities.
8. Completed, ongoing and planned measures since the last report.
9. Required additional measures on the occasion of the results from the assessment.

Similar headlines are also available for the County Administrative Boards and the municipalities (MSBFS 2015:5; MSBFS 2015:3).

The regulations also include predetermined indicators for estimation of the general emergency preparedness of the authority or municipality. The indicators are divided into different groups: Management, Planning, Cooperation, Communication, Competence and Resources. Each indicator should be analysed if it is fulfilled or not with a “Yes” or “No” together with a justification (MSBFS 2015:5; MSBFS 2015:3).

2.3.4 Funding

According to the responsibility principle, every public agency should maintain an emergency preparedness which is included in their ordinary budget. It is also possible to apply for extra funding from the national *2:4 Emergency Preparedness Grant* to further strengthen the abilities in emergency preparedness (Statskontoret, 2014). Further it is also possible to apply for funding from the national *2:2 Preventive Measures against Landslides and other Natural Disasters grant* (Försvarsdepartementet, 2014).

Sometimes it is difficult to decide what should be funded by the authority or municipality and what is included in the *2:4 Emergency Preparedness Grant*. The grant can be used to fund projects that are a cooperation between actors. The grant could also be used for funding comprehensive, and sometimes temporary, risk-reducing measures that are of essential importance for the society (MSB, 2015d).

3 Method

To answer the research question an interview study with twelve respondents was performed. Five interviews were held with respondents working in national authorities, five with County Administrative Boards and two interviews were not applicable to either category but were still regarded to provide valuable input to the study.

The interviews were semi-structured using open-ended questions with the advantages that probing questions can be utilised to develop a deeper understanding of certain subjects. Another advantage is that unexpected answers may be given, something that can provide useful input to answer the research question.

A small literature review was conducted in order to sort out relevant literature already written on the subject using various combinations of the keywords *risk*, *vulnerability*, *assessment*, *management*, *governance*, *measures*, *decision maker* and *Sweden* while excluding unrelated keywords such as *finance* and *business*. The keywords were chosen to suit the research question and the search was conducted in the Lund University Libraries databases. The purpose of the literature research was to get a broader understanding of the topic in preparation for the interviews. Most of the findings focused either on the local and regional level or the contents of the risk and vulnerability assessments and not so much on how these assessments actually are utilised for decision making.

3.1 Selection process

An e-mail was sent to 26 people in total; 16 people working on a regional level and ten people working on a national level. The contacted County Administrative Boards were randomly chosen while the national authorities were targeted depending on their perceived relevance to the topic. The email contained information about the study with an introduction letter attached, shown in *Appendix A: Introducing letter*. The County Administrative Boards were contacted via e-mail through the contact person for the risk and vulnerability assessment given on their webpage. When contacting the national authorities four of them were contacted via the contact person given on their webpages and four were contacted through a registrar since relevant contact information was not found. With two of the national authorities, two persons were contacted. In total twelve potential respondents, including registrars, forwarded the question to a more suitable respondent.

Five potential respondents who got a request for an interview declined with the reasons of not having time or that they recently had started to work with the topic and therefore considered themselves to not have enough knowledge. Nine persons did not answer the email or forwarded it to another person but without any further reply.

3.2 The respondents

Twelve interviews were held, five with respondents working in national authorities, five with County Administrative Boards and two interviews were not applicable to either category but they operate on the national or the regional level. Therefore the twelve respondents are divided into two groups, national or regional level. The respondents are listed in *Appendix C: Respondents*.

The respondents' educational background was divided into three groups: *Natural/Technical sciences*, *Social sciences* and *Other*. The group other includes people without academic background. Seven respondents had an education in the realm of the social sciences, one had a background in natural/technical science and four had other backgrounds such as military or emergency services. The distribution is shown in figure 4.

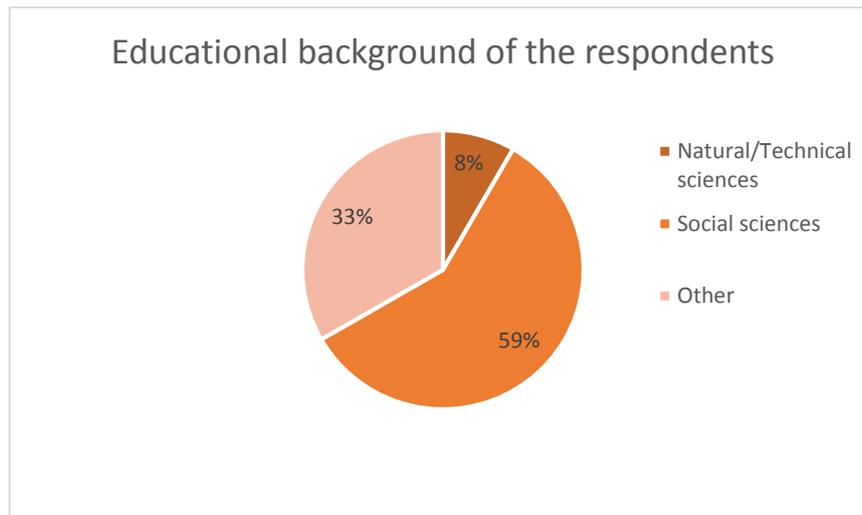


Figure 4. Educational background of the respondents. The category other includes military or emergency services background. The total number of respondents is twelve.

3.3 Interviews

In total, twelve interviews were conducted. The duration of the interviews varied between 15 and 45 minutes. Four interviews were held in person and eight were held using telephone. The interviews held in person were longer compared to the ones using telephone and also followed by discussions that were outside the interview and therefore not recorded. All interviews were recorded and transcribed in order to be available for thorough analysis.

After the first interviews it was clear that the interviews held in person were more exhaustive. The questions were not sent beforehand, except to one respondent who requested it. The aim was to get the respondents' spontaneous thoughts. In three cases the respondents mentioned beforehand that they did not have the possibility to spend the requested 30 minutes on the interview or had special knowledge that did not fit to the guide but was of interest for the work. These interviews are marked in *Appendix C*: . In these cases the length of the interview guide was adapted accordingly keeping focus on risk and vulnerability assessments.

The questions in the interview guide were open-ended with suggestions on relevant probing questions. The questions are ideally short but delivers long answers (Esaïasson, Gilljam, Oscarsson, Wängnerud, 2012, pp. 264-265). The first part aimed to create trust between the interviewer and the respondent and covered questions about current work, background and the respondents' view of risk. The second part covered risk and vulnerability assessments and how they are performed within the respondents' organisations. The third part focused on the use of risk and vulnerability assessments in the decision making process as well as strengths and weaknesses. The last part covered points of improvement with the assessments and their utilisation in the decision making process. The interviews were held in Swedish.

The interview guide was updated after the first two interviews. The order of the questions about the respondent's background and current work changed and a question regarding problems with risk and vulnerability assessments was removed since it was answered when asking about weaknesses. A translation of the different interview guides is attached in *Appendix B: Interview guide*.

A few respondents also sent their risk and vulnerability assessments, working documents with instructions and documents from workshops on the topic. These documents were used to increase the knowledge about the topic but also as a source of data for the result.

3.4 Analysis

The interviews were analysed based on the topics of the interview guide and common denominators were identified. The question *What is risk?* was analysed regarding whether it contained the parts of the ACU-framework presented in the *theoretical background*. How the respondents described risk and vulnerability assessments was analysed regarding whether they included the parts identification, analysis and evaluation.

The answers on the other questions were used to find common use, opinions and points of improvement related to risk and vulnerability assessments. The results from the interviews were used to make a description of how risk and vulnerability assessments are utilised both on a regional and a national level and the connections between these levels. From this description further analysis of strengths, weaknesses and points of improvement mentioned by the respondent were made.

4 Result

The results from the twelve interviews were divided into three parts:

- The concept of risk
- Risk and vulnerability assessment as an input for decision making
- Strengths, weaknesses and points of improvements

The twelve respondents were put together into two different groups, six professionals working on the national level and six professionals working on the regional level. The result is summarised as the opinion expressed within the groups to maintain the respondents' anonymity.

4.1 The concept of risk

To better understand the work with risk and vulnerability assessments the respondents were asked about their views on the concepts of risk as well as risk and vulnerability assessments. In total, ten respondents answered the questions *What is risk?* and *What is a risk and vulnerability assessment?*. Two of the twelve respondents did not answer these questions since this part was not of priority due to limitations in time or specific knowledge of the respondent.

4.1.1 What is risk?

The answers to the question *What is risk?* were analysed regarding whether the respondents included the events, consequences and uncertainties related to the ACU-framework. All ten respondents included events in their concept, seven included consequences and four included uncertainties. The result is summarised in table 2. One national respondent argued that the concept of risk is dependent on the context. Another national respondent mentioned that risk is about dependencies to other actors.

Table 2. The number of respondents including the elements from the ACU-framework in their concept of risk. The total number of respondents answering the question was ten.

Elements of the ACU-framework	National level	Regional level	Total
A - Events	5	5	10
C - Consequences	3	4	7
U - Uncertainties	2	2	4

Only two of ten respondents, both operating on the national level, referred to known standards and regulations when answering this question. One of them referred to the Swedish Civil Contingencies Agency's regulations *MSBFS 2015:3*. The regulations state that risk is a combination of the likelihood of the event and its consequences (MSBFS 2015:3). The other respondent referred to the ISO 31 000 standard about *Risk management – Principles and Guidelines* which express risk as effect of uncertainty on objectives (SS-ISO 31000:2009, p. 1).

When asking the respondents about their view on risk, the answers were often vague and tentative. The answer was often more of a discussion with themselves about what risk really is.

4.1.2 What is a risk and vulnerability assessment?

The answers to what a risk and vulnerability assessment is for the respondent were analysed regarding whether the respondents included *identification*, *analysis* and *evaluation*. All ten respondents included *identification* and *analysis* in their answers. Five respondents, three national and two regional, included *evaluation*. The result is summarised in table 3.

Table 3. The number of respondents including the different elements of a risk and vulnerability assessments from the theoretical background in their answers to what a risk and vulnerability assessment is. The total number of respondents answering the question was ten.

Elements of a risk assessment	National level	Regional level	Total
Identification	5	5	10
Analysis	5	5	10
Evaluation	3	2	5

When asking what a risk and vulnerability assessment is, no respondents mentioned concrete parts such as matrices, frequencies or the treatment of uncertainties. This was only mentioned when probing questions were asked specifically about the content of a risk and vulnerability assessment. One respondent referred to the Swedish Civil Contingencies Agency regulations when probing about the contents of a risk and vulnerability assessment.

4.2 Risk and vulnerability assessments as an input for decision making

The following questions were answered by all twelve respondents. The respondents were asked about the role of the risk and vulnerability assessment related to decision making. All respondents said that risk and vulnerability assessments are used as a support for decision making. Seven of the twelve respondents described risk and vulnerability assessments as a part of a more comprehensive process, such as including workshops and exercises in their work with risk and vulnerability assessments. Out of these seven respondents five operated on the regional level. Two of them said that the risk and vulnerability assessment was the ground for planning of exercises and not only used for the planning of physical risk-reducing measures. The two national respondents said that the risk and vulnerability assessments were used as input for the activity planning. One of them also said that the risk and vulnerability assessment is based on the events and incidents during the previous years. The other national respondent stated that the risk and vulnerability assessments made at the agency are the basis for a to-do-list over risk-reducing measures.

Four respondents, two national and two regional, mentioned that the risk and vulnerability assessments they got were different compared to each other. They saw difficulties to summarise the information and also to act on them when they differ as much as they do. Especially the respondents from the national level felt frustrated about this since they argued that it is difficult for them to summarise the data and therefore also to work out a comprehensive risk and vulnerability assessment. Despite this, there was an understanding for the differences in the risk and vulnerability assessments explained by the lack of resources and a useful and comprehensible method. The most common opinions about risk and vulnerability assessments as input for decision making are shown in table 4.

Table 4. The number of respondents including the different properties of risk and vulnerability assessments (RVA) as input for decision making. The total number of respondents answering the question was twelve.

Risk and vulnerability assessments as input for decision making	National level	Regional level	Total
RVA:s as a support for decision making	6	6	12
RVA:s as a part of a process	2	5	7
Differences in the input data	2	2	4
RVA:s as input for activity planning	2	2	4
RVA:s are done to apply for funding	1	1	2

One national respondent was worried that the same risk and vulnerability assessments are used again and again over time with only a few additions or changes. The respondent thought that the reason behind this could be a lack of time or other resources for the work.

One national and one regional respondent said that the risk and vulnerability assessments are done with the aim to apply for money. The national respondent also said that there is a lot of politics when making decisions, both related to interest but also available financial resources. It was explained by saying that there are always competitions about the money and depending on the size of the region, geographical location and available money the prerequisites for implementing risk-reducing measures are different in different regions. According to the respondent the risk and vulnerability assessments could differ in their roles for decision making depending on the resources available in the region or municipality.

4.2.1 Feedback

No questions were asked explicitly about the degree of communication between the levels but the respondents mentioned it related to the question about risk and vulnerability assessments as an input for decisions making. In total five interviews treated feedback between the different levels, four with national respondents and one with a regional. The respondent from the regional level was positive to the idea of more feedback from the Swedish Civil Contingencies Agency but also expressed an understanding about that the workload could be too comprehensive. Two national respondents were frustrated about the feedback process and wanted to see improvements. One of them was more focused on feedback to lower levels than with the departments. The other two national respondents did not request a feedback system, instead they thought that it was more or less solved by the involved stakeholders working together with the assessments.

One of the four respondents from the national level stated that the feedback from the level above is very dependent on the official at the authority and that today there are no clear rules about the feedback. Two of the five respondents referred to the Swedish Civil Contingencies Agency national risk and vulnerability assessment when being asked about how much feedback they receive. They explained that this is also very general feedback and they do not really know how their risk and vulnerability assessment is received by the authorities.

4.2.2 Political commitment

No questions were asked explicitly about political commitment but two national and one regional respondent mentioned it related to the question about risk and vulnerability assessments as an input for decisions making. They pointed at the importance of which signal the politicians send. If they for example change the grant for risk-reducing measures or the timeframe for risk and vulnerability assessment this could be perceived as the work with risk-reducing measures or the risk and vulnerability assessments is of more or less importance to the country. This in turn will affect the commitment and the resources budgeted at regional and municipal level. During one interview it was explained that if there has been a disaster recently the political decisions are of increased importance to create commitment to disaster management.

4.2.3 Funding for risk-reducing measures

Another reoccurring topic not explicitly asked about during the interviews were the funding of risk-reducing measures. Three respondents from the regional level and four from the national level mentioned different aspects of funding on at least one question during the interview. The respondents from the County Administrative Boards said that they apply for extra funding, in different extent, from the available grants for risk-reducing measures. The respondents from the national level pointed out that the funding for risk-reducing measures should be included in the ordinary budgets. They were

worried that risk-reducing measures were not implemented if no extra funding was available. Two national respondents who mentioned funding felt very frustrated about how funding from grants was used when implementing risk-reducing measures. They meant that the system was not used in the right way when risk-reducing measures are dependent on funding from grants. One of the respondents also expressed a dissatisfaction regarding the commitment from the national government on the issue.

A national respondent brought up that the *2:4 Emergency Preparedness grant* has been used to develop softer projects during the recent years compared to a few years ago when focus was on more physical risk-reducing measures.

One regional respondent mentioned that it is difficult with the funding of risk-reducing measures in large organisations. Every administrative unit has to fund the measures within their responsibility, which makes it difficult to implement decisions about risk-reducing measures compared to if the whole organisation had a unified budget for risk-reducing measures.

4.2.4 Methods for risk and vulnerability assessments

Two regional respondents said that they have started a process for improving and changing their work with risk and vulnerability assessments. One of them described that they have seen a need for a better work with the risk and vulnerability assessments since they are not used in the organisation and are just considered as an unused report on a shelf. Therefore they develop a more including process that also works as a support for the municipalities to develop comprehensive risk and vulnerability assessments. One of the main points in the new method is that the stakeholders in the region together should decide what is worth protecting.

4.3 Strengths, weaknesses and points of improvement

The respondents were asked about strengths and weaknesses as well as points of improvement with the risk and vulnerability assessment as they are used today. When asked about the **strengths** eight of twelve respondents specifically mentioned that they feel that the risk and vulnerability assessments motivate measures to reduce risk. Three respondents said that one strength with risk and vulnerability assessments is that they are done to get funding. The main strengths that were mentioned are summarised in table 5.

Table 5. The number of respondents mentioned the most common strengths with risk and vulnerability assessments as a tool in decision making. The total number of respondents answering the question was twelve.

Strengths	National level	Regional level	Total
Motivate measures	4	4	8
Used to apply for funding	2	1	3

Three respondents, one national and two regional, said that *if* the risk and vulnerability assessments are comprehensive and elaborate they would give a good picture of the situation and also be a good support for decisions. It was also common that the respondents started to talk about weaknesses instead of strengths.

When asking about **weaknesses** four respondents mentioned that the risk and vulnerability assessments in many cases became a shelf item that was not actually utilised in the decision making process. Three respondents stated that the connection between the risk and vulnerability assessments and the actual risk-reducing measures taken was weak. Three respondents detected a glitch between the different levels regarding the degree of knowledge about what is happening with the risk and vulnerability assessments on the other levels. One regional respondent thought that there is better transparency between the local and the regional level compared to regional to national level where the

glitch is much larger. Another regional respondent thought that there are few national authorities that know how their national departments processes the assessments sent to them. Three respondents mentioned that there are differences in how risk and vulnerability assessments are performed. The most common weaknesses are summarised in table 6.

Table 6. The most common weaknesses mentioned with risk and vulnerability assessments (RVA) as a tool in decision making. The total number of respondents answering the question was twelve.

Weaknesses	National level	Regional level	Total
RVA only a shelf item	0	4	4
Weak connection between RVA and risk reducing measures	2	1	3
Glitch in knowledge regarding what is happening with RVA:s on other levels	2	1	3
Differences in how the RVA:s are performed	2	1	3

One national respondent exemplified using a consultant as a weakness. If the case is that the consultant performs the assessment and leaves the report there is no increase in knowledge in the organisation. Thus, it is not the document that is of most importance, it is the process behind it according to the respondent.

When asking about **points of improvement** the respondents formed two camps. One camp that requested a more general method used when assessing risk consisting of four respondents, two national and two regional. One national respondent said that there is a need for more structure and rigor to be able to compare the risk and vulnerability assessments. Three respondents, one national and two regional, wanted to improve the quality of their risk and vulnerability assessments by clarifying the connection between risks, vulnerabilities and measures. The other camp, consisting of one national and two regional respondents, preferred the freedom of adapting the methods used to their own context. However, all three respondents mentioned the need for clarity in the instructions but argued that the solution was not a general method since it would reduce the possibility to adapt to local circumstances.

In relation to a more regulated method two national respondents expressed that the risk and vulnerability assessments have to be more quantitative. Another respondents on the national level did not see quantification as practicable since it is too much information and a huge workload.

Another point of improvement was the frequency of performing the risk and vulnerability assessments. Four respondents, two national and two regional, explicitly mentioned that a reduced frequency from the current annual assessment to semi-annually would increase the quality of the risk and vulnerability assessments in national authorities and/or County Administrative Boards. According to all of them this would enable the possibilities to implement risk-reducing measures. However two respondents, one regional and one national, wanted the municipalities to increase their frequency from once every fourth year to semi-annually.

Two national respondents requested increased possibilities to perform inspections of the work but also incentives to perform risk-reducing measures, such as financial benefits. One regional respondent pointed out that a weakness with the risk and vulnerability assessment is that it is easy to pay attention to high consequence – low likelihood scenarios but there is a need to look beyond these scenarios. The respondent also pointed out that the regional risk and vulnerability assessment often treated national issues such as energy supply, infrastructure and telecommunication. The respondent said that there are obviously factors that affect them but they cannot control it. The respondent would instead prefer that

the regional risk and vulnerability assessment should focus more on the risks that distinguishes the region from others.

All through the interviews the respondents working on a regional level did not mention as many weaknesses and points of improvements as the respondents on the national level.

5 Discussion

The aim of this thesis is to describe how risk and vulnerability assessments are utilised in the decision making process on the national and regional level in Sweden. This section begins with reflections on the results from the interviews and their relation to other research on the topic. Afterwards follows a short description of how risk and vulnerability assessments are utilised on the national and regional level. Observed gaps within the work with risk and vulnerability assessments will also be identified. During an interview study there are possible biases that can affect the result and thereby also the analysis of the result. These possible biases will be discussed at the end of this section.

5.1 Reflections

Based on the result from the interviews, presented under the heading *result*, together with input from earlier studies performed by others the analysis aims to see hints on development, strengths and weaknesses with how risk and vulnerability assessments are utilised in the decision making process for disaster management in Sweden. The aim is also to highlight interesting and relevant thoughts from the respondents.

5.1.1 The concept of risk

Seven of ten respondents answering the question about the concept of risk included consequences in their definition. In order to make risk-informed decisions a risk and vulnerability assessment without a description of the consequences is not useful for a decision maker. There were only four respondents including uncertainty in their definition of risk. This could be seen as a weakness since risk and vulnerability assessments often are uncertain because the future cannot be predicted. Describing uncertainties could help the decision makers to understand how uncertain the analysis is which in turn helps them evaluate and prioritise between different risks.

It is difficult to come up with one concluding definition of the respondents' view of the term risk since the answers were too vague and straggling. It seems like there is no clear and widespread definition of risk in the Swedish disaster management system. There is instead an ambiguity regarding the meaning of the term. One reason to this could be that there is no common definition of risk in academia and that the concept is difficult to describe. The uncertainties are most likely transferred into the risk and vulnerability assessments. It could be difficult to perform a comprehensive risk and vulnerability assessment without having a clear understanding of risk.

However, when asking about what a risk and vulnerability assessment is the respondents were more confident in answering the question. The reason to this could be that risk and vulnerability assessment is more concrete while defining risk is more abstract and not often done. Even though risk is abstract the risk and vulnerability assessment could be improved if the concept of risk is further discussed to be better understood. A widely used definition of risk would make the risk and vulnerability assessments more homogenous and easier to communicate. The problem with lack of common definitions is also identified by Månsson et al. (2015, p. 10) who concludes that this is a known and reoccurring problem in the Swedish disaster management system.

All ten respondents answering the questions about risk and vulnerability assessment included identification and analysis of events but only five included evaluation. Risk evaluation is an important part for decision making and therefore it is a bit alarming that this is the part of the risk and vulnerability assessments least mentioned by the respondents. The reason for not including risk evaluation could be that a prerequisite for evaluation is that there are criteria to evaluate against. These criteria should include different perspectives such as human, environmental and economic consequences. It could be difficult to set up these criteria, which might result in a too big workload. However, this result may be biased by respondents including evaluation when talking about analysis.

Risk evaluation enables the decision makers to understand the situation and identify areas in need of resources. Consequently it is important that the risk evaluation is comprehensive when using the risk and vulnerability assessment as a tool in the decision making process.

5.1.2 Risk and vulnerability assessments as input for decision making

All twelve respondents agree that risk and vulnerability assessments provide an input for decision making. Only six respondents further explained how risk and vulnerability assessments are used as input which implies that the connection between risk and vulnerability assessments and decision making is unclear. Four of the six respondents said that risk and vulnerability assessments are used to include risk-reducing measures in the organisation's activity planning. The two other respondents said that the assessments are used to apply for funding which implies some sort of activity planning.

It is seen as positive that all the twelve respondents mentioned risk and vulnerability assessment as a tool for decision making since one of the purposes with a risk and vulnerability assessments is to communicate the situation and provide decision support. The interview study was presented as a study of how risk and vulnerability assessments are utilised for decision making. Therefore the respondents could be biased from the topic of the interviews. Only seven of twelve respondents mentioned risk and vulnerability assessments as a part of a process, which is a bit more alarming. If the risk and vulnerability assessments are not seen as a process it is easy that the organisations are satisfied with just writing them and then putting them on a shelf instead of implementing them in the work with risk-reducing measures and as a support for decision making. This together with one respondent's worry regarding that the same risk and vulnerability assessments are reused year after year with a few additions could point at them being seen more as a mandatory report than as a process to increase preparedness within the whole of society. Maybe is there a change going on regarding this, at least at the regional level. Five of these seven respondents operated on a regional level. Two of them explained that they have started the work with improving the work with risk and vulnerability assessments towards a more holistic, including and comprehensive process.

Risk and vulnerability assessments do not reach their full potential if they are not seen as a process. The risks and the vulnerabilities in a society are dynamic and change with both external forces as for example climate change or by the political situation in the surrounding world but also with implemented risk-reducing measures and changes in organisations. The need of a process could be related to Becker (2014) and his thoughts about a resilient society. He states that a resilient society is dependent on the ability to anticipate, recognise, adapt and learn (p. 154). These abilities require a process and are thereby not fulfilled with just a report on a shelf. Utilising risk and vulnerability assessments as a process is important to continuously develop along our preferred expected trajectory since it helps anticipating future deviances from what society values.

Worth mentioning is also the thoughts about the differences in the data that the risk assessors work with. This is concluded through input from four respondents who clearly said that there are differences as well as a general frustration among the respondents regarding the current use of the received data. Even though they were frustrated they were also understanding why there were differences. The reason mentioned was lack of resources. It felt like lack of resources was an acceptable reason to why the system has inadequacies. As one respondent said, there is always a competition about resources and the public sector will never have enough financial resources. A reflection regarding this is that it is easy to blame an inadequate system on lack of resources even though there are other reasons for this inadequacy.

Another reason to the differences in the data could be that the risk assessors perform the analyses without contemplating the purpose of the assessments within the Swedish disaster management system. In an organisation it is easy to perform activities without basing them on objectives. One way to avoid this kind of problem is to increase the communication about why the assessments are made

and what goals they are purposed to fulfil. The communication should take place between the risk assessors on the same level as well as with the levels above and below in the system. It is easier to communicate the objectives of an assessment when having a deeper understanding of the system as a whole which makes the communication with the level above quite important. This type of communication should be initiated from the higher level since it ought to be easier to see the need for it when having a broader picture of the system and the roles of each function within it.

One respondent from the national level said that the work to come up with a risk and vulnerability assessment is so comprehensive in time that there is no energy left over for implementing the risk-reducing measures. Further, according to the respondent, the reason why the risk-reducing measures are not implemented could also depend on the funding - a risk and vulnerability assessment is cheaper than an actual measure. One of the main points with risk and vulnerability assessments is that they are used to identify and motivate risk-reducing measures. If there are no resources left to implement them there is a problem. Seven of ten respondents talking about what a risk and vulnerability assessment is mentioned that risk-reducing measures are a part of the assessment. To which extent is unknown. It is not a guarantee that there is a connection between the identified risk-reducing measures and the implementation of them. One consequence of this could be that it is difficult to see the relation between the assessments and the commitment of the organisation to reduce risk. Implementing measures is a pillar of disaster management and if the assessments do not include risk-reducing measures there is a possibility that no measures are implemented.

5.1.3 Strengths and weaknesses with risk and vulnerability assessments

One interesting point about the result from the interviews is how the respondents answered the question about strengths with risk and vulnerability assessment as input in the decision making process. Less strengths were mentioned compared to weaknesses and when talking about strengths some of the respondents added an *if* when talking about how the risk and vulnerability assessments could be used and *if* they were used that way, it would be a strength. This could be interpreted as the respondents knowing that there is more potential in the tool. When asking about weaknesses most respondents answered the question with less hesitation compared to the question about strengths. One explanation to this could be that it is more common that people see the problems or the weaknesses easier than the advantages. The question about why they do not use the risk and vulnerability assessment as they explain with the added *if* remains. Is it the lack of resources, commitment or is it the Swedish disaster management system that prevents an optimal use?

Since there is an expressed frustration it is not surprising that they see weaknesses in the method. The weaknesses are not seen as the core problem with the system, instead they can be seen as symptoms. For example, the differences in the material sent to the authorities is a commonly mentioned weakness. The core problem could probably relate to the method used or the principles of the Swedish disaster management system regarding how to work with the risk and vulnerability assessments but the problem could be shown via differences in the quality of the risk and vulnerability assessments.

An interesting observation is that the most common strength, mentioned by eight respondents, is that risk and vulnerability assessments are used to motivate risk-reducing measures. In contrast to this, one reoccurring weakness mentioned by three respondents is that there is a weak connection between the risk and vulnerability assessment and the risk-reducing measures. Two of these three respondents belong to the respondents who said that a strength with risk and vulnerability assessments is that they are used to motivate risk-reducing measures. Worth to keep in mind in this contradiction is the last heading that should be included in the risk and vulnerability assessments according to the regulation from the Swedish Civil Contingencies Agency: *Required additional measures on the occasion of the results from the assessment* (MSBFS 2015:3; MSBFS 2015:5). The conclusion of this contradiction is that the use of risk and vulnerability assessments to motivate risk-reducing measures differs a lot as

they are used today but also that the regulation from the Swedish Civil Contingencies Agency is not converted fully into the work with the assessments and the risk-reducing measures. Even if this is a new regulation for 2015, the same heading can also be found in the earlier regulation (MSBFS 2010:7).

Another weakness is the glitch in knowledge of what happens with the risk and vulnerability assessments at other levels. When asking about the process the respondents often explained the process below them, such as from whom they received the data and how they summarised them. Then the majority of the respondents just said one or two sentences about to whom they send their risk and vulnerability assessment but nothing about how they were processed at the next level. During three interviews with national respondents probing questions were asked about if they wanted to know more about what happened on the next level. The answers were a bit struggling resulting in that there was no further interest in how their risk and vulnerability assessments were received and further analysed. This is also related to the thoughts from the respondents about feedback and that there are no general guidelines for feedback today. One explanation to this related to decision making is the three principles in crises management in Sweden and the bottom-up approach. The work should take place where the crisis occurs and should be performed by the people that are closest concerned with as small changes in the organisation as possible. According to the principles the risk-reducing measures should be implemented at the local level by the stakeholders on this level. The work on the governmental level is more about laws, regulations and budget. The cause-effect relation could be easier to see at the local and regional level. The decisions that are made on the national political level do not receive the same commitment and are often the effect of many contributing causes. Another explanation could be that the risk assessors work with the material sent from the level below them and are therefore more concerned about it since it is the foundation that enables them to do a good work.

The question that could arise from the lack of knowledge in how the risk and vulnerability assessments are used at the next level is if there is a need of increased feedback and transparency between the different levels. One profit with increased transparency is that it could be easier to see dependencies and if many regions or organisations face the same problems. If that is the case, there is a need for decisions regarding national or political measures. To be able to make these decisions, the information must reach the decision makers. To increase the transparency there is a need for feedback of what is important to include but maybe also changes in methods, regulations and directives.

The result from the interviews also point at the regional level being more satisfied with the process compared to the national level. On the regional level more respondents referred to risk and vulnerability assessments as a process compared to the national level. It was also more respondents who expressed a frustration about the topic disaster management on the national level compared to the regional level. The reason could be that work with risk and vulnerability assessments is less developed on the national level compared to the local and regional level. It could also depend on that the national level receive data from two lower levels compared to the regional level who work with data from the level directly below them. Transparency could be lost at the levels below and consequently make the work more difficult at the national level.

5.1.4 Points of improvement

The points of improvement mentioned during the interviews are difficult to draw general conclusions from. They are dependent on personal preferences and the respondents' backgrounds. The most commonly mentioned points of improvement will be analysed below.

Clarifying the connections between risk and vulnerability assessments and the risk-reducing measures

Clarifying the connection between risk and vulnerability assessments and the risk reducing measures is a recurring improvement mentioned during all parts of the interviews. The judgement is that it is possible to create an improvement regarding this since these connections are one of the main points with the risk and vulnerability assessment process. How the improvement should be implemented and how the situation is today needs further research to answer.

Månsson et al. (2015) conclude that today there are insufficient directives, dissimilar in prerequisites, mixed purposed and lack of time to provide feedback in the disaster management system. This makes the professionals working with the risk and vulnerability assessments frustrated and leads to decreased willingness to use the available data presented by others. They mean that all this could affect the ability to do a comprehensive work with the risk and vulnerability assessments including the implementation of risk-reducing measures (p. 12). These conclusions together with the result from the interviews within this thesis indicate that the vague connections between the assessments and the measures could be explained by the regulations and directives used today. Related to the result from the interviews in this study it seems like the funding and the ownership of the measures also is an interference to implementation of risk-reducing measures. The lack of resources and the dependency on extra funding for risk-reducing measures should therefore also be seen as something that should be further analysed.

More quantitative data in the risk and vulnerability assessments

One point of improvement expressed by two respondents on the national level is that the risk and vulnerability assessments have to be more quantitative. Another respondent on the national level did not see quantification as practicable since it is too much information and a huge workload. The idea of more quantitative data could contribute to increased transparency. On the other side respondents already express that the workload with the annual risk and vulnerability assessments is too big. The discussion on whether risks should be quantified or not is a recurring discussion, which could be related to the different approaches to risk presented in the *theoretical background*.

Quantitative likelihoods and uncertainties were seldom mentioned during the interviews. More quantitative risk and vulnerability assessments could help the decision makers to better prioritise which measures to implement and also to motivate risk-reducing measures. Worth mentioning in this context is that people in general, including decision makers, have problems to understand small likelihoods and frequencies. Kahneman (2012) states that people overestimate the probabilities of unlikely events and therefore people overweight unlikely events in their decisions (p. 324). Disasters are often unlikely events and thereby people ought to be overestimating their likelihood. Even if the risk and vulnerability assessments are quantitative it is difficult for the decision makers to judge the information but an overestimation of the likelihood is better than no likelihood at all. Many respondents in this thesis do not have a background in the technical sciences which can affect their view on quantification compared to if a technical science background had dominated among the respondents.

Abrahamsson and Tehler (2013) have evaluated risk and vulnerability assessments from County Administrative Boards in Sweden from 2008 and 2010. They conclude that the risk and vulnerability assessments do not fulfil what is needed as input to the national risk and vulnerability assessment.

To achieve their purpose they need to provide more information about scenarios, likelihoods and consequences. They also conclude that the risk and vulnerability assessments from 2008 and 2010 present risk in a qualitative or semi-quantitative manner with the majority of the assessments being qualitative (pp. 88-90). This conclusion confirms the lack of quantitative risk and vulnerability assessments in this area.

A more regulated method

All municipalities and counties face their own risks. There is a need for everyone to be able to adapt the method to their own conditions. The more regulated method, the more likely it is that it *could* be difficult to apply to all concerned organisations. One regional respondent expressed a worry that a more regulated method is often better customised to the big regions compared to the small. A more regulated method could also limit the possibility to think outside the box of what can happen. On the other hand a regulated method could increase the comparability between the assessments since they will be more homogenous.

The decision makers are represented on all levels in the society due to the three principles of the crisis management system in Sweden. Decisions about risk-reducing measures are made on all levels, from the municipalities to the government. Therefore the knowledge from the risk and vulnerability assessments need to be spread to all levels but there is also a demand of a limitation in how much information that could be spread. The decision makers and risk assessors have limitations in how much time they can spend on the assessments. As one national respondent pointed out during the interviews: the politicians on the local level do not have time to utilise all the information available as it is now.

Change how often the risk and vulnerability assessments are performed

Another recurring idea of improvement is that the risk and vulnerability assessments should be performed more seldom. This would give more time to implement the measures and also that more time could be spent on the process instead of annually producing a report. The idea seems feasible but it could include some challenges. The disadvantages with it could be political. An increased time interval could send signals that the work with disaster management is of lower priority. Therefore it is important to create an understanding that the risk and vulnerability assessments are a part of a more comprehensive work and also that the change would enable strengthened disaster management in Sweden. The advantages with it related to decision making are that the analyses are more comprehensive and also easier to base decisions on. If the link to implemented measures increase it will be easier for the decision makers to see how their decisions and priorities changed the risks and vulnerabilities.

Even if disaster management in Sweden is not the topic of most interest to the population there is still politics in it. As stated in the result, it is important which signals the politicians send. If Sweden face a disaster the commitment from the population will increase and it is thereby important to make the right political decisions. The politics about the disaster management is related to the risk perception of people. If we have recently faced a disaster it is easier to spend money on risk-reducing measures for this disaster compared to new threats. People are biased by what they have experienced recently which is known as availability bias. Also, the more concrete the disaster is for our senses, the easier is it for people to react on it (Becker, 2014, pp. 165-166).

The fact regarding how we are affected by what happened recently is described by Alexander (2015). He refers to theories about *windows of opportunity*. A disaster could be seen as window of opportunity for positive change. He explains that after a disaster the public will strongly support efforts to reduce risk (p. 222). One problem with this is that the world is changing and the future is no longer an extrapolation of what has happened. We will miss or ignore scenarios if we base our actions on recent

experiences only (Becker, 2014, p. 166). An interesting thing is that the window of opportunity does not always generate the requested measures. One example of this mentioned by several respondents was the forest fire in Västmanland in august 2014. Before the fire there was ongoing work to increase the time interval for the risk and vulnerability assessments for the County Administrative Boards and the national authorities. The forest fire did not result in the expected changes about the time interval, rather the opposite since no one wanted to make decisions about an increased time interval after the event because of political reasons. On the other hand the forest fire generated other positive aspects such as discussions about the preparedness in Sweden, the role of the risk and vulnerability assessments and the three principles in Swedish crisis management.

Alexander (2015) pinpoint another relevant thought about disaster risk reduction and politics. He states that people do not often see disaster risk reduction as a popular option and politics is about what people want (p. 225). One consequence of this related to the research question and the result is that there is not enough commitment to the topic. However, perhaps there will soon be a change in the time-interval for the national authorities. The Swedish Civil Contingencies Agencies request to reduce the time interval to every second year for national authorities but that requires a change in 9§ *SFS 2006:942: The Regulation of Emergency Preparedness and Increased Preparedness*. This change has to be done by the government (MSB, 2015e).

Create increased possibilities to follow-ups

This could be related to the discussion about a more regulated method. The disaster management in Sweden relies on a bottom-up approach. This could make it difficult to use a more top-down oriented approach. There is currently a discussion going on within the Swedish disaster management system to increase the possibilities of top-down management in crises situations.

5.2 The use of risk and vulnerability assessments in the decision making process

To be able to answer the research question it is of importance to find out where the decisions are made and by whom. No clear distinction between risk assessors and decision makers has been found within the scope of this thesis. Therefore it has been difficult to describe how risk and vulnerability assessments are utilised as input for decision making. The difficulties in finding respondents with a clear decision making mandate brings out the question whether it is even clear to the professionals working within the Swedish disaster management system by whom the decisions are made. This in turn can be connected to the previous reasoning about not seeing the purpose of the risk and vulnerability assessment. If it is uncertain who are going to use the assessment as decision support it is difficult to know how to communicate it and from where to expect feedback on the results.

A summary of the process on the regional and national level is made from the findings from the twelve interviews together with working documents received from the respondents as well as information in the *theoretical background* is presented in the following sections.

5.2.1 Risk and vulnerability assessments at the regional level

The County Administrative Boards in Sweden, which have been representing the regional level of the Swedish disaster management system in this study, use their risk and vulnerability assessments in different ways when it comes to reducing disaster risk. Some boards use them in order to apply for funding while others use them as an input to their activity plans. In general risk and vulnerability is approached in a qualitative manner by the respondents. The assessment is conceived through various activities such as workshops with municipalities and other important stakeholders on the regional level as well as utilising risk and vulnerability assessments from the municipalities, County Councils and other national authorities.

The County Administrative Boards' risk and vulnerability assessments are presented to, and signed off by, the head of the County Administrative Board and is sent to the Swedish Civil Contingencies Agency and to the Government Offices. How the risk and vulnerability assessment is utilised within each County Administrative Board after it has been signed off differs. Four of five respondents working on a County Administrative Board use it as input when planning exercises and seminars on crisis management but how it is utilised by other parts of the organisation is unclear.

The mandate to perform risk-reducing activities lies on several different stakeholders where the principles of proximity and responsibility places many mitigating measures within the mandate of the municipalities. This, together with the difficulties in motivating expensive activities with an unclear effect, makes it hard to connect performed risk-reducing activities to the risk and vulnerability assessment. Thereby the documents become a general description of the risks and vulnerabilities present in the county and are not used to their full potential as a tool for decision making.

When looking at funding of risk-reducing activities there are some differences between the County Administrative Boards. One reoccurring answer, mentioned by three of five respondents from the County Administrative Boards, was that the boards were in one way or another depending on grants from the government to develop their disaster management capabilities by performing risk-reducing activities. One respondent even stated that about half of the County Administrative Boards disaster preparedness was funded by the *2:4 Emergency Preparedness Grant*. A conclusion from the interviews is that the risk and vulnerability assessments are important to support decisions about extra funding.

Five of six regional respondents said that the risk and vulnerability assessment are a part of a process. The question is how comprehensive the process is since four regional respondent also said that one weakness with risk and vulnerability assessments is that it becomes a shelf item. The risk and vulnerability assessment does maintain the capability to spread knowledge and information to relevant stakeholders but becomes more of a reactive document where the identified events are based on past events to anticipate future deviances. This is not optimal since the future cannot be anticipated based on past experiences alone.

One respondent said that the risk and vulnerability assessment is not the only way of identifying potential risk-reducing activities, which of course is true. However, these other ways of identifying vulnerabilities and risk-reducing activities such as workshops or lessons identified from exercises ought to be an input to the risk and vulnerability assessment. Therefore they should be included in the document with the aim to present a representative view of the situation to the decision makers.

Two of five respondents from County Administrative Boards said that their boards have started to work with improving the way they perform risk and vulnerability assessments. There are ongoing changes towards a more holistic and collaborative way of working with risk and vulnerability within the counties. This seems positive for the decision makers since the holistic perspective is important to make risk-informed and relevant decisions.

5.2.2 Risk and vulnerability assessments at the national level

Two of six national respondents said that the risk and vulnerability assessments sent to the authorities from a lower level differ a lot in their extent and quality. This makes it difficult to aggregate them and to make decisions based on them. Despite this, all the authorities represented in this study experience that the risk and vulnerability assessments are appreciated in the decision making process. The differences in the data makes it difficult for the national authorities to use their own methods because it is not known how the data has been treated when the analyses are done. There is no stringency in methods used. All national authorities have to follow the guidelines from the Swedish Civil

Contingencies Agency but there are no regulations on which method to use. The differences in methods create difficulties in making comparisons and observing trends over time.

According to two of six national respondents the risk and vulnerability assessments are used as a support for the upcoming activity planning by the authorities. Often the events from the recent years are used as input in the risk and vulnerability assessments. Overall the risk and vulnerability assessments performed by the interviewed organisations are qualitative in their data. Since the sectors often are big the risk and vulnerability assessments are also general which could make them difficult to act on. It is important to keep in mind that even though these difficulties exist, the risk and vulnerability assessments are an appreciated tool for decision making since they generate a knowledge to make decisions from even if they do not fulfil their potential.

Today the risk and vulnerability assessments have deficient links between the risks and the proposed measures according to two national respondents. This is a problem even though the regulations from the Swedish Civil Contingencies Agency says that the national authorities should analyse the *need for additional measures on the occasion of the results from the assessment* (MSBFS 2015:3). There are also identified inadequacies regarding the report of the actions taken from the last risk and vulnerability assessment, which could have changed the organisations capacity. One respondent said that often, not all implemented risk-reducing measures are reported which makes the national authorities insecure about if and to what extent risk-reducing measures are implemented and also which decisions are made.

The implementation of measures is strongly related to the funding. Related to the responsibility principle every agency should fund their own risk-reducing measures if it is not a special occasion. Respondents from the national level felt confident in the knowledge that they should fund most risk-reducing measures from their own budget but three national respondents felt worried that the implementation of measures is defective at the regional and local level if they do not get funding from the grants. The risk and vulnerability assessments are of great importance when talking about decisions regarding funding.

One common observation among the national respondents is that the national authorities focus more on the processes at the levels below them compared to what happens at the political level at the departments. All national respondents could better explain the process below them compared to the process at the Government Office. The process at the Government Office is understood from interviews together with working documents. The departments are more interested in problems with the national disaster management system and the interlinked regulations than the actual risks and vulnerabilities. If there are identified inadequacies it is the government's responsibility to manage these with tools as proposals of changes in laws and regulations or in the appropriation warrant. The role of risk and vulnerability assessments at governmental level is not entirely compliant to the purpose of the assessment on the regional or even national level.

The working process with the risk and vulnerability assessments differs a bit between the different departments since there are different needs. Some departments have the responsibility for national authorities that often are included in serious events and some departments are involved more rarely. Therefore there is no method used at all departments. Instead there are recommendations of general process that should be used at all departments.

The Department of Justice sends feedback to the departments which in turn send feedback to their national authorities. There is no general method for giving feedback. Instead it depends on the officials at the departments what feedback they want to give. This could create differences in how much and which sort of feedback every authority has access to. There is no personal feedback from the Swedish Civil Contingencies Agency to the other national authorities. Instead the national authorities refer to

the national risk and vulnerability assessment. Even if there are not much feedback there is no perceived request of it from the respondents within the national authorities.

5.3 Observed gaps

When observing how risk and vulnerability assessments are utilised as support for decisions some areas where there is room for improvement have been recognised, both related to the work with risk and vulnerability assessments but also to the communication between the regional and national level.

The documents from the risk and vulnerability assessments have a tendency to become separated from the risk management process. This result in that the risk and vulnerability assessments become a shelf item and do not fulfil their potential. The problem is related to the difficulties in connecting the risk and vulnerability assessments to risk-reducing activities and the implementation of risk-reducing measures.

An observed difference between the regional and national level related to the implementation of risk-reducing measures is the view on how to use grants to finance disaster management. On the regional level it is seen as a necessity to maintain reasonable disaster preparedness while the national authorities seemed to see them as a complimentary tool to their ordinary budget.

Another gap identified is that there is not enough focus on the risk evaluation in the risk and vulnerability assessment. Risk evaluation is an important part in the decision making process but it is also difficult to do a comprehensive risk evaluation. The evaluation is related to the risk-reducing measures since one approach is to evaluate against the effect of risk-reducing measures.

The view on communication of the risk and vulnerability assessments and the need for feedback between the levels differ. There seems to be less interest in how the risk and vulnerability assessments are used after they have been passed on to the level above compared to what is produced on the level below. The need for feedback is recognised at both the regional and national level to clarify the effect of the risk and vulnerability assessments.

5.4 Possible biases

Performing research implies including some biases related both to the method and the respondents. It is important to keep these biases in mind when analysing the results and drawing conclusions from the work. Even though there are identified possible biases in the result and the sample is small, the thesis is considered to provide an analytical generalisation (Yin, 2003, p.10) of how risk and vulnerability assessments are utilised in the decision making process in the Swedish disaster management system.

5.4.1 Method

A bias of the thesis is the inexperience of the authors when it comes to performing interviews. Interviewing is an art and claiming to perform quality interviews without having the experience would be unwise. The learning curve of performing interviews has been quite fast and therefore the last interviews held were better performed than the first ones. In order to be able to ask relevant probing question and discuss the topic during the interviews a small literature review was performed. The aim was not to get a complete picture. To improve the quality of the thesis a more structured and complete literature review could have been performed. Since the purpose of the thesis is to perform a descriptive study based on interviews the extent of the literature study is not regarded to have had a large impact on the result.

The interview guide used worked fairly well and the questions used often provided long answers from the respondents. The responses were mostly on-topic. A weakness concerning the interview guide is that it was not possible to use it with all respondents due to time restraints or a need to focus the questions in a certain interview to the respondents work. This was done in three interviews and while they did not answer all the questions from the guide, they all provided information that was useful to answer the research question.

Eight of twelve interviews were held using telephone. These interviews tended to be shorter and provide less elaborate answers than the interviews held in person, which was expected since it is possible to develop a more trustful relationship in person than over telephone. This provides a possibility of affecting the result since the interviews held in person provided more personal opinions and more elaborate answers. However, since only four of twelve interviews were held in person, this is regarded to have a low impact on the result and since the more information gained is better the interviews held in person should be seen as advantages of the thesis instead of weaknesses.

The analysis of the interviews comes with several biases. The definition of risk adopted in this thesis together with the authors' backgrounds in engineering places focus on quantification and concretisation of risk which might result in less notice being taken of other approaches to risk. When compiling the results the points chosen to place focus on are not the only ones made in the interviews which implies a certain selection must have been made. This selection was based on the points mentioned by most respondents and the relevance of these points to decision making and risk and vulnerability assessments. Since there were no respondents showing any extreme views on the concept of risk and the use of risk and vulnerability assessments the screening process is considered to be objective in regard to what points to focus on.

The results have been compiled simultaneously with the interviews, which may have affected the outcome of them. The results from previous interviews has opened up for probing questions in following interviews. Since semi-structured interviews were used, this has not been considered an issue but an opportunity to increase the detail and depth achieved in the interviews. One problem this may have caused is to introduce leading questions into the interviews when trying to pinpoint certain problems. This was observed, especially in the early stages of interviewing, but is not considered to have affected the respondents' answers in any major way.

When compiling and analysing the results it was difficult to draw conclusions from what was not mentioned in the interviews. On the other hand, the responses from the interviews show what comes to the respondents mind at the time which might imply whether one area of inquiry is more considered or not. Determining this is one of the hardest parts of compiling the results and creates a weakness in the result.

Another bias related to the analysis of the interviews is that the respondents could have used different notions for describing the concept of risk while meaning the same thing. This could have affected the result regarding how many respondents included the different parts of the concept of risk in their answers.

When performing interviews with open-ended question it is important to keep in mind that the interviews will focus on different perspectives of the topic. Every respondent will talk about that they know and what they are interested in. This makes it difficult to quantify the result since all interviews do not include the same data. Compared to if a questionnaire had been used the data had been more quantifiable but it would also omit interesting thoughts and opinions that the questions do not cover. Since this study is descriptive, getting the thoughts and opinions about the system was valued higher than a quantifiable result.

The result could also be biased by which opinions are presented from the interviews. There is no possibility to present everything mentioned during the interviews. The aim has been to present the most common views of how risk and vulnerability assessments are used for decision making. Some opinions mentioned by only one respondent have also been presented since they have been determined as interesting to the result. If someone else has worked with the same interviews it is possible that they would have highlighted other things. Once again, since there are no general conclusions drawn from the specific interviews this is not seen as weakness with the thesis.

5.4.2 Respondents

There is a possibility that the respondents interviewed represent a small part of the desired population that has an interest in participating in studies such as this one and that this may have resulted in that only the views of one demographic within the researched population is represented in the result. Not all national authorities or County Administrative Boards working with risk and vulnerability assessments were contacted due to limitations in time. The national authorities were mainly contacted through registrars and depending on whom the request was forwarded to the resulting interview ought to have yielded different results. However, the respondents were able to provide answers to most of the questions and should be considered a representative sample of the professionals involved in disaster management in Sweden today. They cover a variety of backgrounds and are distributed between young professionals and professionals with extensive experience in the field.

The differences in experience clearly showed when it came to the interviews. More experienced respondents were inclined to provide personal views and clear answers to the questions while more inexperienced respondents tended to be unclear in their answers and not as open with their personal opinions.

The research process did not consider the geographical distribution of the respondents, which could have impacted the result by focusing it to a certain part of Sweden. The most geographically sensitive group of respondents is the County Administrative Boards and the interviews turned out to cover central and southern Sweden. There were no respondents from northern Sweden. This was not considered beforehand and might provide a bias but is not believed to have impacted the study in any important manner.

The sample is not very large. This is a result of the timeframe of the thesis. The conclusions drawn from the interviews can therefore not be regarded as a complete image of the Swedish disaster management system. Yet it is considered to be large enough to provide an analytical generalisation (Yin, 2003, p.10) of the question at hand. The interviews have provided a fairly good theoretical saturation, which means that the last interviews did not change the general result. Instead the last interviews strengthened the already identified areas of inquiry.

5.5 Areas of interest for further research

To gain a better understanding of how risk and vulnerability assessments are utilised in the decision making process a study of how identified risk-reducing measures are implemented today is of interest. What has been included in the risk and vulnerability assessment that motivate implementation? How many of the identified risk-reducing measures are implemented and how are they funded? How dependent are the risk-reducing measures on extra funding?

Another area of further interest is how the politicians on all levels experience the material they receive from the risk and vulnerability assessments and how important the material is compared to other inputs when making decisions.

6 Conclusions

Risk and vulnerability assessments are an important part of the Swedish disaster management system. They are supposed to be used as a first step in the process of reducing risk and vulnerability in society as well as to increase the ability to mitigate the effects of, and respond to, extraordinary events (MSB 2011, pp. 5-6). The assessments can be used as a tool to support decision makers when making decisions regarding disaster management. Earlier research has mainly been done regarding the use of risk and vulnerability assessments on the local and regional level in Sweden, as can be seen in for example Hassel (2012), Abrahamsson and Tehler (2013) and Lin, Nilsson, Sjölin, Abrahamsson and Tehler (2015). Today there is a limited knowledge regarding how risk and vulnerability assessments are utilised as an input to decision making on the regional and national levels in Sweden as well as how they are perceived.

The purpose of this thesis has been to perform a descriptive study of how risk and vulnerability assessments are utilised as input to decision making in the field of disaster management at the regional and national level in Sweden. To fulfil this purpose an interview study consisting of twelve semi-structured interviews, six with respondents operating on a national level and six operating on the regional level of the Swedish disaster management system, was performed.

Decisions regarding risk-reducing measures are made on all levels in Sweden, by administrators and politicians from local to national level depending on the extent of the decision. The Swedish disaster management system relies on a bottom-up approach, which entails that decisions about risk-reducing measures are mainly made on the level closest to the risk. To be able to answer the research question it is of importance to find out where the decisions are made and by whom. No clear distinction between risk assessors and decision makers has been found within the scope of this thesis. Therefore it has been difficult to describe how risk and vulnerability assessments are utilised as input for decision making. The difficulties in finding respondents with a clear decision making mandate brings out the question whether it is even clear to the professionals working within the Swedish disaster management system by whom the decisions are made.

Based on the twelve interviews the following conclusions can be drawn regarding how risk and vulnerability assessments are utilised in the decision making process for disaster management at the national and regional levels in Sweden:

- Risk and vulnerability assessments are appreciated as a tool for decision support.
- There is a weak connection between the risk and vulnerability assessments and risk reducing measures since it is unclear how suggested measures are implemented and followed-up on.
- The greatest strength with risk and vulnerability assessments today is that they are used to motivate risk-reducing measures.
- There is a deeper frustration about the process with risk and vulnerability assessments on the national level compared to the regional level. This is based on emotions perceived and identified weaknesses during the interviews.
- Risk evaluation is not considered to be an obvious part of a risk and vulnerability assessment since it is only mentioned by half of the respondents when asked about the content of a risk and vulnerability assessment.
- There is an ambiguity among the professionals in the field on the concept of risk which could affect the quality of the risk and vulnerability assessments.

Based on the findings from the interviews the work with risk and vulnerability assessments in the Swedish disaster management system can be improved. A more developed process with risk and vulnerability assessments will positively impact the Swedish society's ability to anticipate and adapt to the uncertainty of the future, recognise deviances and learn from past and anticipated events and thereby help creating a more resilient society.

In order to utilise the full potential of the Swedish disaster management system it is important that there is efficient and effective communication between all levels: local, regional and national. Today the system relies on a bottom-up approach, which makes it difficult to change the situation by using laws and regulations. Instead, there has to be a change towards a more centralised system or an increased ownership of the question from the lower levels and upwards. It is difficult to develop a system suitable to all levels of the Swedish disaster management system. The aim with this thesis is not to come up with general solutions. Instead the findings should be seen as an analytical generalisation of what the situation looks like today. Some recommendations on future development are made based on the result from the twelve interviews.

First, this thesis agree with the Swedish Civil Contingencies Agencies that the national authorities and County Administrative Boards should perform risk and vulnerability assessments every second year instead of yearly since this would enable increased possibilities to implement as well as to follow up risk-reducing measures.

In addition to this, risk evaluation needs to be given more attention since this is an important input for decision making. One way to do this is to work more with developing measurable criteria for evaluation. Every authority should develop their own criteria in order to be able to adapt them to their own context.

There needs to be increased communication between the regional, national and political levels to get a better understanding of how the risk and vulnerability assessments are used on other levels and also to get input regarding whether the assessments are useful. The initiative to this should be taken by the national authorities.

7 References

- Abrahamsson, M., Tehler, H. (2013). Evaluating risk and vulnerability assessments: a study of the regional level I Sweden. *Int. J. Emergency Management*. Vol. 9. No. 1. pp. 76-92.
- Alexander, D. (2015). Political Responses to Emergencies. In A. Collins, B. Manyena, S. Walsh, J. F. Shroder (Ed.) *Hazards, Risks, and Disaster in Society* (pp. 217-231) Amsterdam: Elsevier.
- Aven, T. (2007). A unified framework for risk and vulnerability analysis covering both safety and security. *Reliability Engineering and System Safety*. Vol. 92. pp. 745-754.
- Aven, T. (2011). A risk concept applicable for both probabilistic and non-probabilistic perspectives. *Safety Science*. Vol. 49. No. 8-9. pp. 1080-1086.
- Aven, T. (2012). The risk concept – historical and recent development trends. *Reliability Engineering and System Safety*. Vol. 99. pp. 33-44.
- Aven, T. (2013). On the meaning of a black swan in a risk context. *Safety Science*. Vol. 57. pp. 44-51.
- Aven, T. (2015). Implications of black swans to the foundations and practice of risk assessment and management. *Reliability Engineering and System Safety*. Vol. 134. pp. 83-91.
- Becker, P. (2014). *Sustainability Science: Managing risk and resilience for sustainable development*. Amsterdam and Oxford: Elsevier.
- Coppola, D. P. (2011). *Introduction to international disaster management, (2 ed)*. Oxford: Butterworth-Heinemann: Elsevier.
- European Commission. (2014). *Sweden – Disaster management structure*. Retrieved from: http://ec.europa.eu/echo/files/civil_protection/vademecum/se/2-se-1.html [2015-09-09]
- Garrick, B. J. (2009) *Quantifying and Controlling Catastrophic Risks*. London: Elsevier.
- Esaiasson, P., Gilljam, M., Oscarsson, H., Wängnerud, L. (2012). *Metodpraktikan – Konsten att studera samhälle, individ och marknad*. 4th edition. Stockholm: Nordstedts Juridik AB.
- Försvarsdepartementet. (2014). *Regleringsbrev för budgetåret 2015 avseende Myndigheten för samhällsskydd och beredskap*, Regeringsbeslut 2014-12-19. Fö2014/125/ESL (delvis), Fö2014/987/SSK, Fö2014/1535/SSK m.fl. Retrieved from: <http://www.esv.se/Verktyg--stod/Statsliggaren/Regleringsbrev/?RBID=16288> [2015-11-03]
- Hassel, H. (2012). Risk and vulnerability analysis in practice: evaluation of analyses conducted in Swedish municipalities. *Natural Hazards*. Vol. 63. No. 2. pp. 605-628.
- Kahneman, D. (2012). *Thinking, Fast and Slow*. London: Penguin books.
- Kaplan S., Garrick J. B. (1981). On The Quantitative Definition of Risk. *Risk Analysis*. Vol. 1. No. 1. pp. 11-27.
- Klinke, A., Renn, O. (2002) A New Approach to Risk Evaluation and Management: Risk-Based, Precaution-Based, and Discourse-Based Strategies. *Risk Analysis*, Vol. 22, No. 6, pp. 1071-1094.
- Lin, L., Nilsson, A., Sjölin, J., Abrahamsson, M., Tehler, H. (2015) On the perceived usefulness of risk descriptions for decision-making in disaster risk management. *Reliability Engineering and System Safety*. Vol. 142. pp. 48-55.

MSBFS 2010:7. *Myndigheten för samhällsskydd och beredskaps föreskrifter om statliga myndigheters risk- och sårbarhetsanalyser*. Retrieved from: <https://www.msb.se/externdata/rs/098ca5ef-1f9c-4a96-b6d1-3736d67c15cc.pdf> [2015-10-15]

MSBFS 2015:3. *Myndigheten för samhällsskydd och beredskaps föreskrifter om statliga myndigheters risk- och sårbarhetsanalyser*. Retrieved from <https://www.msb.se/externdata/rs/2ef1b968-9b11-456e-bf99-77caad87bd92.pdf> [2015-09-07]

MSBFS 2015:5. *Myndigheten för samhällsskydd och beredskaps föreskrifter om kommuners risk- och sårbarhetsanalyser*. Retrieved from: <https://www.msb.se/externdata/rs/15e78831-767b-4714-9fa4-3b4fd0df92a8.pdf> [2015-09-07]

Myndigheten för samhällsskydd och beredskap [MSB], (2011). *Vägledning för risk- och sårbarhetsanalyser*. Karlstad: Myndigheten för samhällsskydd och beredskap (MSB).

Myndigheten för samhällsskydd och beredskap [MSB]. (2012). *Strategier och styrande dokument för klimatanpassning och katastrofriskreducering*. Retrieved from: <https://www.msb.se/RibData/Filer/pdf/26229.pdf> [2015-10-20]

Myndigheten för samhällsskydd och beredskap [MSB]. (2013). *Activity Report 2013 - Sweden's National Platform for Disaster Risk Reduction*. Retrieved from: <https://www.msb.se/RibData/Filer/pdf/27471.pdf> [2015-10-20]

Myndigheten för samhällsskydd och beredskap [MSB]. (2014). *Konsekvensutredning för föreskrift om statliga myndigheter risk- och sårbarhetsanalyser*. Retrieved from: <https://www.msb.se/externdata/rs/ff20ceaf-8b6d-4ccf-bb89-97c74f6ba447.pdf> [2015-10-15]

Myndigheten för samhällsskydd och beredskap [MSB]. (2015a). *Risk- och sårbarhetsanalyser*. Retrieved from: <https://www.msb.se/RibData/Filer/pdf/27577.pdf> [2015-10-15]

Myndigheten för samhällsskydd och beredskap [MSB]. (2015b). *Civil Emergency Planning/Crisis Management in Sweden*. Retrieved from <https://www.msb.se/en/About-MSB/Crisis-Management-in-Sweden/> [2015-09-07]

Myndigheten för samhällsskydd och beredskap [MSB]. (2015c). *Årlig redogörelse och bedömning av samverkansområdenas arbete 2014*.

Myndigheten för samhällsskydd och beredskap [MSB]. (2015d). *Finansieringsprinciper - Anslag 2:☒ Krisberedskap*. Retrieved from https://www.msb.se/Upload/Forebyggande/Krisberedskap/Anslag_2_%20Krisberedskap/Bilaga%201%20-%20Finansieringsprinciper%20version%201.0.pdf [2015-10-08]

Myndigheten för samhällsskydd och beredskap [MSB]. (2015e). *RSA-föreskrifter beslutade – gäller från 1 mars 2015*. Retrieved from: <https://www.msb.se/Om-MSB/Nyheter-och-press/Nyheter/Nyheter-fran-MSB/RSA-foreskrifter-beslutade--galler-fran-den-1-mars-2015/> [2015-11-06]

Månsson, P., Abrahamsson, M., Hassel, H., Tehler, H. (2015) On common terms with shared risks – Studying the communication of risk between local, regional and national authorities in Sweden. *International Journal of Disaster Risk Reduction* (2015), <http://dx.doi.org/10.1016/j.ijdr.2015.08.003>

Prop. 2005/06:133. *Samverkan vid kris – för ett säkrare samhälle*. Retrieved from: <http://www.regeringen.se/contentassets/d4c5867dc0184e438de49c7689336c15/samverkan-vid-kris---for-ett-sakrare-samhalle-prop.-200506133> [2015-09-07]

SFS 1996:1515. *Förordning med instruktion för regeringskansliet*. Retrieved from: https://www.riksdagen.se/sv/Dokument-Lagar/Lagar/Svenskforfattningssamling/Forordning-19961515-med-ins_sfs-1996-1515/ [2015-11-12]

SFS 2006:942. *Förordningen om krisberedskap och höjd beredskap*. Retrieved from http://www.riksdagen.se/sv/Dokument-Lagar/Lagar/Svenskforfattningssamling/Forordning-2006942-om-krisb_sfs-2006-942/ [2015-09-07]

Slovic, P. (1987). Perception of Risk. *Science*. Vol. 236. No 4799. pp. 280-285.

Slovic, P. (2001). The risk game. *Journal of Hazardous Materials*, Vol. 86, Issues. 1-3, pp. 17-24.

Statskontoret. (2014). Mer krisberedskap för pengarna? MSB:s hantering av anslag 2:4. Stockholm: Statskontoret.

Svensk Standard SS-ISO 31000:2009. *Riskhantering – Principer och riktlinjer*. 1st ed. Stockholm: SIS Förlag AB.

Sveriges Kommuner och Landsting. (2015). *Kommuner och landsting*. Retrieved from <http://skl.se/tjanster/kommunerlandsting.431.html> [2015-11-04]

Totalförsvarets forskningsinstitut (2011). *FOI:s modell för risk- och sårbarhetsanalys (FORSA): handbok*. Stockholm: Totalförsvarets forskningsinstitut (FOI).

Yin, R. K. (2003) *Case Study research: Design and methods*. 3rd ed. Thousands Oaks: Sage Publications.

Appendix A: Introducing letter

The following letter was attached in the first contact with the potential respondents.

Examensarbete om hur riskanalyser används vid beslutsfattande

Vi är två studenter som läser till civilingenjörer inom riskhantering vid Lunds Tekniska Högskola. Vi genomför nu vårt examensarbete som handlar om hur riskanalyser används inom katastrofriskreducering, både nationellt och internationellt. Arbetet syftar till att undersöka hur riskanalyser används som stöd i beslutsprocessen inom katastrofriskreducering. För att undersöka detta genomför vi en intervjustudie.

Vi kontaktar er eftersom vi är intresserade av er kunskap och er roll inom ämnet. Intervjun kommer att fokusera på riskanalysernas roll för beslutsprocessen. Intervjun är uppdelad i 4 delar: bakgrund, risk och riskanalyser, beslutsprocessen och förbättringsmöjligheter. Intervjun beräknas ta runt 30 minuter och kommer att genomföras via Skype, telefon eller besök beroende på vad som passar bäst.

Självklart hoppas vi att ni är intresserade av att delta. Har ni ytterligare frågor eller vill delta, vänligen kontakta oss antingen på mail eller på telefon¹.

Bästa hälsningar

Albin Karlberg och Olga Nilsson

Studenter, Civilingenjörsprogrammet i Riskhantering, LTH

¹ E-mail or telephone number is not included in the report.



Appendix B: Interview guide

The interview guides used during the interviews are shown below. The interviews were held in Swedish.

Interview guide version 1

The questions from the first interview guide are presented below.

Stage 1: Individual

1. What is your background?
2. What is your current work?
3. What is risk for you?
4. What is risk and vulnerability assessment for you?

Stage 2: Risk and vulnerability assessments

1. Describe the process you use to assess risk.
Probing: What methods do you use? Why? How are uncertainties described?

Stage 3: Decision making

1. Could you describe the decision making process related to risk and vulnerability assessments?
Probing: Role of risk and vulnerability assessment? Other issues?
2. Which strengths do you see in using risk and vulnerability assessments in the decision making process?
Probing: Why?
3. Which weaknesses do you see in using risk and vulnerability assessments in the decision making process?
Probing: Why?

Stage 4: Points of improvement

1. What problems do you identify with risk and vulnerability assessments as a decision support tool?
Probing: Why?
2. Do you have any ideas on how risk and vulnerability assessments can be improved to be a better support to decisions?
Probing: Why?

Interview guide version 2

The interview guide was updated after the first two interviews. The order of two questions changed and one question was deleted since the respondents answered the same thing on two questions. Also more probing questions were added. The changes are marked with **bold** letters.

Stage 1: Individual

1. **What is your current work?**
2. **What is your background?**
3. What is risk for you?
4. What is risk assessment for you?
*Probing: **What should a risk and vulnerability assessment contain? Why?***

Stage 2: Risk and vulnerability assessments

1. Describe the process you use to assess risk.
*Probing: **What methods do you use? Why? How are uncertainties described?***

Stage 3: Decision making

1. Could you describe the decision making process related to risk and vulnerability assessments?
*Probing: **Role of risk and vulnerability assessment? Other issues? Who implements the risk reducing measures? How are the risk reducing measures funded?***
2. Which strengths do you see in using risk and vulnerability assessments in the decision making process?
*Probing: **Why?***
3. Which weaknesses do you see in using risk and vulnerability assessments in the decision making process?
*Probing: **Do you see this as a problem? Why?***

Stage 4: Points of improvement

1. Do you have any ideas on how risk and vulnerability assessments can be improved to be a better support to decisions?
*Probing: **Why?***

Appendix C: Respondents

Interviews have been conducted with respondents from the organisations below.

The interviews that did not follow the interview guide are marked with *.

BRM Europe*

Energimyndigheten

FOI – Totalförsvarets forskningsinstitut

Justitiedepartementet*

Länsstyrelsen Gotlands län

Länsstyrelsen Gävleborg

Länsstyrelsen Kalmar län

Länsstyrelsen Stockholm*

Länsstyrelsen Uppsala Län

Myndigheten för samhällsskydd och beredskap

Socialstyrelsen

Trafikverket