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Implementation through collaborative crisis management and contingency planning: the case of dam failure in Sweden

Erik Persson^{a,b,c} and Mikael Granberg^{a,b,d}

^aThe Centre for Societal Risk Research, Karlstad University, Karlstad, Sweden; ^bThe Centre for Natural Hazards and Disaster Science (CNDS), Uppsala University, Uppsala, Sweden; ^cRisk and Environmental Studies, Karlstad University, Karlstad, Sweden; ^dPolitical Science, Karlstad University, Karlstad, Sweden

ABSTRACT

This article builds on the field of collaborative crisis management, a mix of collaborative public management (CPM) and crisis management (CM). A field that often focuses on large-scale threats, sometimes labelled societal challenges, whose impacts are broad and cross-cutting and impacts many actors in society and drives demand for collaboration. In this study, we are interested in events that have broad and disastrous impacts on society, high degrees of uncertainty and potentially cascading effects and we study this through an in-depth case study of collaborative crisis management tasked with contingency planning for dam failure risk in a large river basin in central Sweden. We find that there was a lack in reach of the collaboration potentially limiting capacity and capacity building in ways that can limit preparedness and increase vulnerability in a crisis situation. We also found that contingency planning was treated as a demarcated project with a beginning and an end and not entirely as a continuous process. Both these observations go against the basic principles of contingency planning. Hence, there is a need to acknowledge and abridge varying levels of organisational capacity and build/maintain awareness within and between the organisations and actors involved. This study shows that the practice of cross-sector collaboration and contingency planning is both complex and complicated. The article has the potential to aid policy-makers in the field to pinpoint central aspects of cross-sector collaboration and contingency planning that needs to be addressed in order to mitigate limits to preparedness and increased vulnerability in a crisis situation. A deeper knowledge on these challenges and problems can also support progress towards the UN Sustainable Development Goal 9 (especially in relation to the aspect of building resilient infrastructure) through its empirical focus on infrastructure failure in terms of dam failure.

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Introduction

This article builds on the field of collaborative crisis management, a mix of collaborative public management (CPM) and crisis management (CM), dealing with ‘cross-boundary work in relation to extreme events’ (Nohrstedt et al. 2018, 3). This field often focuses on large-scale threats,

CONTACT Mikael Granberg  mikael.granberg@kau.se  The Centre for Societal Risk Research, Karlstad University, Universitetsgatan 2, Karlstad 651 88, Sweden

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sometimes labelled societal challenges, whose impacts are broad and cross-cutting and effects many actors in society and drives demand for collaboration. Examples of societal challenges are climate change; energy, food and water security; overpopulation; etc. These societal challenges, however, are also materialised in events with concrete impacts in specific localities such as floods, landslides, forest fires, etc., sometimes with devastating and catastrophic results (Granberg et al. 2019; Moloney, Fünfgeld, and Granberg 2018b).

In this study, we are interested in events that have broad and disastrous impacts on society, high degrees of uncertainty and potentially cascading effects (Grin, Rotmans, and Schot 2010). Our interest is directed towards low-probability/high-impact risk (Könnölä et al. 2011; Wittmayer et al. 2014). We study this with a broad and holistic approach observing CM and contingency planning aiming at grasping the complexity of a threat with a special interest in the perceptions of the actors included. The empirical focus is on dam failure in a specific local setting.

In this article, we argue that dam failure could function as an 'operationalisation' of a societal challenge as it fits many of the criteria through its potential for cross-cutting, life changing and devastating impacts, that, at the same time, can be studied in a focused single case study. In this way, dam failure becomes a focused 'model' of society's handling of risk connected to societal challenges. Hence, we argue that dam failure lends itself well to a concentrated in-depth case study of collaborative crisis management and contingency planning focusing a 'normal accident' in terms of infrastructure failure (Perrow 1999). At the same time, the changing energy demand propelled by climate change mitigation efforts entails the development of new hydro-power installations leading to an increase in the number of dams around the world and in Sweden (Kirchherr and Charles 2016; Sovacool and Walter 2019; SvK 2019). Hence, there is ample motivation for studies aiming at increasing the understanding of dam failure governance itself.

This article is based on a qualitative in-depth case study of actors participating in collaborative crisis management tasked with contingency planning for dam failure risk in a large river basin in central Sweden. Based on perceptions of the interviewed respondents, the objective of the article is to identify and discuss prerequisites and barriers for contingency planning in a collaborative crisis management context.

Theoretical approach

There has been an increased stress on collaboration as a viable way to manage crises associated with wide-ranging and complex societal challenges (Bryson, Crosby, and Stone 2006, 2015; Moloney, Fünfgeld, and Granberg 2018a). Potentially, collaboration can decrease uncertainty, increase organisational stability and capacity through the expansion of mobilised resources (Nohrstedt et al. 2018). At the same, it is '... the actual experience of a crisis that proves to be the strongest incentive ...' for action (Drennan, McConnell, and Stark 2015, 41).

A crisis drives the need for cross-cutting collaboration as it often spans boundaries in a number of ways (Ansell, Boin, and Keller 2010; Grin, Rotmans, and Schot 2010; Linneroth-Bayer, Löfstedt, and Sjöstedt 2001) as it can cross:

1. political or administrative boundaries horizontally and vertically making coordination horizontally and vertically more challenging;
2. the functional boundaries of policy areas with varying operating imperatives, norms and logics in ways that can surprise and confuse involved actors;
3. temporal boundaries and impacts can be manifested many years after a triggering event, leading to uncertainty regarding response, mobilisation and coordination.

Transaction costs, however, can be substantial for collaborative efforts (McGuire and Agranoff 2011) as coordination with varying access to resources and with different motivations is

challenging under stressful conditions with limited information (Ansell, Boin, and Keller 2010). Collaboration can also '...add institutional complexity and create additional challenges to ... the efficiency of planning and decision-making processes' (Fünfgeld and Moloney 2018, 18). Hence, institutional uncertainty can increase in processes involving coordinated action among actors with divergent agendas dispersed in space and time (Ansell, Boin, and Keller 2010; Grin, Rotmans, and Schot 2010; Nohrstedt et al. 2018).

Collaborative crisis management and contingency planning entail complex problem-solving, policy-making and planning in a context saturated with uncertainty. Society expects organisations to be able to control and manage uncertainty (Clarke 1999; Drennan, McConnell, and Stark 2015; Eriksson and McConnell 2011). From a rational planning perspective, planning involves collecting information, analysing it, and by doing this, transforming uncertainty into reasonable certainty (Allmendinger 2017; Mandelbaum, Mazza, and Burchell 1996). Hence, from this perspective, planning and uncertainty are understood as inversely related – the more you plan, the more you will reduce uncertainty. At the same time, risk, becomes an approximation of the likelihood that an adverse event will occur and an estimation of its consequences, quite often in quantitative terms (Drennan, McConnell, and Stark 2015).

Clarke (1999) observes, that rational planning can function when uncertainty is relatively low, or ignored, and sufficient information about hazards and risks are available, analysed and utilised. However, rational approaches become more problematic under conditions of high uncertainty (Luhmann 2002; Pidgeon, Kasperson, and Slovic 2003; Renn 2008). Accordingly, a well-designed plan might fail when facing a fast-moving crisis with uncertain impacts (Eriksson and McConnell 2011). The challenge in transforming uncertainty into risk is enhanced when there is no tangible information or experience to draw from (Ansell, Boin, and Keller 2010; Drennan, McConnell, and Stark 2015; Eriksson and McConnell 2011).

Collaborative crisis management and contingency planning need to focus on 'contingency' in ways that accommodate '...chance, uncertainty, unpredictability' (Schedler 2007, 56). Accordingly, contingency could be understood as a misfit in relation to a more traditional concept of planning. This means that planning for crisis and disaster events basically is a contradiction in terms. At the same time '...the absence of a planning process or contingency plan is generally considered a recipe for chaos, confusion and crisis mismanagement' (Eriksson and McConnell 2011, 90).

Hence, normal planning practices may be insufficient in approaching a crisis situation and organisations facing hazards need turn to contingency planning in order to prepare '...for low-probability/high-impact issues in advance' (Drennan, McConnell, and Stark 2015, 132). Contingency planning can provide a 'worst-case' scenario that potentially can guide collaborative crisis management in the face of an event that also offers flexibility in relation to specific scenarios and contingencies (Eriksson and McConnell 2011, 89–99).

Accordingly, contingency planning is perceived as a cornerstone in CM (Alexander 2014; Drennan, McConnell, and Stark 2015; Eriksson and McConnell 2011) as it entails a systematic approach to recognising risks in specific situations by identifying contingency events. The aim of contingency planning is further to utilise plans, strategies and approaches for avoiding, or at least facilitate coping with, events in situations characterised by high threat levels, serious impacts on society and very limited time for action once an event unfolds (Drennan, McConnell, and Stark 2015). At the same time, contingency planning is, and has to be, an ongoing process that develops as new knowledge comes to light. In that way, the actual planning document can be considered as a snapshot of the situation at a specific point in time (Perry and Lindell 2007).

The development of contingency plans is normally paired with a variety of training and exercise activities for those potentially involved in a crisis situation ('tHart 1997; Boin and McConnell 2007; McConnell and Drennan 2006). Exercise activities are at the heart of crisis preparedness with many potential benefits associated with them but also hurdles to overcome. Collaborative crisis management and contingency planning processes require coordination as they involve a

multitude of actors from different spheres of society (Drennan, McConnell, and Stark 2015; Nohrstedt et al. 2018; Simo and Bies 2007). Collaborative crisis management and contingency planning have to handle differences in institutional logics/rationalities, organisational goals, professional cultures, lines of accountability, political control styles, decision-making cycles, etc. As Dovers and Handmer have stated 'If society wishes to better understand, avoid, prepare for or cope with emergencies and disasters [...] that can only be achieved through effective policy processes operating within suitable institutional settings' (2013, 337). This entails that an institutional (formal or informal) framework has to be in place to facilitate action.

This does not mean that attempts to develop collaborative crisis management involving broader contingency planning measures are futile. There are numerous examples of single sector action that has not been successful in the face of societal challenges (Bryson, Crosby, and Stone 2006, 2015) and in handling of catastrophic events as in the example of Hurricane Katarina (Leavitt and Kiefer 2006; Simo and Bies 2007) and sometimes a contingency plan can be the only thing that stands between success and disaster when a crisis strikes (Drennan, McConnell, and Stark 2015; Eriksson and McConnell 2011).

Hence, there is still a lot to be gained from a common understanding of the challenges inherent to collaboration and its coordination; clarified roles and responsibilities; transparent and deliberate allocation of resources, knowledge and expertise; mutual learning; and testing of collaborative crisis management systems through exercises, etc. (Boin, Kofman-Bos, and Overdijk 2004; Boin and McConnell 2007; Bryson, Crosby, and Stone 2006; Hillyard 2000; Persson 2016; Persson, Nyberg, and Svedung 2015).

Below we will first present the methods utilised in the study and then move over to a discussion on critical infrastructure failure before moving on to our case study, our analysis and our results.

Methods

In this study, two Swedish regions at the forefront of collaborating on contingency planning for dam failure were identified and one of them was selected as it had the most developed collaboration and contingency planning process. Representatives from five of the main collaborating actors were interviewed in in-depth, semi-structured telephone interviews between January and June 2016. This facilitated in-depth perspectives from key stakeholders in the collaboration.

The study includes two municipalities that face the most severe consequences if the largest dam in the system would fail. Also included were the County Administrative Board (CAB, Länsstyrelsen) managing the collaboration, the dam owning hydropower company Fortum responsible for the safety of the majority of dams in the region, and Svenska Kraftnät (SvK), responsible for national dam safety and supporting the development of contingency planning for dam failure in Sweden.

To gain a broader perspective and to triangulate the data (Malterud 2001), key documents and reports from the organisations were analysed. This included local and regional contingency plans, guideline documents and legislative documents. Presented quotes are linked to organisations rather than persons (Yin 2009).

The study is a single case study paired with content analysis. Case studies are for directly observing events and conditions of complex social and organisational phenomena and facilitate analytical generalisations (Yin 2009). Content analysis enables inferences from interview data as well as from documents (Silverman 2010).

The data are organised and interpreted through a framework of analytical categories based on the research objectives, the theoretical approach and on the data itself. The framework of analytical categories addresses organisational capacity for collaboration and coordination, internal and external communication, ability to implement decisions formed in collaboration

with partner organisations, and, ability to navigate in a context defined by high levels of uncertainty and difficulties to interpret and internalise knowledge and information.

Critical infrastructure failure

In contemporary society, the propensity for breakdowns in critical infrastructure has increased (Boin and McConnell 2007). In addition, as critical infrastructures are getting increasingly complex in ways that reach beyond geographical and functional borders compound crises emerge (Leavitt and Kiefer 2006; Perrow 1999). Society's dependency on critical infrastructure is growing and this increases vulnerability to disruptive events and the potential for severe and negative impacts (Pescaroli and Alexander 2016; Liu and Song 2020). At the same time, the development of infrastructure governance has entailed institutional fragmentation through privatisation of public functions and responsibilities (Cedergren, Johansson, and Hassel 2018).

Breakdowns can range from marginal emergencies to full-blown all-encompassing catastrophes with cascading events having ecological, economic and social impacts causing great harm (Garschagen and Sandholz 2018). Accordingly, it can be very difficult to '... predict with any degree of precision the potential *consequences* of infrastructural failure' (Boin and McConnell 2007, 51 italics in original).

The complexity of interacting systems, paired with the increasing dependency, the un-ability to predict the consequences of critical infrastructure breakdowns and increasing institutional fragmentation highlights the society's challenge in proactively addressing risks of infrastructure failure (Cedergren, Johansson, and Hassel 2018; Cruz 2012; Eriksson and McConnell 2011; Garschagen and Sandholz 2018). Below we will look at critical infrastructure failure through the example of dam failure.

Dam failure

Regulation of rivers and lakes are common all over the world including production of hydro-power, storage for water supply or irrigation, mining operations, mitigation of flood risks, etc. Hence, dams are often massive water reservoirs and vital components in large and complex infrastructure systems. The International Commission on Large Dams (ICOLD) administrates a World Register of 58,400 dams with a height of 15 metres or more (WCD 2000). As stated in the introduction of this article, there are efforts to mitigate climate change leading to increased investments in renewable hydropower energy. Utilising dams is on the rise around the world, and in Sweden, hence, the number of dams are increasing (Kirchherr and Charles 2016; Sovacool and Walter 2019; SvK 2019).

ICOLD defines dam failure as '... the collapse or movement of part of a dam or its foundation, so that the dam cannot retain water' (WCD 2000). Dam failure can take place through high flows or drought, it can be related to the construction and redevelopment of the dam as whole and/or to its specific or combinations of parts and, of course, contributed to the age of the dam (Hill et al. 2003; SvK 2019). The main focus in Sweden, and for the river groups discussed below, concerning dam safety is dimensioning flows and risks of dam failure connected to high flows (SvK 2019). The impacts of dam failure span from a serious accident to disastrous depending on the size and location of the dam. In that regard, this type of infrastructure failure can be compared to the failure of nuclear power plants (OECD-NEA 2010). However, while nuclear accidents caused the greatest monetary cost, dam failure accounted for 85% of the fatalities during the time period 1874–2014 (Sovacool, Kryman, and Laine 2015).

There are several examples of dams failing (OECD-NEA 2010; Sovacool, Kryman, and Laine 2015; WCD 2000). One of the most damaging events occurred in China in 1975 resulting in some 30,000 casualties due to the direct impact of floods down-stream, and another 145,000

due to the following famine, diseases, etc. in the aftermath of the event (OECD-NEA 2010; Si 1998). The massive overtopping 1963 of the Vajont Dam in Italy led to 2000 casualties (Di Baldassare et al. 2014). Sweden has since 1985 had a few dam failure events (Noppikoski, Hästberga), but only one with a reported casualty (Näckån) (SvK 2013). Sweden has around 10,000 dams mainly used for hydropower production and mining (SvK 2015). Around 500 of these are of a size and have a location where failure would cause severe societal consequences.

Dam failure can happen but is uncommon and, accordingly, dam failure risks are low probability and high impact. Key factors that contribute to the uncertainty of dam failure risk are: they require rapid action with great resolve, un-ability to rely on and learn from prior experiences; high probability of cascading events (defined as a consequence of accumulated vulnerabilities as well as functional dependencies and interdependencies at different societal scales) (Pescaroli and Alexander 2016); a propensity for interactive complexity and tight coupling (Perrow 1999); and a large number of interconnected stakeholders that needs to collaborate and that depend on each other before, during and after a disaster event (Hartford and Baecher 2004).

Case description

The collaborative model: river groups

In 1997, following recommendations of the national River Safety Investigation (SOU 1995:40), the Swedish government called for the formation of river groups, although no guidelines were provided (Olausson and Nyhlén 2017). Today, around 30 river groups have been established in Sweden, with the mission to assess risk and water status, engage in coordination of information and suggest measures to reduce flood losses before and during high water flows (SvK 2016). Some river groups are also a part of the national river network coordinating some of the action in the larger, hydropower producing rivers. Participants in river groups are municipalities along the river (with their respective rescue services and safety coordinators), the Swedish Transport Administration; SOS Alarm Sverige AB (operators of the national emergency number 112); the Swedish Hydrological and Meteorological Institute (SMHI); dam owners and; the CAB's coordinating the groups (SOU 1995:40; SvK 2016; Olausson and Nyhlén 2017). There is one CAB for each of the 21 counties.

The river group is the principal forum or node for the collaboration and is used for networking and strategic decision-making (SvK 2016). Most of the actual work, however, is done in smaller work groups. The river group facilitates and bridges communication and information gaps between actors. Research has found that river groups can improve the communication and trust between dam owners and rescue services, leading to an improvement of municipal early warning capacity and ability to reduce flood losses (Hedelin and Hjerpe 2015). Other research has shown that there '...is a lack of clarity as to what the activities in the networks should include, who should be involved and what the cooperation should result in' (Olausson and Nyhlén 2017, 323).

In the mid-2000s, a Swedish pilot study (Elforsk 2006) was conducted aiming at establishing a template for coordinating contingency planning in large regulated river systems. The study focused on the emergency phase. The study framed the 'who', 'what' and 'how', and presented lessons learned as a point of departure for implementation in Swedish river system management. The first part mapped out the river system by aerial photography, hydraulic and terrain modelling, dam failure risk estimations and GIS layering for inundation areas. Based on the mapping, the second part created local and regional contingency plans and alarm routines. The report from the pilot study stated that:

The most important actors are the dam owners, municipalities and County Administrative Boards. None of these actors on their own has the ability to reach a sufficient level of preparedness, which is why collaborative and exercised contingency planning is motivated. (Elforsk 2006, 9)

Based on the lessons learned from the pilot study, collaboration purpose, membership and organisational structure, designated decision-making structure, and established performance measures and goals were specified. This was supported by a government policy that stated that the cross-sector collaborations should use existing networks (river groups) and receive funds in order to finance the collaborations (SOU 2012:46).

The collaboration studied and analysed in this article commenced in 2006. The dam in the river is in the highest risk class in the dam safety system. The consensus among the respondents is that the county where the dam is located is at the forefront regarding contingency planning for dam failure. Hence, the county is a model for other counties. When the CAB started the process, they could partly rely on the results of the pilot study for collaborative contingency planning and some of its key actors for input on how to go forward. As a whole, however, guidance was limited and most of the process had to be invented step by step.

Actors in the case study

SvK is a government authority and the operator of the electricity transmission system and the national dam safety authority providing dam safety guidelines to the CABs, support development of contingency planning and capacity building for dam failure and promote research and development (SvK 2015, 2016, 2019).

Dam owners, in this case, the hydropower company Fortum, have an overall responsibility for their dams and are obligated to maintain the dams to ensure that damage is avoided. Dam owners have strict liability for dam failure. Self-regulation procedures are in place and dam owners follow a safety management system that includes routines for contingency planning and for identifying and assessing risks. Appropriate and effective measures for dam failure are developed and decided in collaboration with affected municipalities (SvK 2015, 2016). The CAB supervises the dam owners' self-regulation and municipal compliance with the Civil Protection Act (SvK 2019).

In Sweden, risk and CM are the responsibility of the 290 municipalities and municipalities are expected to identify, analyse and plan for extraordinary events (cf. Olausson and Nyhlén 2017). This is also the case for dam failure where the municipalities are responsible for contingency planning and providing rescue services. The municipalities are also responsible for supervision of the dam owners' compliance with the Civil Protection Act for dams that are classified as dangerous facilities (SvK 2019).

Results

Organisational capacity

The respondents see contingency planning as a continuous process, where plans are recurrently evaluated and revised. From the interviews, it is clear that the level of intensity in the planning process varies over time. When all the plan components (local and coordinated) are in place the process transforms into administration, not the least because there are many other safety and risk management issues to attend to for a municipality or for the CAB.

Administration of the contingency planning process is facilitated by the river group:

...the thing about preparedness, it is a progressive process and development. You are never finished and can say 'Now we have done this once and for all'; [...] the challenge is to keep it alive and double check the knowledge around it and keeping it up to date. This challenge will always be there, and I think that is

where we will help each other in the river group to make sure that it is not just a document, [...] but that we will actually keep it alive and make sure that it is an updated coordinated process going forward. (CAB)

The role of the river group is to facilitate the development of plans, implementing and continually revising and updating them are viewed as a critical component in the process towards preparedness, according to the CAB and SvK. It is, however, up to the individual organisation taking part in the river group to achieve preparedness through the means available to them. The contingency plans rest on a large and complex information and knowledge base, and, according to the CAB, it is a considerable challenge to extract and produce routines and action plans that can be easily adopted by the operative actors in a crisis situation. Many actors are affected by, included in and activated by a dam failure and need to be involved in building preparedness. All respondents saw the effectiveness of plans as largely determined by the operative actors' knowledge and understanding. This is challenging as involvement of impacted actors in the planning process, in exercises and drills on the different levels and from the different organisations is central.

From a municipal perspective, the river group is a forum for discussing and keeping the plans alive. However, disseminating the benefits of that interaction within the municipality is a challenge. A respondent from one municipality expressed frustration over the difficulty to get other concerned parties within the municipality interested and involved:

I have invited people to the river group meetings, but the problem is that when you do no one comes, something else always gets prioritized. I have established a forum in the municipality, a safety group, where the departments and the municipal companies are represented. I try to inform about the issue, what we are doing, etc., but it is very difficult to get any response. They are there and they listen, but they don't have any questions, they simply receive the information and then there is not much interest. (MUN2)

In the municipalities, there are 1–2 people responsible for updating the plan and for keeping in contact with the actors in the collaboration. Several respondents stressed the vulnerability of only having one person per organisation active in the collaboration. One respondent argued that this problem is most evident in the municipalities, and:

... sometimes it feels like they only have the rescue services as their only contributor, and I don't think that is very good. I mean, there are a lot of things within a municipality that needs to be planned [with respect to a dam failure event], and it can't all rest on the rescue services. (Fortum)

According to the respondents, exercises are crucial for the performance in a crisis situation. Exercises are also perceived as critical for implementing preparedness plans within and between organisations. The exercises have the potential to stimulate learning about important aspects of the organisations, what works, what needs to be improved and to their ability to cooperate. The aim in the municipalities is to exercise the CM organisation at least once a year, and include politicians twice every four years (the period between elections are four years in Sweden). Larger regional exercises, including a broader set of risks and a variety of actors (like municipalities, CABs, the energy company, etc.), take place once a year. Opinions on the regularity of the larger exercises vary between the respondents.

The respondents state, however, that exercises require a great deal of resources and commitment. Hence, instances where one person represents an entire organisation in a larger exercise, or where critical actors are absent, has been observed in this study. This exemplifies how learning and knowledge cannot be reached due to weak mobilisation of central actors. The set-up of exercises becomes complicated as actors have varying needs (and perceived needs) and resources, as expressed by the respondent from Fortum:

... from a dam owner's perspective, when we exercise dam failure we'd prefer to pick a dam that is likelier to give us problems. Unfortunately, the level of impacts is often lower, and then the authorities won't get to exercise every aspect of importance. That's a balancing act. But I would like to say that exercising dam failure in 'the largest dam' [author's edit] is almost pointless from our point of view, since the likelihood of that happening is so low. (Fortum)

There is a yearly exercise to test the alarm chain, to make sure that all actors are reached in sufficient time and without interruptions. One issue, that the SvK has identified, is that the actors use different technical communication systems and this creates problems in inter-organisational communication. Another issue, identified by the municipalities, is that the exercise stops when it reaches the rescue service director, while in a real crisis situation the procedure would reach a multitude of actors from many different sectors/departments within the municipality. Expanding the alarm exercise to involve a broader set of municipal actors is the responsibility of the municipalities.

The organisations involved in the river group also have different structures and paths for communicating and for executing decisions. One respondent observed a similarity, however, in the difficulties between organisations regarding resources:

There is also the issue of resources, and that is something I think we share with the municipalities. There is not an infinite amount of people who have time to work with contingency planning. (Fortum)

The respondent went even further, saying that it is tradition in Sweden is to rely heavily on the work and input from a limited number of experts, and that there is a communicative gap between the experts and other actors involved on a day-to-day basis. He concluded that:

'...we get very dependent on the availability of these experts and they might not be available on Christmas morning for example' (Fortum).

Contextual implications

The contingency planning aims to reduce the consequences of dam failure by making the actors capable of collaborating before, during and after an event. According to the respondent from SvK, the measurement for this has been to look at the fulfilment of intermediate goals such as the production of plans and there are no detailed indicators to measure the level of preparedness or potential capacity to manage a crisis among the organisations involved. When asked about aims for the planning process, the respondent from the CAB was unsure about the overall aim of the planning process and talked instead about working towards intermediate goals and striving for completing 'the project'. While the respondent stressed that contingency planning is a never-ending process, the planning and the production of contingency plans were, at the same time, distinctly understood as a demarcated project.

Several respondents pointed to the problem with this perspective concerning how to decide on the level of ambition for the project, agreeing on explicitly defined specifications on what should be accomplished and which interactions between actors that are necessary for arriving there:

... what level [of ambition] should we agree on? We have a very good knowledge foundation to stand on, but at the same time this foundation is not an exact science – we do not know precisely what will happen [in case of a dam failure event]. [In the model] the water is clean, but I mean, it might take a new path, a lot of things can happen. You need to find a reasonable level for the planning; it is not possible to go into every detail. (CAB)

Without agreeing on a reasonable level of ambition, it was not possible to think more than a few steps ahead and focus on issues such as signing contracts with entrepreneurs and so on. It was also difficult to assess the time frame and estimate for how long into a crisis it is possible to plan. This has serious implications for the contingency planning as, as the respondent from the CAB argued, the level of uncertainty five days into a major dam failure crisis is so high that it is pointless to try to plan for any and all contingencies.

Concluding discussion

Two analytical categories have emerged based on the data and on the theoretical approach. These categories have structured the discussion of our findings above and are important parts of the results and the broader contribution of this study. The lack of reach and inclusion in the collaboration potentially limited capacity and capacity building in ways that can have a negative impact on preparedness and lead to increased vulnerability in a crisis situation. For instance, the exercises of emergency action stopped at the rescue service director and did not include other important municipal actors and sectors that would be impacted in a real crisis situation. From that perspective, the exercises described by the respondents seem to be symbolic actions with limited value. Another example of a systemic vulnerability is the over-reliance on external experts.

Context matters and this was manifested in the measures of success that was limited to the fulfilment of intermediate goals such as the production of plans. Furthermore, the practical understanding, despite statements of the opposite, of contingency planning was rather as a demarcated project with a beginning and an end and not as a continuous process. In addition, the short-sightedness of the planning in terms of the stated impossibility of planning for more than five days into a crisis due to uncertainty is seriously limiting the utility of the process and the plan. These observations are more in line with the logics of rationalistic planning but clearly go against the basic principles of contingency planning.

The river groups were the node for collaboration as mandated in the national government directives but also as the river group already included relevant actors. This is in line with Bryson, Crosby, and Stone's (2006) statement that the use of existing networks and platforms can be a success factor. However, that the collaboration was mandated by the state (even enforced) and not voluntary seems to limit the desire from the involved organisations to go above and beyond in terms of resource allocation and putting the issue of dam failure at the forefront of the agenda (cf. Olausson and Nyhlén 2017). Hence, problems concerning implementation and communication through mediating organisations were highlighted. The river group as hub for collaboration has obvious benefits but also some clear downsides as the involved organisations have considerable differences in allocated resources for dam failure, as well as differing interests and priorities.

This leads over to the importance of organisational capacity, as pointed out by Simo and Bies (2007). River group collaboration will face a steep uphill climb if it does not take into account imbalances in organisational capacity among participating organisations. By mandating the use of river groups as a node for collaboration, existing barriers to implementation has been consolidated and even reinforced (see also Hedelin and Hjerpe 2015). The river group is working in the 'shadows of the hierarchal model of governing' (Olausson and Nyhlén 2017, 322) and not truly self-organised, which could impact the incentive for cooperation negatively.

The river group collaboration studied here focused on dam failure risk in the largest dams in the tributary. The potential consequences of a failure in a large dam are considerable and that aspect has been used to motivate the collaboration. However, the main dam owner states that likelihood of a failure, with considerable but smaller consequences, is higher in the smaller dams in the tributary. Other actors, however, do not view issues involving smaller dams as urgent and this assessment cannot drive the collaboration. This highlights competing logics and motivations as obstacles in collaborative crisis management (Ansell, Boin, and Keller 2010; Nohrstedt et al. 2018).

Uncertainty and the abstract nature of the risk is a further complication for contingency planning in the municipalities. The probability of dam failure in the large dams is perceived by the respondents as minute, and management of these risks has little to no opportunity of prioritisation on an agenda where it competes for attention and resources with other, more prioritised, issues. Staff working exclusively with risks are usually located in the rescue services and does not have a position where they can influence priorities in the wider municipal setting. They also have a

plethora of more immediate issues to deal with. Respondents in both municipalities acknowledged the difficulties of implementing plans, creating and maintaining awareness in organisations with their main focus and priorities elsewhere. They discussed the ability to scale down the plans for dealing with more frequently occurring floods as one potential piece of the puzzle.

There was also the issue of fragmented governance as SvK and the CAB view the implementation of plans as the responsibility of each organisation and, accordingly, no comprehensive implementation strategies were put in place. This lack of cohesion has real consequences, for example when alarm exercises routinely stop at the rescue service director, effectively limiting the utility of the exercise for other parts of the municipalities. Hence, the exercises become more symbolic than real and their impact in the event of a dam failure is questionable. Exercises can, from this perspective, function as legitimising a collaboration but do not really prepare the involved actors for a real crisis.

The arguments presented by the CAB on finding a reasonable level of ambition stem from the uncertainty of how an event will unfold and the inherent risk of cascading effects. In the view of the respondents, finding a reasonable level of ambition is connected to efforts to find a manageable frame to work within that is possible to agree upon. This manageable frame requires a perspective on the system that might be too narrow to account for cascading effects with wider impacts in space and time. This is also connected to uncertainties of mandates and responsibilities between organisations and within each organisation.

The discussion can in turn be related to the argument by Clarke (1999) that contingency plans addressing risks with very high levels of uncertainty runs the peril of ending up as legitimising fantasy documents without any real impact on preparedness. As with the exercises discussed above, this symbolic value might be real in the sense that they can facilitate the public's trust in institutions (Eriksson and McConnell 2011) but has the downside of indicating control and preparedness when, in fact, these are lacking. As a result, symbolic action and documents have the potential to increase risks and vulnerabilities.

Collaborative crisis management is adopted in order to plan for and manage crises where actors cannot solve the problems without collaborating with other actors. Research has been done to dissect and better understand success factors and barriers for effective collaborative crisis management (Nohrstedt et al. 2018). Our case highlights principal issues with collaborative crisis management as it relates to societal challenges in general and low-probability/high-impact risks, in particular. We can show how critical characteristics of societal challenges in combination with limitations that epitomise Swedish risk- and CM organisations, creates obstacles for success that are not easily manoeuvred. By following the organisational logics that are in place, targeted goals can be reached through symbolic action and documents without actually handling the problem at hand. As an effect, the problem might actually get worse, since it has brought with it a perception that uncertainty has decreased and the problem is handled when, in reality, uncertainty has increased and the problem has not been handled. This aligns with observations found by Nohrstedt et al. (2018) and Grin, Rotmans, and Schot (2010), where efforts to decrease the uncertainty through collaboration ends up creating new uncertainties as actors with unclear responsibilities, different interests and divergent agendas get involved to share information and mobilise resources.

In this study, we have pointed out the need to acknowledge and abridge varying responsibilities; different levels of organisational capacity; ability to implement plans; and ability to build/maintain awareness within and between organisations as well as with regard to the public, who in some respect are end users of contingency plans and early warning systems.

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