

## Integrating a national risk assessment into a disaster risk management system: Process and practice



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### ABSTRACT

The national risk assessment (NRA) has recently become a very important component in a country's disaster risk management (DRM) system. The NRA aims to identify threats and hazards that could affect the entire country, and assess their potential likelihood and impacts from a national perspective. Compared to other DRM activities, NRA work is comparatively new, and is often a response to an external demand. For instance, in the European Union (EU), most member states initiated their NRA process in response to a EU directive. This article investigates how the requirement to conduct a NRA has influenced an existing DRM system, taking the case of Sweden as a study case. Specifically, it examines how the NRA process has been integrated into the multi-stakeholder, multi-level, bottom-up Swedish DRM system. Empirical data were collected through 21 semi-structured interviews with representatives from 13 national authorities, supplemented by Swedish and EU documentation. The results were analyzed following the ISO 31000 risk assessment process. The findings provide an indication of how NRA work has been integrated into ongoing DRM activities, and the level of integration. The results also indicate the extent of stakeholder involvement in the NRA process, the quality of DRM information communication among stakeholders, how the NRA has been implemented in the Swedish context, and the potential to expand the NRA worldwide.

### 1. Introduction

Globalization has greatly increased interdependencies in modern society, and seemingly minor events can easily spread and cascade into a full-blown crisis [1,2]. Risks, ranging from everyday occurrences to systemic failure, can trigger severe losses. An all-hazards approach is needed to assess them, while collective, whole-of-society efforts are needed to address them [2–4]. This new risk landscape has generated concerns about governments' disaster risk management (DRM) capabilities in dealing with situations characterized by complexity, ambiguity and uncertainty. A second problem is the need to coordinate different administrative levels, cross-sectoral stakeholders, and trans-boundary organizations. Finally, a third issue concerns the reduced capacities of central government due to decentralization and/ or privatization [2,5,6]. Given these conditions, improving a country's DRM is no easy task.

Historically, DRM activities in many countries have focused on the post-emergency response. However, recent progress in science, technology, and information management means that DRM bodies can conduct comprehensive, pre-emergency assessments. These evaluations

help to understand potential disaster risks, how they affect vulnerable human beings, and society's ability to handle hazards and threats [6]. Consequently, the focus of DRM activities has shifted from the response phase, to preparedness and prevention. According to the European Commission's Humanitarian Aid and Civil Protection Factsheet [7], it's estimated that for every €1 invested in disaster risk prevention, €4–7 is saved in disaster response. Therefore, governments have been encouraged to invest more in prevention.

Many countries now carry out a national risk assessment (NRA). The aim is to identify the threats and hazards that could affect a country, and assess their likelihood and impacts from a national perspective [6]. As it is carried out before a negative event happens, the aim is to improve prevention policies and mitigation programs by directing limited resources, thereby reducing a nation's exposure and vulnerability. Often carried out in conjunction with a capability assessment (which seeks to determine if a county is able to handle a certain emergency), the NRA helps to understand the potential risks a country faces, and plays an important part in developing its capacity to prevent and respond to disaster risks at all levels [6].

Within the European Union (EU), many security challenges are

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cross-border and cross-sectoral [8], and no single member state is able to handle them alone. In order to minimize potential risks and better prepare for future risks, the European Commission invited all member states to begin developing a NRA by the end of 2011 [9]. Following the adoption of the EU Civil Protection Mechanism in 2013, all member states were obliged to conduct a NRA and submit a summary to the Commission by 22 December 2015, and every three years thereafter [10,11]. Together with the European Commission's Risk Assessment and Mapping Guidelines for Disaster Management [12], it is expected that the coherent NRAs from member states will contribute to a better understanding of the risks faced by EU, so that a comprehensive, Union-wide risk assessment can be prepared.

At the same time, various academic research projects have investigated NRA issues. For instance, Vlek examined Dutch and British NRAs and questioned the scientific robustness of the results [13]. In the Netherlands and Norway, Veland et al. [14] compared methodologies used in practice with existing theories of risk conceptualization and description, and found weaknesses in both countries. Vastveit [15] investigated the actual use and results of Dutch and British NRAs. Finally, Bossong and Hegemann [16] examined the functional and political limitations for the implementation of standard NRAs from a pan-European perspective, and argued that the adoption of common guidelines would be a useful political tool to legitimate internal EU policy initiatives in the domain of risk governance.

Most of the NRA literature focuses on the methodology, the validity of results, and the role of NRAs in countries' DRM activities. As the Dutch and British NRAs are two of the earliest examples in the EU, they are often used as a role model for other countries, and have received most attention from researchers. However, not much attention has been paid to the impact of the NRA on existing, multi-level, multi-stakeholder DRM systems. Is it the case, for example, that it complements ongoing DRM work and brings stakeholders closer together? Or is it an isolated process that remains separate from other established DRM activities? There appears to be no previous work that offers clear-cut answers to these questions.

Based on Rasmussen's study [17], in dynamic modern societies, where DRM stakeholders are from multi-disciplinary backgrounds and various societal levels, general DRM objectives and values formulated by higher levels are interpreted and implemented accordingly at lower levels in the structure. Therefore, it appears interesting to investigate how member states have responded to the call from the EU to implement international NRA guidelines. Previous research into multi-level, multi-stakeholder national DRM systems has pointed out that fragmentation is a common problem [18,19]. Information is produced by various stakeholders, which creates a barrier for its transfer [18,20–22]. It appears likely that the implementation of the high-level requirement to produce an NRA, based on the joint efforts of various domestic stakeholders, will not be a smooth process. Therefore, this paper examines NRA work, taking the example of Sweden. It investigates the collation of DRM information from various national bodies into the NRA, and is designed to contribute to prevention and protection efforts, both nationally and internationally.

Sweden was one of the first EU member states to carry out an NRA. The country's DRM system is rooted in the activities and responsibilities of stakeholders at three administrative levels (national, regional, and municipal). All authorities have been required to carry out a risk and vulnerability assessment (RVA) since 2002, and these assessments form the basis for many other DRM activities. The Swedish Civil Contingencies Agency (MSB) has been tasked by the government to prepare the country's NRA, based on input from the RVAs. This paper focuses on the NRA process and practice: how it interacts with ongoing DRM activities, especially RVA work; whether it actively involves stakeholders from all administrative levels; the perceived quality of DRM information transfer among stakeholders; how EU guidelines are incorporated into national values, and how the NRA contributes to both domestic and international DRM. The research questions addressed are:

*Is Swedish NRA work integrated with existing DRM activities? If so, how does it interact, and to what extent is it integrated, e.g., in terms of involving stakeholders from the whole of society and generating credible DRM information from various sources?*

This article is structured as follows. The following section describes the context for NRA activities in Sweden. Section 3 outlines the principle theoretical concepts. The next section introduces the research methods. Section 5 presents the empirical findings and analysis. This is followed by a discussion, which relates the findings of this paper to earlier work. Finally, some conclusions are presented in Section 7.

## 2. The Swedish context

### 2.1. The Swedish DRM system

The Swedish DRM system consists of three administrative levels of governance: local, regional and national. It is based on three fundamental principles: responsibility, parity and proximity. Respectively, they mean that: 1) whoever is responsible for an activity in normal circumstances is also responsible during an emergency; 2) how authorities and public services function during a crisis should, as far as possible, be the same as under normal conditions; and 3) a crisis should be handled at the lowest possible administrative level.

The Swedish DRM system is coordinated by the MSB, which is responsible for issues concerning civil protection, public safety, emergency management and civil defense. It is also mandated to take a holistic, all-hazards approach to DRM. The government specifies the MSB's responsibilities, objectives and reporting requirements, and allocates resources. One of the MSB's principle tasks is to enhance the DRM capacity of Swedish society, by supporting and guiding the activities of other DRM stakeholders.

The RVA is one of the most important components of this multi-level, multi-stakeholder, bottom-up system, and forms the basis for many other DRM activities. Under Swedish law [23,24], governmental agencies, regional authorities and municipalities have conducted regular RVAs since 2002. The RVA normally includes an assessment of the potential risks faced by an authority, any other specific scenarios chosen by the MSB, and information about the authority's capability to deal with these risks. The underlying logic is that RVAs conducted by lower-level authorities should contribute to the higher-level assessment. Specifically, regional RVAs should be produced based on input from municipal RVAs, as the two levels share the same geographic focus. Similarly, the national RVA is based on regional RVAs. The system is thus highly dependent on collaboration among stakeholders from different disciplinary backgrounds and levels of society. No individual stakeholder can see the full DRM picture without information from others; collaboration is key.

The MSB (and its predecessor, the Swedish Emergency Management Agency) publishes overall assessments of Sweden's emergency management capability. These are primarily based on RVAs conducted by authorities at local, regional and national levels. However, these lower-level RVAs are designed to facilitate disaster risk preparedness at the relevant level, and there are therefore inevitable limitations if seen from a national perspective. For instance, they differ widely in terms of geographical perspective, as some authorities have functional areas of responsibility (e.g. agriculture, telecommunication, customs, police) that are not geographically delimited [19–22,25]. In addition, different authorities use different methods to select, analyze and evaluate potential disaster risks and their consequences [20–22,25]. Thus, there is a need to improve the coherence of all of these RVAs in order to generate a NRA. In 2010, the MSB issued regulations [26,27] designed to enhance the comparability and transparency of RVAs. However, the system continues to lack a systematic method.

## 2.2. Sweden's NRA practice following the EU call

In 2011, the Council of the European Union passed the 'Council Conclusions on Further Developing Risk Assessment for Disaster Management within the European Union'. The Council argued that standardized NRAs would contribute to a common understanding of the risks facing the EU [9]. NRAs were expected to facilitate cooperation in the prevention of, and response to, shared and cross-border disasters. It was hoped that comparable methodologies would be adopted by member states that faced similar risks, and joint assessments would be carried out. It was also hoped that these assessments, in turn, would contribute to political contingency priorities.

On 9 June 2011, the MSB was tasked by the Swedish government to conduct a NRA based on the European Council's conclusions [28]. The Agency faced two challenges: developing a method; and conducting the actual NRA [29]. Although the country's RVAs already served as a basis for identifying potential disaster risks, the existing national assessment was very different to the NRA outlined by the European Commission [12]. The Commission's guidelines state that the NRA should be methodologically coherent in terms of scenario analyses. They also require the active involvement of experts and stakeholders from all levels of society, functional sectors, and disciplines, rather than the aggregation of RVA documents. In other words, the EU-style NRA calls for an integrated and comprehensive approach that actively involves relevant DRM stakeholders – which was a new challenge for both Swedish society and its DRM system. The first attempt to develop an NRA took the form of the document *A first step towards a national risk assessment – National Risk Identification* [9,30].

In December 2013, under new civil protection legislation [31], all EU member states were required to submit a summary of risk assessments at national or appropriate regional (sub-national) level to the Commission no later than 22 December 2015, and every three years thereafter. In response, the MSB published an overview of risks, and a synthesis of 14 risk scenario analyses between 2012 and 2015 [29].

## 2.3. The National Risk and Capability Assessment

The National Risk and Capability Assessment (NRCA) is another important element in the Swedish DRM system. Although the NRCA and NRA are separate processes, serving different target audiences, in practice, they are closely connected. Both are primarily based on RVAs from all three administrative levels, and are designed to facilitate decision-making in order to improve the country's overall DRM capability.

Many Swedish DRM stakeholders argue that a risk assessment, which identifies potential disaster risks without mentioning existing capabilities (and/ or how to improve these capabilities), is less useful for DRM decision-making than an integrated risk and capability assessment. Therefore, the aim is to develop an integrated risk and capability assessment at the national level, which not only lists potential risks the country is facing, but also helps to understand the capabilities that need to be developed to handle these risks.

Currently, there is no clear statement of the relationship between the Swedish NRA and the NRCA, thus one of the aims of this study was to explore the issue.

## 3. Theoretical background

DRM is “the systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster” [32]. It is an ongoing process that can be seen at various societal levels. The organizations, technical systems, mechanisms, etc. that participate in an ongoing DRM process constitute the DRM system [21,22,33]. The DRM system involves stakeholders from the whole of society, and aims to integrate their contributions in order to collectively manage societal risks.

Risk governance refers to “the totality of actors, rules, conventions, processes, and mechanisms concerned with how relevant risk information is collected, analyzed, and communicated, and how regulatory decisions are taken” [5]. From this perspective, it is easy to argue that a DRM system represents risk governance in practice, as all of the relevant stakeholders are encouraged to collectively contribute and manage potential risks [21,22]. Similarly, certain risk governance principles are also applicable within the DRM system, and can be used to indicate issues that need to be considered in managing disaster risks [5].

The first is the communication principle. Effective communication is not just the simple action of bringing stakeholders together and encouraging them to communicate. Interactions between stakeholders from different backgrounds, and at various societal levels, must be facilitated [5]. This does not necessarily mean that each stakeholder communicates with all of the others [5], as values, perceptions and objectives can vary greatly among different participants [17]. Therefore, it is very important that stakeholders learn what type of information to communicate, to whom, when, and how [5]. The aim is to provide a better basis for all stakeholders to continuously and interactively, share and exchange DRM information in ways that help to collectively manage disaster risks. However, achieving this is very challenging, and communication failures might result in the failure of the overall DRM system [5,21,34,35].

The second is the inclusion principle. This reflects the fact that DRM is a multi-stakeholder process. However, it does not suggest that the total number of actors is what matters. Nor does it mean that various stakeholders are simply included in the process. Instead, stakeholders should actively frame or pre-assess potential risks, while inclusion should be as open and adaptive as possible [5]. On the other hand, it is important to bear in mind that the degree of inclusion is not equal to the quality of potential DRM outcomes. In other words, more inclusion does not guarantee better DRM results [5,22]. Thus, careful thought must be given to what inclusion means when selecting participants, in order to make the multi-stakeholder DRM system more effective. Ideally, a range of stakeholders with complementary roles and diverging interests are included, in order to address different potential risks [5].

The third principle is integration. This refers to “the need to collect and synthesize all relevant knowledge and experience from various disciplines and various sources including uncertainty information and articulations of risk perceptions and values” [5]. It reflects two aspects of DRM; the first relates to the end-product (e.g., risk assessments, capability assessments), while the second refers to the process itself (e.g., stakeholder involvement and the generation of DRM information). The first aspect highlights the importance of including multi-dimensional evaluations in the DRM process. Cost–effectiveness and risk–risk trade-off evaluations should supplement the risk assessment and evaluation [5]. In addition to content/end-product integration, the DRM process itself should also be integrated, e.g., the different steps of the process should be interconnected and actively interact with each other.

As stated in Section 1, this paper investigates the NRA process and practice, with a special focus on how NRA-related work is integrated into existing DRM activities in the Swedish system. While the above-mentioned risk governance principles can be used to evaluate the degree and quality of integration, the risk management process proposed in ISO 31000 is an appropriate point of departure to examine both processes and practices.

ISO 31000 defines the risk management process as the “systematic application of management policies, procedures and practices to the activities of communicating, consulting, establishing the context, and identifying, analyzing, evaluating, treating, monitoring and reviewing risk” [36]. Here, we apply these steps to study the NRA process and practice in the Swedish DRM system. Specifically, this consists of the following: (a) establishing the context; (b) conducting the risk assessment (including risk identification, risk analysis, and risk evaluation); (c) the risk treatment; in parallel with (d) monitoring and review; and

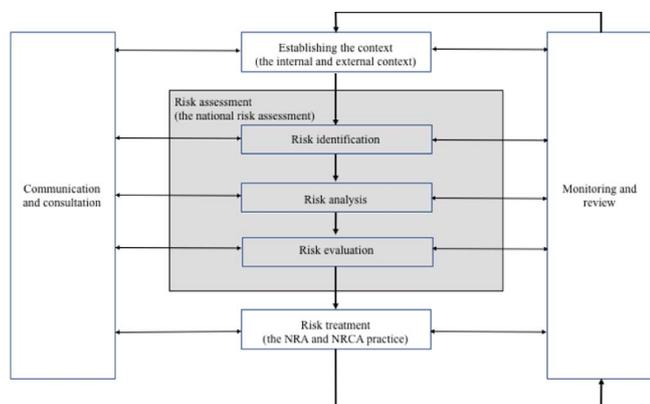


Fig. 1. The NRA process and practice based on ISO 31000.

(e) communicating and consultation. This is shown schematically in Fig. 1. The examination of the overall NRA process and how it integrates with other DRM practices sheds light on the functionality of a multi-stakeholder, multi-level DRM system, and paves the way for the study of the generation of credible DRM information from very different sources.

#### 4. Methods

The main research methods adopted in this study were semi-structured interviews, combined with a content analysis of relevant official documents.

Twenty-one interviews were conducted in two periods. The first round (20 interviews), was carried out between November 2013 and May 2014. They involved 20 participants from 13 national authorities in Sweden. Data collection began with face-to-face interviews with MSB staff, who were heavily involved in preparing the NRA and NRCA, and had direct responsibility for developing RVA regulations and supervising other authorities' RVA work. The snowball sampling method [37] was adopted both during and after these initial interviews, in order to identify other relevant MSB staff, and employees of other national authorities who were responsible for the production of their organization's RVA and had contributed to the production of the Swedish NRA. All the selected interviewees were directly involved in their respective authority's national-level RVA work, which forms the basis for the NRA. Most had also participated in workshops run by the MSB that were designed to contribute to the NRA scenario analysis. At the national level, there are a total 23 authorities (in addition to the MSB) that are obliged under Swedish law to conduct RVAs. Therefore, the sample represents a good range of objectives at the highest administrative level in the Swedish DRM system.

Potential interviewees were approached either by telephone or email. Those who responded and agreed to participate in the study were interviewed by telephone (18) or in person (2). Telephone interviews were preferred as they were easier to fit into busy schedules and were very cost-effective.

Each interview lasted approximately 60–90 min. Issues related to the production of national-level RVAs, and the NRA process. Questions included: how RVAs were conducted; how national authorities involved stakeholders from various administrative levels in their RVA work; how RVAs contributed to the NRA; how NRA work was integrated into the DRM system and built upon RVAs conducted by different authorities; how the NRA process involved stakeholders from different disciplines and administrative levels; what communication tools were used in both the RVA and the NRA; how different stakeholders collaborated with each other, etc.

The second, and final round of semi-structured interview was conducted in January 2017, several years after the first. The goal was to provide a new perspective, and complement the dataset that had been

collected almost three years earlier, as NRAs are based on an ongoing process of scenario analysis. By the time the second round of interview was planned, the MSB's NRA work had matured, and authorities had gained experience. It therefore appeared interesting to examine how NRA work had improved in this time, especially from a policymaking perspective. Furthermore, by this time, proposed amendments to RVA regulations had been implemented (which had an impact on the NRA).

Initially, several interviews were planned (mainly with MSB staff). However, a heavy workload at MSB prevented this happening. In the end, one, in-depth interview took place, with one person who acted as a representative for the whole group of experts. This person, who worked on both the NRA and NRCA, and was knowledgeable at the EU policy level, was interviewed via telephone.

This final interview lasted approximately one hour. It was guided by the empirical data collected from earlier interviews, the knowledge gained about NRAs during the intervening period, as well as new questions that had emerged. Consequently, the questions were more focused. Issues included: the transformation of NRA work between 2014 and 2017; the relationship between the NRA, the NRCA, and RVAs; the methods adopted to conduct the NRA and the NRCA; the communication tools available to stakeholders in their NRA work; how RVA work provided input to the NRA and the NRCA, and how they influenced each other; the cooperative areas and stakeholder collaboration in NRA work; how the NRCA influenced the distribution of DRM resources; whether national values were consistent with the EU NRA guidelines; the major challenges in NRA work; and goals for the future.

All 21 interviews were conducted mostly in English, although some terminology, and specific procedures were described in Swedish, in cases where interviewees found it difficult to express themselves clearly. Each interview was recorded and transcribed in full, including any necessary translations from Swedish to English. The transcripts were carefully read through, then analyzed according to a template that was developed from the headings that guided the interviews. Some new aspects that emerged during the interviews were added to the template during this process.

In addition to the empirical data that was obtained from the semi-structured interviews, other documentation was collected and studied. Official documents related to Swedish NRA work were collected from the MSB's website, or provided by respondents during the interviews. Other NRA-related EU regulations, guidelines and policy documents were downloaded from the internet, thoroughly examined and analyzed, using content analysis [38–40]. The following information was summarized and aggregated based on the content analysis of the available documentation: how Sweden had implemented the EU call to conduct a NRA; how the Swedish NRA incorporated national values into EU guidelines; and how NRA work improved as more experience was gained.

#### 5. Results and analysis

Empirical evidence about the integration of NRA with other DRM activities in the Swedish system was analyzed according to the process shown in Fig. 1. The following subsections outline the findings in more detail.

##### 5.1. The internal and external context

Sweden, as a EU member state, must conduct a NRA, and the Swedish government appointed the MSB to carry out this task. The Swedish NRA is a scenario-driven analysis performed at national level, which carefully follows EU guidelines and incorporates Swedish national values. Scenarios are chosen from RVAs that are conducted by authorities at all levels in Sweden, and represent national interests. The MSB carries out the actual analysis, and sends the NRA to the government, which in turn develops a summary that is delivered to the EU.

## 5.2. The national risk assessment

### 5.2.1. Risk identification

The risk scenarios that are included in the NRA are based on input from the RVAs. These scenarios are very different in terms of fields and sectors. The MSB selects stakeholders who are most likely to be affected by the risk scenarios (e.g., representatives from municipalities, county administrative boards, county councils, national agencies, volunteer groups, NGOs) and invites them to workshops to develop risk scenarios in more detail. Participants are drawn from “*pretty much the whole of society*”, and the risk scenarios that are identified and described are the result of their joint efforts.

### 5.2.2. Risk analysis

Workshops are the main channel used to bring together relevant stakeholders, collect risk-related information, and carry out a joint assessment. They provide a platform for stakeholders to become familiar with each other's responsibilities, interact, and understand dependencies in the event of a crisis. They promote a wider range of input from different perspectives, and pave the way for potential collaboration among participants.

According to interviewees, these workshops have provided a great deal of useful information, and far more than the previous system in which the MSB sent out forms and asked stakeholders to make self-assessments. However, they also noted that discussions could be dominated by a few very active representatives from certain organizations, while others were more silent. When the workshops end, MSB staff continue to develop the analysis. They attempt to ensure that the views of all parties are represented (for example including the views of less-active participants). Once complete, the analysis is forwarded to all of the participants that were involved in the workshop, asking for further comments. Not all risk scenario analysis is based on workshops. If sufficient information is available from previous assessments, official documents or other scientific reports, the MSB can use this information to produce the risk analysis, rather than arrange a time-consuming, expensive workshop. The MSB has so far selected around 27 risk scenarios to develop for the NRA. Two NRAs have been delivered to the EU, and risk scenario analysis work is ongoing.

### 5.2.3. Risk evaluation

Under EU guidelines, the NRA should include a statement of whether risks are acceptable or tolerable, and what measures should be prioritized based on this evaluation. However, Sweden holds the opinion that it is very difficult to determine thresholds for acceptable levels of risk without knowing the country's DRM capability to handle them. Furthermore, the government believe that prioritized measures should not be decided based on a risk evaluation, but instead based on vulnerabilities and deficiencies identified in a capability assessment. Swedish authorities therefore argue that the capability assessment is the starting point for deciding what is lacking and what needs to be done.

According to the interviewees, the NRA, as it stands today, focuses on potential consequences. However, in order to move towards limiting these consequences (which is also a governmental requirement), there is a need to identify current capabilities, as well as vulnerabilities and deficiencies in DRM. Once this is done, cost-effective measures can be developed and applied to reduce the potential impact of adverse events, depending on how urgent the situation is.

“It doesn't help that we know what the problem is. The government wants to know what to do, where to go.”

“For us at the national level, also for authorities at regional or municipal levels, we need to focus on what to do and that means we have to make the capability assessments as a part of the national risk assessment or as the next step for the risk assessment.”

## 5.3. Risk treatment: the NRA and NRCA practice

Following EU guidelines, the Swedish NRA does not contain much guidance about capability assessments. However, the NRA process highlighted various vulnerabilities and deficiencies to be addressed at the domestic level. Meanwhile, Sweden is seeking to encourage the EU to integrate a capability assessment into the NRA process, based on the experience gained domestically.

The NRA is published on the MSB website and is accessible to authorities and the general public. Interviewees mentioned that some authorities referred to the NRA in their RVAs and used it to draw lessons about their own situation. Moreover, some participants in the NRA workshops continued to work on their risk scenarios even when the workshop had ended, and had developed plans regarding how to deal with these scenarios within their organizations. In addition, the MSB uses the NRA as a primary source to develop the NRCA.

The NRCA is an annual exercise carried out by the MSB. It is an important source of information about the overall situation regarding DRM work nationally. While the NRA is completely based on scenario analyses, the NRCA has a more solid foundation, and draws upon a wider range of source materials. It is mainly based on RVAs, but also takes input from the NRA, together with other relevant scientific reports, evaluations of DRM activities, etc. During the exercise, the MSB checks with RVA producers to make sure that their documents have been understood properly, and are being used correctly. The three main targets of the NRCA and their respective functions are:

- The Swedish government: The government uses the NRCA to understand the country's major risks and vulnerabilities. It guides overall DRM policy, and serves as a basis for decision-making regarding budgets, new legislation, the distribution of resource for crisis preparedness, etc.
- The MSB: The MSB uses the NRCA to steer its own work, e.g., to decide annual strategic plans.
- Cooperative areas: Swedish legislation states that government planning must be coordinated. In order to strengthen society's crisis response, authorities and other actors (municipalities, county councils, and armed forces) cooperate in six areas, namely: economic security; dangerous substances; geographic area of responsibility; protection, rescue and care; technical infrastructure; and transportation. Authorities with different responsibilities are required to agree and synchronize their planning; in particular, they must reduce society's vulnerability in these areas, and ensure that a crisis is dealt with as well as possible. Over the past few years, the NRCA has been used as the basis for decision-making in planning cooperative DRM activities.

To sum up, Sweden's goal is not simply limited to improving its domestic civil contingency capabilities; at EU policy level, the country has also been pushing for the inclusion of a capability assessment in NRAs.

## 5.4. Communication and consultation among DRM stakeholders

### 5.4.1. The need to collaborate

Interviewees noted that governmental authorities have realized that they are highly dependent on each other. They acknowledged that it is unwise for agencies to conduct their own risk assessment without knowing the roles, responsibilities and potential risks of others. The NRA workshops and regular DRM-related meetings offer stakeholders opportunities to meet and understand each other's role and responsibilities. Some interviewees called for even more communication and collaboration. They suggested that more information exchange and stakeholder communication should be included in the process, even when each authority conducts their own RVA.

Private stakeholders are largely excluded from the NRA and other

DRM process, since they are not legally required to participate. However, it was repeatedly expressed during the interviews that private stakeholders shall be encouraged, and be more actively involved in the country's DRM activities. Furthermore, the need to invite researchers and research institutes to contribute their perspectives was also noted.

#### 5.4.2. DRM information sharing

It was pointed out that using workshops to collect DRM information could result in the views of some participants being overrepresented, depending on how active they are. Furthermore, some gray areas in terms of DRM information sharing were identified, which made stakeholders uncertain whether they should share this risk-related information with each other or not.

#### 5.4.3. Two-way communication needs to be improved

Effective risk communication relies on two-way communication. Interviewees stated they received little or no feedback on their contribution: *"It feels like it (the information) is going to a black hole"*. This leaves stakeholders unsure about whether the information they provide is useful or not, or whether it is sufficient. Consequently, it has decreased some stakeholders' motivation to improve their analysis, given that they have no idea about how their previous input is evaluated. The MSB has admitted that the lack of adequate feedback is a problem that needs to be solved. However, a lack of human and financial resources means that no solution has so far been found.

#### 5.5. Continuous monitoring and review of NRA work

Interviewees indicated that efforts to involve stakeholders and increase collaboration have positively influenced DRM work in Sweden, especially at the national level. The results can be seen both in the NRCA process, and in practice. Furthermore, interviewees pointed out that the information and knowledge gained while conducting the NRA has fed into the NRCA document and thus influenced the overall DRM work in Swedish society.

According to MSB staff, there was no specific plan to improve the NRA process at the time when this study was carried out. However, there are two directions that demand more effort in the near future: the first is to improve the NRA scenario analysis, and find complementary ways to include more relevant information; the second is for Sweden to influence the EU at policy level. The aim of the latter is to improve NRA guidelines in line with Swedish NRA practice, namely to include a capability assessment into the NRA.

## 6. Discussion

The Swedish NRA process brings together many stakeholders and provides them with a platform to communicate with each other. It offers them an opportunity to continuously and interactively share and exchange DRM information, both during and after the NRA workshops. However, it is unclear whether the stakeholder communication provoked by the NRA process is effective, as there is no direct evidence found to prove that this is the case. The empirical findings presented in Section 5 suggest that involving stakeholders via NRA workshops does improve communication, and the sharing of risk-related information. However, the quality of such communication largely depends on the personality of participants (e.g., how active they are, whether certain people dominate the group). Moreover, the study made it very clear that almost no feedback is provided by MSB, the lead authority. Without this feedback, communication cannot be claimed to be mutual and meaningful, which raises further questions about the effectiveness of risk communication. Van Asselt and Renn [5] state that "risk communication and trust are delicately interconnected processes". Although trust is not the focus of this paper, a breakdown in risk communication is highly likely to decrease trust among DRM stakeholders, which may result in the failure of DRM activities.

The founding of a multi-level, multi-stakeholder DRM system is closely related to the fact that no single risk owner [36] can see the full risk picture and manage risks without drawing upon input from others [17]. Therefore, it is natural that the NRA process involves stakeholders from various disciplines and administrative levels. The results of this study have highlighted the positive inclusion of stakeholders from the whole of society. On the other hand, more thought needs to be given to the inclusion of other stakeholders who are not obligated by law to participate, such as private stakeholders. Open and adaptive participation will help to improve social learning among stakeholders, so that they can better understand each other's complementary roles. As a result, it may also increase stakeholders' willingness to participate in collective DRM activities (not just the NRA), rather than simply being involved because they have to.

DRM is much more than just minimizing disaster risks. Stimulating societal resilience is another goal [5]. As the results presented here reveal, EU NRA guidelines do not require a capability assessment, which may make it difficult to take further action once potential societal risks have been identified. Swedish practice suggests that if the NRA process is to lead to a less risky, and more resilient society, a capability assessment needs to be included. Furthermore, since budgets for DRM activities are often limited, another useful addition to the risk assessment document would be a cost-effectiveness evaluation, together with an assessment of risk-risk trade-offs, in order to increase the chance that the risk is addressed.

This paper complements previous NRA studies, by broadening the research topics and providing a unique perspective that links the NRA process and practice with other DRM activities. The empirical findings presented in this paper can help both scholars and practitioners to better understand the (comparatively new) NRA process, how it can involve stakeholders, and how it can be integrated into established DRM activities in a multi-stakeholder, multi-level system. It provides food for thought regarding future investigations. Follow-up studies could look at issues related to the NRA process and the final document, in particular the link between the level of integration between the NRA process and other DRM activities, and the quality/ usefulness of the final document. It would be very interesting to understand how integration can improve the usefulness of the NRA, and whether the EU and individual member states share the same point of view regarding its usefulness. Finally, future studies could address questions such as whether a bottom-up, multi-level, multi-stakeholder DRM system fulfills its purpose, and whether it is able to successfully guide stakeholders in collectively managing disaster risks.

## 7. Conclusions

This article studied the NRA process from end-to-end. It examined how stakeholders from all levels of society are involved, and how it is integrated into existing DRM activities. It investigated stakeholder involvement, the quality of risk communication, and the level of integration between the NRA process and other DRM activities. The analysis followed the risk management process proposed in ISO 31000. The findings suggested that Swedish NRA work has been integrated with other DRM activities, such as the RVA, the NRCA, and emergency planning cooperation. The results also reveal several problems, notably relating to private stakeholder involvement, mutual and effective risk communication, gray areas in the legislation (particularly the sharing of confidential information), and the fact that the EU's NRA guidelines do not include a capability assessment. Furthermore, the paper has raised some interesting questions about future studies. It should be noted that even though this study focuses on the Swedish NRA and DRM system, the findings are not necessarily limited to Sweden. The project sheds light on the NRA process and provides insights into how to improve NRA practice in any, similar, DRM system.

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