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# Climate Change Adaptation and Vulnerability Planning within the Municipal and Regional System

## Examples from Northern Sweden

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**ABSTRACT** The integration or mainstreaming of adaptation to climate change, while highly emphasized in the literature, is often operationally both very complex and places high requirements on resources for coordination in organizational units. This study reviews the development of integration of adaptation in the regional and local risk and vulnerability analysis processes, in the cases of the counties of Norrbotten and Västerbotten in Northern Sweden. The study concludes that adaptation as a non-binding and not specifically resourced policy area risks limited integration with existing measures. The Swedish distribution of authority and resourcing on adaptation, focusing on integrating adaptation within the municipal authority without specific funding, will thus constitute a limitation to integration and mainstreaming in particular in sparsely populated municipalities that despite limited tax bases are required to maintain the same municipal services as a larger municipality.

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**KEYWORDS** adaptation to climate change, risk and vulnerability analyses, Sweden, Norrbotten, Västerbotten

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## Introduction and Aim

Adaptation to climate change challenges established policy and planning systems, since it demands action in several policy sectors and across governance levels. Policy integration is potentially a productive response, since it: “concerns the management of cross-cutting issues in policy making that transcend the boundaries of established policy fields, and that do not correspond to the institutional responsibilities of individual departments” (Stead & Meijers 2009: 321). However, to integrate adaptation within an existing structure is highly complex. Regularly discussed in the climate change literature in terms of “mainstreaming,” studies show that mainstreaming/integration of one area into pre-existing policies and practices is dependent on political prioritizing, prerequisites for integration, and resources for integration (Ayers *et al.* 2014; Rauken *et al.* 2014).

National policies on adaptation range from formal adaptation strategies with certain elements made mandatory through legislation to no formal national-level adaptation policy. Many countries have, however, in some way investigated the impacts and potential adaptations that could concern different sectors (Keskitalo [ed.] 2010). Where little development has taken place, coping strategies developed in policy or legislation may be able to support future adaptation. This may be for instance in cases of crisis response facilities, which have traditionally related to natural accidents or events, but could also be expected to be placed increasingly in focus with climate change (Groven *et al.* 2012).

Northern Sweden is vulnerable in relation to natural events, often through cold and snowy weather conditions. Due to climate changes weather-related events can be expected to increase in intensity and frequency in the region (SMHI, Climate Indicators; SMHI, Regional Climate Analyses), resulting in increased stresses on societal functions such as increased precipitation and flooding affecting infrastructure, housing, water and sewage systems. Consequences of such extraordinary events are local, hence provoking municipal responses. However, municipalities in Northern Sweden are often sparsely populated with a larger proportion of elderly inhabitants and cover larger territories than other municipalities. As a consequence, their municipal income tax revenues are smaller, with municipal administration budgets being smaller, with potential negative impacts on possibilities for integrating climate change adaptation (Keskitalo [ed.] 2010).

Adding to a study reviewing the role of Risk and Vulnerability Analyses (RVA) in relation to extraordinary events in three municipalities in Sweden (Mossberg Sonnek *et al.* 2013), this paper reviews the ways in which adaptation to climate change is treated in RVA documents in 29 municipalities in

the counties of Norrbotten and Västerbotten, Sweden. Further, preconditions for local-regional policy integration is analysed through mainly interview data. Based on an assumption that increased and more manifest consequences of climate change through extraordinary events may put societies increasingly at risk and provoke vulnerabilities, the study reviews:

- How and to what extent are issues of climate change adaptation and risk and vulnerability management coordinated at local and regional levels in the two counties?
- What are the identified limitations to higher integration between the two policy domains in these cases?

## Theoretical Framework

Vulnerability to climate change has often been conceived of as a result of exposure-sensitivity minus the adaptive capacity (Smit & Wandel 2006; Hovelsrud *et al.* [eds.] 2010). Exposure sensitivity is defined as the sum of the exposure to climate change and sensitivity to this exposure, that is the total impact. Adaptive capacity is defined as the capacity of the societal, organizational or other unit to adapt to this impact. Adaptive capacity is thus situated and determined by institutional, economic and technological factors, infrastructure and knowledge/information access and structure (Smit & Pilifosova 2001; Keskitalo *et al.* 2011). Within the delimitations set by adaptive capacity, different adaptations can be undertaken (Smit & Wandel 2006). In order to understand which adaptations can be developed, we need to understand which parts of societal structures delimit and determine adaptations. For instance, may adaptations differ largely among more and less economically wealthy municipalities, even if impacts may be the same (Naess *et al.* 2005). It is also an accepted perspective in social vulnerability research that climate change as a stress needs to be understood within a broader perspective of how adaptations are developed and prioritized in relation to the full scope of stresses to which they need to respond. Double or multiple stress perspectives emphasize that different units form their adaptive strategies not only in response to climate change, but also in response to globalization and other stresses (O'Brien & Leichenko 2000).

Within the municipal and regional structure, these concepts of vulnerability and adaptive capacity highlight both the role of the existing structure of these units (within which adaptation is to be integrated) and political prioritizing. Adaptation concerns will be negotiated and balanced against other aspects, such as return on investments or more efficient but potentially more vulnerable investments. Resources are more likely to be allocated to prevention of events in the near future. Some level of prioritizing is therefore needed in terms of what events are more likely to occur,

where they will take place, what groups of people and functions will be most severely affected and so on (Henstra 2010). Hence, there is an element of strategic planning involved in understanding that a longer-term perspective is needed, even though the extraordinary event might occur tomorrow. If there exists an acceptance of (climate-related) extraordinary events, it should ideally influence land use planning—the municipal consideration of where to place constructions such as housing, industries, waste processing, sewage and infrastructure (Bulkeley & Betsill 2013). Extraordinary events are also subject to contingency planning and frameworks for emergency management. In total, planning is thereby essential to adaptation (Bulkeley & Betsill 2013).

The Government distributes responsibility for specific policy and planning sectors through binding legislation in some cases, appoints responsibilities for revision and implementation to regional level actors, and appoints certain requirements or openness to choose approaches (including whether implementation is necessary) to municipalities. The implementation of policy thus regularly utilizes a number of instruments (Appelstrand 2007; Bergling *et al.* 2016). Binding regulations often encase and make mandatory certain institutional instruments through laws or decrees, and can be seen as instruments traditionally emphasized in government steering. Economic instruments are often used to develop funds (for example through taxes) or incentives for specific ways of acting, for instance through grants systems. However, informational instruments (“soft governance”) have also been emphasized, relying on common understandings and voluntary agreements among groups. Informational instruments can substantiate mandatory requirements and may improve efficiency, through actors’ aspirations to be involved, participate and deliberate in policy and planning systems (Lebel *et al.* 2005; Appelstrand 2007).

However, the use of informational or other non-binding instruments also risk that implementation varies highly among municipalities depending on the need for implementation due to variations in vulnerability, and on differences in budgets between smaller and larger municipalities. In particular, it has been discussed in the adaptation literature that many of the measures suggested are potential or recommendations rather than planned or undertaken (Keskitalo [ed.] 2010; Keskitalo 2011). There is thus a need to review the possibilities for integrating climate change adaptation requirements within planning (Kidd 2007). Integrated planning can be understood as coordination and cooperation of different public policy domains and their associated actors within a territory—vertical integration. Ambitions to harmonize or cooperate within policy sectors but across territories are often termed horizontal integration (Collinge *et al.* 2013; Kidd 2007; Stead

& Meijers 2009). However, resources in terms of funding or time may quite simply be too limited, or existing requirements too large, for non-binding targets to attract the resources necessary for mainstreaming or integration (Smit & Wandel 2006; Keskitalo *et al.* 2011).

## Case Study and Method

The specific analysis in this paper targets policy sector integration—climate change adaptation and risk and vulnerability planning—within two given territories: Norrbotten and Västerbotten (see Fig. 1). The Swedish politico-administrative system consists of a unitary state governed by the national parliament. The parliament has a national legislative monopoly. On the regional level, the County Administrative Boards (CAB) constitute the implementing and controlling arm of the state. These state agencies have no elected governors. Among many other functions CABs have responsibilities related to climate change and risk and vulnerability planning.<sup>1</sup> At the local level the municipalities provide a range of welfare services and other societal functions. They are self-governing to a large extent, for example in land-use planning where they are in charge of the so-called “planning monopoly.” Consequently, the Swedish system is built on coordination between state and municipal duties, as well as coordination with the regional level CABs. Despite its status as a unitary state, Sweden constitutes a complex case of decentralisation with regard to the local government level (Bergling *et al.* 2016).

In comparison with Mossberg Sonnek *et al.* (2013) who reviewed RVA development in relation to adaptation in Stockholm and two other southern Swedish municipalities that had strong leadership on adaptation, this study reviews a large number of municipalities without specific focus on selection for leadership in adaptation or integration of RVA and adaptation policies. Rather, it targets the northern part of the country where the geographical area covered by each municipality is larger, while population numbers are regularly relatively low—resulting in sparsely populated areas with low tax income to cover municipal services. As municipalities hold responsibility for a large number of functions, this will result in relatively few municipal staffs needing to cover the same scope of services as in larger municipalities. Northern and sparsely populated areas of the country could thus be seen as particularly challenged in integrating new, especially non-mandatory, planning tasks.

Methodologically, the paper is based on literature reviews and semi-structured interviews in the two northernmost counties in Sweden. The literature reviews encompass adaptation policy literature with relevance for the two counties Norrbotten and Västerbotten, as well as local (municipal)



Fig. 1. The study area, Norrbotten and Västerbotten Counties, Sweden.

RVAs in the same counties, in total including RVAs in 29 municipalities. RVAs should be produced once every fourth year, after a new political term has started (MSB 2010). This analysis is based on the first set of municipal RVAs produced in 2011 for the political term 2010–2014.<sup>2</sup> Further, each CAB is mandated to collect and analyse municipal RVAs on an annual basis. The analyses are reported to the Government, and each annual report from 2006–2015 in the two counties is included in this analysis.

In addition, the study draws on semi-structured interviews with those responsible for the CAB's work with adaptation as well as with analysing and reporting the RVAs; in total four interviews conducted in late 2012. Questions in the interview guide focused on the establishment of CAB processes on adaptation and RVA, integration among these sectors and other means of potential integration, and the role and strength of different measures in the documents for adaptation, with coding focused on these same features. Interviews were recorded and fully transcribed, with quotations in this paper translated from the original Swedish by the authors.

## Results

### Municipal Planning for Extraordinary Events

Swedish municipalities have far-reaching responsibilities and authority with regard to emergency management. The Municipality Executive Boards are responsible for all crisis management at the local level, according to “The Law on Protection Against Accidents” (SFS 2003:778). It was revised and extended in 2003 to include consideration of natural accidents, not only fire and other “man-made” accidents. According to this legislation, every municipality should have an action programme for prevention, including evaluations of risks for accidents where rescue operations might be needed (SFS 2003:778). This was added to in 2006 by a “Law on Municipalities’ and County Councils’ Measures Before and During Extraordinary Events in Peace Time and Increased Preparedness” (SFS 2006:544), and further in the 2010 *Regulations on Municipalities and County Council’s Risk and Vulnerability Analyses* (MSB 2010):

Municipalities and county councils shall adjust risk and vulnerability processes to their own needs and to other preconditions. These activities should be coordinated and integrated with risk analysis processes that take place in line with other legislation. (MSB 2010: 4§)

Municipalities and CABs are assigned territorial responsibilities in relation to risk and vulnerabilities, effectively being in charge of coordination among actors within each territory.

Preparations shall rest on RVAs—Risk and Vulnerability Analyses—in each territory, where potentially damaging risks and vulnerabilities are analysed and evaluated. From these RVA action plans shall be established. On an annual basis changes in risk evaluations, organisational or capacity development related to municipal RVAs shall be reported from Municipality Executive Boards to the CABs (MSB 2010). These reports are used to identify county level preparedness, and presented in annual reports to the



Government. The CABs are also mandated to evaluate the municipal RVA processes in relation to state funding that follows from the establishment of the extraordinary events legislation (SFS 2006:544; Länsstyrelsen Norrbotten Årsredovisningar 2012; Länsstyrelsen Västerbotten Årsredovisningar 2012). The CABs and a selected number of other stated agencies adhere also to the “Ordinance on Crisis Preparedness and Alerted Preparedness” (SFS 2006:942) where all public authorities are mandated to perform RVAs related to their own sector of responsibility.

While the development of municipal RVAs are mandated by law, implementation may have been hampered by the lack of guiding principles other than the Act itself. In 2011 the Swedish Civil Contingencies Agency published a guidance document for how to prepare, conduct and report RVAs (MSB 2011). Thus, the RVAs shall include for instance risk assessments and municipal coping mechanisms for severe disorders regarding functions of high societal importance. The guidance provided an impetus in actually developing municipal RVAs and improving their quality (Länsstyrelsen Norrbotten Årsredovisningar 2006–2015; Länsstyrelsen Västerbotten Årsredovisningar 2006–2015).

### Adaptation Planning

Political and policy awareness of adaptation to climate change in Sweden was developed through the Governmental Commission on Climate and Vulnerability (Governmental Offices of Sweden). Its concluding report was published in 2007 with some of the suggestions in the commission’s report brought forward in the “Bill on an Integrated Climate and Energy Policy” in 2009 (Government Offices of Sweden 2009). The non-binding responsibility for adaptation was largely seen as resting on the municipal level and to be undertaken within existing means. It was seen as falling under the municipal planning monopoly and general competence by municipalities to determine the need for adaptation in each particular case. The state rejected municipal requests for increased funding for natural hazard preparation in the face of climate change, which were presented by many municipalities in replies to consultation to the Bill. As a result, adaptation is required to be assessed, integrated and funded within the regular municipal system, with the exception of large-scale issues that are beyond the municipal mandate (Government Offices of Sweden 2009).

With regard to adaptation planning, the municipalities receive adaptation support from the CABs. They produce reports on climate change, land use planning and regional climate scenarios, they organize conferences and seminars, and they monitor and report on adaptation activities to the Government. They also participate in, comment on and influence various



planning processes—regional drinking water plans, municipal land use plans and environment impact assessments to mention a few (Interviews Adaptation Norrbotten, Adaptation Västerbotten). However, adaptation measures that are at the time of the study planned or implemented are relatively few (Nordström 2007; Keskitalo 2010; Keskitalo *et al.* 2013), although a number of supporting documents exist, developed to spread knowledge about what the consequences might be of a changing climate, and how these can be managed at the local level. Some examples are publications on how to develop a municipal Climate Adaptation Plan, on climate adaptation in spatial planning, and on climatic factors important to take into account in planning (Lökvist Andersen 2010a; Lökvist Andersen 2010b; Lökvist Andersen 2010c). In a paper on climate adaptation in spatial planning, all CABs collaborated to provide practical advice on climate adaptation work at the municipal level (Westlin 2012). In Norrbotten and Västerbotten reports have been published on communications and communications' infrastructure, technical supply systems, built-up areas and buildings, land-based industries and tourism, natural environment, and health (*Översvämningsrisker i fysisk planering* 2006; Nordström 2007; Bredfeldt 2009; Lökvist Andersen 2010a; Westlin 2012). The examples provided include taking greater account of the impacts in land use planning, in planning for energy supply, roads and railways, and accounting for natural disasters in preventive action plans. In addition, the municipalities are recommended to develop more detailed investigations of areas at risk of flooding, landslides or mudslides, and to deepen and update flood mapping and stability maps (Nordström 2007).

To summarize, planning and preparing for extraordinary events and for adaptation to climate change are separate processes. The former is structured and implemented through legislative measures, the latter through non-binding, information based incentives (Table 1). However, policies and regulations in each field state that integration with other planning processes and coordination between actors is essential.

Table 1. Institutional setup for risk and vulnerability planning and adaptation planning in Sweden.

Policy actor	Risk and Vulnerability Planning		Adaptation Planning	
	Politics	Administration	Politics	Administration
National level: • National Parliament • Swedish Civil Contingencies Agency (MSB) • Swedish Meteorological and Hydrological Inst. (SMHI) • Sectoral bodies	Law on protection against accidents (SFS 2003:228); law on municipalities' and county councils' measures before and during extraordinary events... (SFS 2006:544)	MSB provides RVA Guidance in 2011	Commission on Climate and Vulnerability (2007); Bill on Climate and Energy (Government Offices of Sweden 2009)	General guidance and information documents developed e.g. by SMHI or Klimatanpassningsportalen (web portal for coordination of adaptation information)
Regional level: • County Administrative Boards (CAB)	SFS 2006:544; Annual Appropriation Instructions ( <i>regleringsbrev</i> )	Annual Reports; county level RVA	Regional coordinating responsibility	Documents developed in coordination between CABs
Local level: • Municipal Councils	SFS 2006:544 (SFS 2003:778)	Risk and Vulnerability Analyses (RVA); Action Plans	No legislative requirements	No administrative requirements

## Integration of RVA and Adaptation at Regional and Municipal Level

The regulations concerning preparedness for extraordinary events and policies for climate change adaptation indicate the need for integration and coordination. The law on extraordinary events states that:

municipalities shall within their geographical area concerning extraordinary events in peace time promote 1. that actors within the municipality cooperate and achieve coordination in planning and preparations, 2. that crisis management measures that are undertaken by different actors in such an event are coordinated, and 3. that information to the public under such circumstances is coordinated. (SFS 2006:544, 2 Ch. §7)

Further, national regulation also states that RVA activities "should be coordinated and integrated with risk analyses that are conducted as a result of other legislation" (MSB 2010: 2). CABs are assigned responsibilities within

both policy domains. The CABs are mandated to produce their own RVA as a state authority (SFS 2006:942), but also to support the municipalities in their production of RVAs. In doing so they provide topical information, they offer courses and seminars, and they visit the municipalities for dialogue and process promotion. Further, they are mandated to report annually to the Government on RVA progress in the counties (MSB 2010). As for adaptation to climate change, no binding requirements exist at the municipal level and for the CABs only a temporary mandate in climate change adaptation is provided so far (Interview Adaptation Norrbotten). Internally it is evident that the respective functions at the CABs are aware of each other; RVA administrators know and meet with adaptation administrators. They are sometimes informed through internal unit meetings, sometimes they share expertise on specific matters and sometimes they are aware of working documents in the other policy domain. However, there is no evidence of shared approaches or routines (Interviews Adaptation Norrbotten; RVA Norrbotten; Adaptation Västerbotten; RVA Västerbotten). Examples mentioned by the interviewees of possible further collaboration are assessment of climate change impacts on each municipality and scenarios for heat waves and precipitation (Interviews Adaptation Norrbotten; Adaptation Västerbotten).

From the CABs perspective risks and vulnerabilities related to extraordinary events and adaptation are clearly connected and ought to be coordinated (Interviews Adaptation Norrbotten; RVA Norrbotten; RVA Västerbotten). One example where the connection is evident is in land-use planning. Swedish municipalities have a strong mandate in land-use planning, stated as a planning monopoly. Its comprehensiveness allows for a greater number of perspectives to be included, two of which are risks of extraordinary events and climate change. One suggested planning measure could be to avoid developments and constructions in potential flood risk areas. That would simultaneously cater for immediate risk management and long-term adaptation to climate related changes. Regional water supply plans, as a second example, can secure and regulate the long term management of drinking water resources, thereby making climate change issues crucial. Other processes where adaptation can be integrated are strategic planning through regional development strategies, detailed municipal planning and environmental impact assessments (Interviews Adaptation Västerbotten; RVA Västerbotten; Adaptation Norrbotten; RVA Norrbotten). As several of these planning processes include CABs as mandatory actors, they have the possibility to stress adaptation measures in several policy domains (Interview Adaptation Norrbotten).

However, an analysis on the municipal level of the present RVAs pre-

sents a picture where integration of adaptation and extraordinary events measures was at this point in time rather limited. In order to assess risks different techniques were used by the municipalities, often selected from the methods presented in the RVA guidance (MSB 2011). Of 29 municipalities in Norrbotten and Västerbotten, 14 use the Preliminary Risk Analysis Approach. It is an approach that allows for mapping of systemic risks and identifying potential risk scenarios. The Risk and Vulnerability Approach<sup>3</sup> can be used to identify vulnerabilities in risk management processes in the municipalities. This approach can then be followed by more risk-oriented approaches (MSB 2011). Six more municipalities used this approach. Altogether, these initial RVA methods were used by 20 out of 29 municipalities, which indicates that the municipalities are in the early stages of risk and vulnerability management. The three municipalities with the largest populations are exceptions using more complex analytical methods. Depending on choice of method each municipality has used different sources of information, such as public data, Government reports, municipal and other expertise, and panels of municipal managers.

There are 298 risks mentioned in total in the 29 municipal RVAs, either as a risk only or as a risk developed into a scenario.<sup>4</sup> On average ten different risks are presented in the RVAs. However, the top ten most frequently mentioned risks account for 225 out of 298 risks mentioned (some 75 %), which indicates that there is a fairly strong structural similarity in how risks are perceived and how vulnerabilities are manifested in northern municipalities. Further, these ten plus six more risks (less frequently stated) are ubiquitous, which means that they can take place anywhere in Sweden (and in many other countries). Another eight risks are more localised in their character; they can only become manifest in specific places where for instance harbours, certain industries or mountains are located (see Table 2). Neither ubiquitous nor localised risks are specific to the northern context.

It should be noted that, even though each municipality performs its own risk identification processes, most likely they are influenced by the MSB guidance where 25 different risks are listed (MSB 2011). It contains a wide range of risks, from multi-resistant bacteria to extreme weather to social unrest, which makes it difficult for the municipalities to acquire and process relevant information on all these risks, at least initially (Interviews RVA Norrbotten; RVA Västerbotten).

The CABs are assigned the task to monitor RVA progress at the municipal level. They conclude that the municipalities are at the early stages of adherence to the law on extraordinary events (SFS 2006:544), which partly explains the varying quality of the RVAs (Interviews RVA Norrbotten; RVA Västerbotten; Länsstyrelsen Norrbotten Årsredovisningar 2006–2015; Läns-

Table 2. Prioritised risks in RVAs for Norrbotten and Västerbotten Counties, Sweden

	Norrbotten: number of RVAs including the risk (N=14)	Västerbotten: number of RVAs including the risk (N=15)	Total (N=29)
<b>Ubiquitous risks</b>			
Electricity failure, esp. in combination with cold weather	14	15	29
Pandemics, epidemics	13	14	27
Drinking water failure—accident, contamination	13	12	25
IT—accident, sabotage	13	12	25
Fire accident (large)—schools, elderly homes, forest etc.	13	11	24
Large accident—bus, airplane, traffic, industry	12	10	22
Extreme weather conditions, snow storms, cold, rain etc.	7	13	20
Accident dangerous goods	7	12	19
Central district heating failure	11	8	19
Threats and violence—school massacre, general, other	6	9	15
Social unrest	2	4	6
Unfit or disrupted food supplies	1	4	5
Lack of fuels	3	2	5
Telephone failure—wire, mobile	3	2	5
External catastrophes affecting municipal citizens	1	3	4
Epizooty/zoonosis	2	2	4
<b>Localised risks</b>			
High water flows, ice stopple	7	5	12
Hydropower dam failure	5	6	11
Harmful emissions—chlorine gas, radio activity, ammoniac	6	4	10
Landslides, erosion	2	2	4
Oil spill in Baltic Sea, harbour		2	2
Major strike, closure/move of industrial activity	2		2
Avalanches, earth quakes	2		2
Explosive goods		1	1
<b>Total number of risks in RVAs</b>	<b>145</b>	<b>153</b>	<b>298</b>

styrelsen Västerbotten Årsredovisningar 2006–2015). Consequences for the municipal organisation in case of an extraordinary event are weakly analysed. Management of the identified risks, how disruptions can be avoided in functions of high societal importance and proposed measures are also weakly developed. Since developing the RVAs contains dealing with many complexities, the CAB interviewees note that municipal RVA processes can be facilitated through provision of general risk and vulnerability information by the CABs. All municipalities could then more effectively map local risks rather than starting from compiling basic facts and describing general conditions. The CABs' concrete measures to reduce vulnerability and increase capacity to cope with extreme events therefore include knowledge building measures like advice and lectures on relevant topics, such as how to identify critical dependencies in drinking water supply (Interviews RVA Norrbotten; RVA Västerbotten).

According to CAB interviewees, the municipalities mainly use the RVAs for crisis management, for example in structuring plans for managing extraordinary events and identifying improvements within the crisis management organization. They are not used very much for risk reducing measures (Interview RVA Västerbotten). The practical use of the RVAs seems to vary among the municipalities due to available resources. Most likely some of the smaller municipalities will not be able to fulfil mandatory obligations on their own, which means that cooperation is needed. Also, municipal cut-backs in resourcing emergency organisations have been reported, altogether indicating a diminishing capacity for planning and action (Interviews RVA Norrbotten; Adaptation Norrbotten; RVA Västerbotten).

As for integration of climate change adaptation into RVA processes and planning, only limited coordination exists (Interviews RVA Norrbotten; RVA Västerbotten). *Climate change* is mentioned in twelve of the 29 RVAs analysed. It is considered a potentially risk changing factor through changing the preconditions for risks such as flooding and spread of diseases. A few RVAs mention other aspects of climate change, common to which is the understanding that climate change will change the world in many ways (Boden 2011). Boden RVA develops that insight into an RVA context:

[...] since the world is changing incredibly fast probabilities change at the same pace. It means that if a risk can happen once in 100 years today the probability can be completely different in 20 years. Examples of this are heavy rains that change frequencies due to climate change or nuclear accidents that have been considered extremely unlikely to happen but still have happened several times during half a decade. (Boden 2011: 23)

Even though climate change is identified and accepted as a fact, actual climate change consequences are still limited and therefore not integrated in analyses and risk scenarios. Only three RVAs utilise a more integrated approach (Robertsfors 2012; Umeå 2012; Vindeln 2012), which due to municipal cooperation is produced by one and the same municipal employee.

The most common reference made to climate change in RVAs is the expected changes in weather conditions in Northern Sweden. In Vindelns RVA (Vindeln 2011) it is concluded that the weather will be milder, wetter and windier, mainly due to larger differences and variations in atmospheric pressure during winters in the Atlantic region. Temperatures will most likely rise and thereby increase the proportion of rainfalls and prolong precipitation periods. Other anticipated consequences are more frequent and intense storms, and changes in ground frost conditions. Changed weather circumstances will most likely trigger other changes. According to the Arjeplog RVA (Arjeplog 2011) higher water flows can be expected, and the Boden RVA (Boden 2011) adds increased occurrence of erosion and landslides. These events are relevant in a northern context due to the many rivers in the region (Lycksele 2010). Changes in the parasite fauna and flora, bacteria and viruses will most likely follow too (Boden 2011). A specific case is the situation in Gällivare where the city of Malmberget is being relocated due to mining activities. Since new houses and buildings are being built and since a new city structure will be put in place, it provides possibilities for planning to include adaptation to climate change and a greater emphasis on risk considerations.

CAB support to climate change adaptation in municipal RVAs is mostly about providing the municipalities with planning material. Dissemination of adaptation policy documents has been prioritized. While this has caused some response among the municipalities, it is noted that the practical use of the adaptation documents for the municipalities is difficult to evaluate (Interview Adaptation Norrbotten). The need for municipalities to work with adaptation varies, as municipalities are affected differently by climate changes and have different capabilities to cope with the changes (Interview Adaptation Norrbotten). Three areas in the counties—Älvsbyn, Haparanda and Vännäsby—are identified as among the most flood sensitive areas in Sweden under the EU Floods Directive, indicating the different needs within the counties. However, municipalities do not necessarily consider—as one example—flood prevention measures as adaptation measures; the connection to climate change is not always obvious. Because of that, measures are not always implemented with a long-term perspective, but focus rather on managing the next flood (Interview Adaptation Norrbotten).

Besides providing municipalities with information and administrative



support in planning processes, the CABs in Västerbotten and Norrbotten have produced a regional water provision plan. They have also provided studies and statements on how climate change can be integrated in municipal comprehensive planning (Interviews Adaptation Norrbotten; Adaptation Västerbotten) and digitization of existing ground stability mapping (Interview Adaptation Norrbotten).

Adaptation and planning for extraordinary events are thus often treated separately in the municipalities (Interviews Adaptation Norrbotten; Adaptation Västerbotten). Hence, the vertical integration is weak, whereas there exist some examples of horizontal integration mainly as municipal cooperation in the production of RVAs. However, there is a perceived connection between the two fields within the municipalities, and an expected added value in connecting them since both of them treat vulnerabilities. This rarely happens, potentially as a result of the division of labour among risk management, adaptation to climate change and those who work with safety and rescue services (Interview RVA Norrbotten).

### Limitations to Integration

On the municipal level then, policy integration between RVA and climate change adaptation can be traced in some respects. Measures in preparation for extraordinary events bring positive impacts on adaptation, but rather as unintended consequences than as part of coherent planning approaches. The CABs are instrumental in providing adaptation-related information and provide impetus to and steps towards integration at the municipal level. However, amongst the number of factors limiting integration or mainstreaming are national legislation and local resources. RVA planning is mandated by legislation, and the CABs and municipalities need to adhere to that assignment. One strong municipal incentive is that Government funding can be withdrawn if the CABs find the municipalities' work insufficient (Interview RVA Västerbotten). Adaptation is not mandated by legislation and no added funding is assigned to the municipalities, only temporary funding is provided to the CABs. The legislative and resource rationales therefore imply that RVA planning is prioritized rather than adaptation. These rationales are further enhanced in the northern context reviewed here. The northern Swedish municipalities are generally sparsely populated, but large territorially. Their populations tend to have a higher proportion of elderly people than the national average, imposing lower levels of income tax revenues and extra costs for elderly care. In a situation of resource restraints legal and economic issues are top priorities. Since integration of planning for extraordinary events and adaptation processes are not mutually mandated by law or supported through funding, the overall integrating incentive is weak.

Another aspect is that the level of ambition varies considerably among the municipalities (Interviews Adaptation Norrbotten; Adaptation Västerbotten). Vulnerabilities, related either to RVA or climate change, are complex to analyse and manage even without restraining economic resources. The largest municipalities are using more complex analytical methods for RVAs (Luleå 2011; Skellefteå 2011; Umeå 2012), indicating that available resources matter. However, judging from the three RVAs where climate change and its consequences are most prominent—Robertsfors, Umeå and Vindeln—political and individual ambition affects integration too, as these three RVAs were co-funded and produced by the same municipal employee.

The issue of what time context to take into account in policy integration was also raised by the interviewees. As an example, increased precipitation implies higher water levels and more floods in areas close to water. In the short term it can cause crises that can be foreseen and managed through RVA processes; in the long term these RVA actions can help municipalities to adapt to climate change (Interviews Adaptation Norrbotten; RVA Västerbotten). Climate change effects on drinking water supply are another example where the RVA focuses on sudden or unexpected extraordinary events while adaptation employs a long-term perspective (Interviews RVA Norrbotten; RVA Västerbotten). These examples show that further integration can be a useful response to vulnerabilities also where economic resources are lacking.

## Conclusion and Discussion

Planning and preparing for extraordinary events has a stronger policy position than climate change adaptation in Sweden. The case of 29 northern municipalities shows that legislation and resourcing are essential to establish changes in management of planning processes. Adaptation objectives and policies are subject to “soft governance,” mainly relying on provision of information to be used on a needs and voluntary basis. Consequently, integration of adaptation policies into RVA processes is fairly weak. There are examples of RVA planning that might bring positive consequences also for climate change adaptation, but most often as an unintended result—not as part of a coherent and integrated planning process. Without CABs providing information and support, the level of municipal adaptation would most likely have been lower. The Government’s adaptation policy mandate to the CABs—especially the lack of funding and a permanent mission—does not allow for stronger governance and input in municipal planning processes.

In other sectors, it has been shown that this focus on information and voluntary measures is not enough (Appelstrand 2007). Without additional funding of adaptation in terms of development of preparedness for extraor-

dinary events, there is a risk that adaptation is added to the list of expectations on planning that is not sufficiently developed. Integration of adaptation is thus limited despite a large potential within several concurrent processes, including comprehensive planning and emergency management RVA processes (Lafferty *et al.* 2004). The study indicates that the level of coordination that would mainstream adaptation in planning for extraordinary events is not present, nor does consensus exist on means by which to develop integration. This uncertainty is particularly challenging for the municipalities reviewed here, with limited operational capacities (see Dannevig *et al.* 2012) with regard to the consideration of municipality size and resources in Norway.

Such a development adds to the discrepancy between large (high-populated) and small (low-populated) municipalities in terms of potential for future planning. Other comprehensive requirements may also result in similar inequalities being dependent on possibilities for responding rather than on vulnerability. For instance, Keskitalo *et al.* (2013) noted that in the municipality of Haparanda, situated in the Swedish-Finnish Torne River Valley and rated as one of Sweden's 18 flood risk areas under the EU Floods Directive, adaptation to climate change was not a driving factor in the development of responses. Instead EU projects related to EU directives were conceived of as driving developments, adding resources to otherwise relatively limited emergency response structures, but largely omitting the adaptation context.

This study thus highlights the potential role of a number of existing mechanisms at the municipal level, mirroring the results of Baard *et al.* (2012) who noted that sustainability analyses could constitute a relevant form of developing adaptation at the municipal level; Mossberg Sonnek (2013; see also Mossberg Sonnek *et al.* 2011) who noted that RVA in the cases of three municipalities could support adaptation; and Groven *et al.* (2012) that noted the possibilities for integrating adaptation in civil protection planning. However, all of these cases also identified large problems with existing approaches, mainly in terms of time and resources for development. This study supports this argument by highlighting the development in relatively sparsely populated municipalities where RVA processes may result in requirements that present difficulties in providing operational integration at the level of the municipality (see also Aall *et al.* 2007 on coordination difficulties in Norway). As Dannevig *et al.* note on Norwegian cases of using this type of tool: "an RVA is merely an assessment and will not necessarily lead to concrete actions or proactive attempts at adaptation" (Dannevig *et al.* 2012: 598).

While Sweden has chosen not to lend economic support to the develop-

ment of adaptation at the municipal level, it is relevant to ask whether it is possible to expect integration based on vulnerability in cases with small resources, and without binding or funded requirements (see Juhola *et al.* 2012; comparisons can also be made with earlier lessons with regard to Agenda 21 sustainability processes, see Aall 2000; Aall 2012). Given the aging population and the large geographical distances in Northern Sweden, more efficient solutions in almost any municipal activity are needed, and prevention and preparations for protection against accidents and extraordinary events are no exceptions.

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## NOTES

- <sup>1</sup> County Councils are political actors at the regional level. They have municipal status, but with the main function to provide health care. They are also obliged to produce risk and vulnerability analyses (RVA) for their own organisation, but lack legislative and land use planning capacities as well as any implementing and controlling functions within the planning system.
- <sup>2</sup> During 2015 a new set of RVAs was supposed to be reported to the CABs. However, due to the unexpected high inflows of immigrants to the municipalities—itsself an extraordinary event—they were allowed to prioritize immigration matters rather than produce and report updated RVAs.
- <sup>3</sup> This is a specific method, to be potentially used within the wider RVA planning processes.
- <sup>4</sup> The categories are not mutually excluding. One example is the distinctions made between Threats and Violence in relation to the category Social Unrest, where the former indicate aspects of individual and the latter of collective insecurity. The same goes for the categories Extreme weather conditions versus High water flows, where the latter potentially being a consequence of the former. The categories are aggregates from RVA lists in order to present a relatively straight forward overview.

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