

Navigating Obstacles to Cross-Border Crisis Preparedness— Preliminary Findings from an Interview Study

Monika Magnusson

Karlstad University
monika.magnusson@kau.se

Erik Persson Pavlović

Karlstad University
erik.persson.pavlovic@kau.se

Peter Bellström

Karlstad University
peter.bellstrom@kau.se

Bjørn Tallak Bakken

University of Inland Norway
bjorn.bakken@inn.no

ABSTRACT

The Covid-19 pandemic and the 2024 floods in Central Europe illustrate that disasters do not stop at geographical borders. Cross-border collaboration is therefore often essential for mitigating risks, reducing impacts, and supporting recovery. This interdisciplinary study contributes to the field of crisis management by identifying key challenges in cross-border preparedness in a Swedish–Norwegian border region and by proposing approaches for crisis management exercises to address these obstacles. Preliminary findings from interviews with practitioners highlight challenges such as unclear mandates, weak cross-border networks, communication problems linked to differences in language and terminology, and limited interoperability of digital tools. We argue that joint exercises can help tackle these issues by explicitly addressing roles, responsibilities, and terminology, as well as by prioritising network building and the use of digital technologies in exercise design.

Keywords

Cross-Border Preparedness, Challenges, Crisis Management Exercises, Exercise Design

INTRODUCTION

Disasters and large-scale disruptions increasingly cross administrative and national boundaries, making transboundary coordination a critical dimension of contemporary crisis management. Recent crises, including the COVID-19 pandemic and the 2024 floods in Central Europe, have demonstrated that impacts frequently extend across borders and require collaborative approaches to preparedness, response, and recovery. Such events expose long-standing challenges associated with transboundary crisis management, including fragmented responsibilities, divergent legal frameworks, incompatible technologies, and limited shared situational awareness (Ansell et al., 2010; Boin, 2019). These issues remain especially acute in border regions where hazards, infrastructures, and communities are closely interconnected.

The Swedish–Norwegian border region of Värmland–Innlandet exemplifies these dynamics. The area is characterised by recurrent floods, landslides, and wildfires, with major rivers originating in Norway and flowing into Sweden, creating shared hydrological risks (cf. van Well et al., 2018). While both countries' crisis management systems are built on similar principles of responsibility, proximity, and similarity, and while cross-border collaboration is formally encouraged through frameworks such as the Haga Declaration and Nordred (MCF, 2025a; MCF, 2025b), cooperation in practice remains uneven. Previous studies identify persistent challenges related to communication, technological interoperability, and the uptake of national information systems (Granholtm et al., 2022; Magnusson et al., 2018). As a result, cross-border collaboration is often dependent on individual relationships and ad-hoc arrangements rather than systematic, institutionalised routines.

A recurring theme in the literature is that joint exercises are essential for developing the capacities, network ties, and shared understandings required for effective transboundary crisis management (cf. Kanteler & Bakouros, 2024a). Exercises are also resource-intensive and challenging to conduct across national borders due to differences in terminology, command structures, legal mandates, and digital infrastructures (cf. Granholm et al., 2022). Despite calls for more frequent and interoperable exercises – both conventional and digitally supported – empirical research examining how practitioners experience these barriers in the Nordic context remains scarce.

To systematise the understanding of cross-border preparedness challenges, Kanteler and Bakouros (2024a) propose a ten-pillar framework that identifies conditions necessary for effective collaboration. While developed in the Balkans, the framework offers a useful analytical lens for examining cross-border preparedness more broadly. However, little empirical work has applied this framework in Nordic civil protection settings or explored what it implies for the design of joint exercises.

The purpose of this work-in-progress study is to contribute to the understanding of what shapes the ability of Swedish and Norwegian actors to engage in meaningful and interoperable cross-border crisis exercises, both virtual and conventional. Our aim is to identify key challenges for cross-border preparedness in the border region, and to suggest how joint exercises can address these issues. This aim is operationalised by the following two research questions:

RQ1 – *What are the key challenges for cross-border collaboration in crisis preparedness in the Värmland–Innlandet region?*

RQ2 – *How can insights from these challenges inform cross-border exercises practices?*

RELATED WORK

Crisis management in the border region of Sweden and Norway

The national crisis management systems in Norway and Sweden share many similarities. Both are organised at three levels—national, regional, and local—and municipalities hold the primary responsibility for managing crises. Crisis preparedness in both countries is guided by the principles of responsibility, similarity, and proximity: actors retain their ordinary responsibilities during a crisis, operations should function as normally as possible, and crises should be handled as close to the affected area as feasible. Norway also applies a fourth formal principle, cooperation.

Collaboration with other Nordic countries in civil defence and emergency preparedness is highly prioritized in both Sweden and Norway (DSB, n.d.; MCF, 2025a). The shared vision of “a robust Nordic region without borders”, includes strengthened cooperation in planning and exercises (MCF, 2025a). The Nordred framework further supports cross-border collaboration by enabling local agreements for mutual assistance, allowing crisis response authorities in one country to request personnel or resources directly from counterparts in the other (MCF, 2025b). At the regional level, Sweden and Norway maintain three cross-border rescue councils. One of these covers the Swedish regions of Värmland and Dalarna and the Norwegian region of Innlandet.

The national TETRA (Terrestrial Trunked Radio) systems Rakel (Sweden) and Nødnett (Norway) have been interconnected for several years. For broader information sharing before, during, and after crises, Sweden provides the national platform WIS free of charge to civil preparedness actors, while its Norwegian counterpart, RAYVN (replacing F24 CIM), is a commercial SaaS solution. These systems are used for logging events, sharing situational and operational information, and supporting exercises. Previous studies show that uptake has been limited, partly because many intended users lack experience of using them (Magnusson et al., 2018; Meum & Munkvold, 2013). Digital maps are another important technological tool for collaboration, although practitioners have reported problems with digital maps when crossing the Swedish-Norwegian border (cf. Granholm et al., 2022).

Challenges for cross-border collaboration

Cross-border crises force countries to collaborate in stressful situations, thereby creating additional political, social and diplomatic challenges (Edwards, 2009). The challenges include administrative and legislative obstacles, linguistic and cultural differences, and differences in legal frameworks (Kalogiannidis, 2024). In addition, data sharing, while vital for disaster risk reduction and resilience in cross-border regions, remains challenging (Adrot et al. 2025). Kalogiannidis (2024) notes that there is a need for more efficient resource sharing systems, unified legal frameworks, and streamlined administrative processes. Moreover, to strengthen and standardize current frameworks and procedures, and to foster cultural awareness and multilingualism.

Kanteler and Bakouros (2024a) developed a collaborative framework for emergency management in the Balkans. The framework identifies elements or ‘pillars’ considered vital for cross-border preparedness. The ten pillars were identified in a literature study and validated in several Delphi studies with experts. The ‘pillars’ are *Governance and Leadership*, *Capacity building & Maintenance (Education, training and exercise)*, *Workforce Capacity*, *Command & Control*, *Technology & Information Security*, *Health Care*, *Resources*, *Cross Border Networks*, *Risk Analysis*, and *Community Engagement* (Kanteler & Bakouros, 2024b). Sub-themes were also identified. Although different groups weighted the pillars differently, Governance and Leadership—covering joint plans, policies, standards, legal requirements, and structures for managing uncertainty, decision-making, leadership, roles, and responsibilities—was consistently ranked as most important. Second most important in all but one group was *Capacity building & Maintenance*. Kanteler and Bakouros study is valuable, although the elements are only briefly described.

Crisis exercises

Within crisis preparedness, exercises are essential. Building on risk analyses and preparedness planning within an organization, crisis management training and exercises not only prepare individuals and organizations for the demanding situations that crises pose to decision-makers; they are also vital for revealing shortcomings in preparedness plans or identifying management practices that are not fit for purpose (cf. Perry, 2004). Edwards (2009, p. 262) particularly stresses the need for training on cross-border crises: “With the complexity of cross-border international events it is clear that annual training for national leaders on the management of international response is crucial”.

The growing level of conflict in many regions today creates new demands on crisis exercises methodology that reflect a VUCA environment—Volatile, Uncertain, Complex, and Ambiguous. Bakken et al. (2024) have developed an empirically grounded model of crisis management training and exercises that emphasizes organizational flexibility/agility, empowered and emergent leadership, extensive information sharing (push rather than pull), and improvisation in unforeseen events. Moreover, Venemyr (2025) has developed a framework that enables frequent, low-cost, albeit effective crisis management exercise processes for collaborating municipalities. Effectiveness is primarily achieved by focusing on the most critical aspects and prioritising the tasks that have the greatest positive effect on long-term resilience. By attempting to predict the most adverse probable outcomes, and taking early action to prevent such outcomes, damages and losses to society may be minimized.

Crisis management training and exercises may benefit substantially from technological support. New technology such as Virtual Reality (VR) and Artificial Intelligence (AI) can assist at all phases of a training and exercise program: from the initial conceptualizing of an exercise, throughout the design with a crisis scenario, to evaluation of a completed exercise session. Also, VR effectively enables distributed exercises, interconnecting decision-makers with an “avatar” functionality. Such virtual exercises are less costly and eliminate the risk of physical stress and harm to participants (Eide et al., 2025). In addition, Magnusson and Wik (2023) report findings from an R&D project that tested virtual tabletop exercises, partly in a cross-border context. They identified barriers related to technological interoperability and a lack of standardisation in exercise design. However, participants were generally positive about the exercise format. The flexibility in asynchronous and distributed features was considered to facilitate more frequent exercises (Magnusson & Wik, 2023).

RESEARCH METHOD

In line with the study’s purpose to contribute to an understanding of what shape crisis actors’ ability to engage in cross-border crisis exercises, a qualitative research approach was chosen. Semi-structured interviews were chosen as the data collection method. Before the study was conducted, ethical approval was granted by the ethics advisor at the main author’s university.

Sampling, Data Collection and Analysis

To select and invite informants to the study, we applied a purposive sampling approach. Purposive sampling is useful when “a researcher has something in mind and participants that suit the purpose of the study are included.” (Etikan et al., 2016, p. 1) which was also the case in the present study. In total 16 interviews, ten on the Swedish side and six on the Norwegian side, were conducted by five researchers (three from Sweden and two from Norway)

in the end of 2024 and the beginning of 2025. With the respondents' consent, interviews were either conducted in-person, on Zoom, or via telephone. The length of the interviews varied between 26 and 126 minutes. The interviews were audio-recorded and transcribed, and a preliminary deductive—abductive thematic analysis (Braun and Clarke, 2006) was adopted. The framework by Kanteler and Bakouros (2024a) was used as a first lens to analyse the data. However, because the framework was applied after the interviews had been conducted, only parts of it were identified during the analysis, and additional themes emerged. Finally, as this study is a work in progress, the analysis currently draws on interviews with six Swedish and two Norwegian participants.

RESULTS

This chapter presents the thematic analysis of challenges identified in the interviews, organised according to Kanteler and Bakouros' (2024a) framework. Three elements of the framework—*Community engagement*, *Workforce capacity* and *Health care*—did not appear in our material, likely due to the interview guide's limited focus on these areas and the absence of respondents from the health sector or non-governmental organisations.

The analysis did, however, reveal cross-border communication as a distinct and central challenge. Although communication is embedded across several elements in Kanteler and Bakouros' framework, none explicitly address language and terminology issues between responsible actors. For this reason, *Communication* is included as an additional theme in our analysis.

Governance & Leadership

Across interviews, Governance & Leadership emerges as a mixed condition shaping cross-border preparedness. Two Swedish respondents from county-level describe governance frameworks as simultaneously clarifying responsibilities and constraining flexibility. One of them notes:

We are working on developing, so to speak, an administrative mobility across the border that we haven't had until now. Within the Border Rescue Council [...] there is a whole set of regulations that allow us to cross the border with resources. But just because an agreement is in place does not mean you can actually do it.

National directives and sector-specific regulations are perceived to produce fragmented mandates that complicate long-term, cross-border collaboration. While one of the interviews revealed tensions between total defence priorities and crisis preparedness, another shows how diverging standards between national authorities leads to inconsistent interpretations of risk and responsibility. Also, the fact that the national crisis management system rests on cooperation can be challenging according to a Swedish local-level respondent:

The biggest challenge, briefly put, is the coordination because it is so complex. From the national level to the regional level to the local level out in the operations. When you are dependent on so many things.

Moreover, uncertainty of the role and responsibilities of organisations in the other country is voiced by several of the Swedish as well as the Norwegian respondents. This results in hesitation about who to contact. Taken together, these accounts suggest that governance structures are sufficiently formalised to support collaboration, yet too rigid or disjointed to translate into routine cross-border practice. A Norwegian local-level respondent notes: "We need much more coordinated cooperation when it comes to preparing risk and vulnerability analyses, preparing plans, etc."

Capacity Building & Maintenance (Education, Training & Simulation)

Several respondents emphasise the importance of crisis exercises. A Swedish region-level respondent values the large, infrequent cross-border exercises that take place approximately every fourth year, noting their deep pedagogical benefits. Another Swedish region-level respondent highlights the feasibility and effectiveness of short, low-threshold formats, such as serious games and 1–2-hour sessions that better align with real-world constraints.

A Swedish local-level respondent also emphasises the limited time available for designing and planning collaborative exercises: "God no, I don't have the time!". This respondent stresses the need for short, easily implemented exercises that can be integrated into regular workplace meetings.

The strive for more regular, shorter exercises was expressed also by a local-level Norwegian respondent:

It's great to have exercises every four years, or whatever it is, by the State Administrator, and that we ourselves have some major exercise once in a while, but here this has to be much more latent in the blood. Which means short, small incidents that you play out that you can practice and practice [...].

The same respondent also calls for enhanced collaboration in how exercises are conducted as a whole:

And if we are going to practice on the Norwegian and Swedish side, why not try to get a common mindset, a common method for how to plan, or analyse, plan, implement, evaluate exercises. [...] To build up the competence step by step. And for that there must be different [digital] tools, depending on whether it is competence building at the individual level, group or collaboration.

In addition, a local-level Swedish respondent highlighted the need to standardise training to facilitate collaboration and the exchange of personnel.

Command & Control

Data from the Swedish region-level indicate that Command & Control functions as a mixed condition, with formal mechanisms in place but persistent operational friction. A Norwegian local-level respondent highlights how differences in command-and-control structures between Sweden and Norway create uncertainty:

In Norway, if I am on duty, I am the incident commander and have responsibility for what happens in my area. There is no doubt about that. On the Swedish side, they have divided external and internal command and so on, so there is an incident commander at the scene. But he does not have full and overall responsibility. There is another incident commander further inland, at a central location, forming another layer. That complicates things for an incident commander [...] And who actually has the authority and makes the decisions then?

This corresponds to differences concerning which actor that assumes leadership during an event, as expressed by a Swedish local-level respondent:

For us, the fire and rescue services [may] lead an incident; for them, it is the police. So those formal structures may create friction. But as long as you are aware of them, it should be possible to handle it. It probably just requires that we get to know each other a bit better, so that we understand how things work.

A Norwegian local-level respondent shares both the uncertainty regarding who should assume leadership in situations such as a cross-border forest fire and the expectation that responsibilities will nonetheless be sorted out relatively smoothly in practice.

Technology & Information Security

When asked about digital barriers to cross-border collaboration, a local-level Norwegian respondent remarked: “No, it’s fine — after all, we hardly have any digital tools, right?” Overall, the level of digitalisation in preparedness appears to be relatively low. One Swedish local-level respondent described their digital toolkit simply as “Office 365”, while another noted that the national system WIS is primarily used for reporting the weekly operational picture. The same respondent explained that WIS is not used in exercises, as the system is not adapted to everyday municipal operations, meaning that many participants are unfamiliar with it.

None of the respondents mentioned WIS—or its Norwegian equivalent, RAYVN—being used across the border, when asked about cross-border collaboration. According to a Swedish regional-level respondent, efforts are currently underway to integrate Norwegian crisis actors into WIS so that the system can function as a shared information platform. However, this process is complex:

[...] getting an entire county's emergency preparedness actors into a new system takes time. First, they have to go through this grind and try to get an account in a Swedish system, but

then also this learning to use the system. It's not self-evident either because you have ten other systems that you also use, so it's both an advantage and a disadvantage, I think.

For the digital tools that are in use, the interviews paint a coherent picture of systemic barriers to collaboration, ranging from incompatible video-conferencing systems to the absence of shared map functionality. A Swedish region-level respondent describes the non-alignable GIS layers: “We have GIS layers on the Swedish side for us Swedes, and GIS layers on the Norwegian side for their use. But when you look across the border, the map just turns grey. You can't see anything.” A lack of map interoperability is particularly problematic when firefighters assist their neighbouring country: “When it comes to the map systems in our vehicles, the situation is that when we cross the border, our mapping—what we have in our fire engines—turns blank.”

A Swedish region-level respondent adds the problem of differently parameterised datasets:

One thing you could imagine is that SMHI's [Sweden's] climate-scenario service stops right at the border. It's difficult to know how this should be done. Is there a similar service in Norway? And if we place them side by side, do they align? It's interesting. I have no idea. [...] And what does their green field represent compared with our orange one?

As for the national TETRA systems, these have been formally integrated, although one Swedish local-level respondent had the impression that they still do not function particularly well together.

An additional challenge for cross-border information sharing stems from Sweden's EU membership and Norway's status outside the Union. Several Swedish respondents expressed concerns about GDPR compliance when sharing information across the border. Together, these insights point to technology as a notable barrier to shared situational awareness and coordinated planning.

Resources

Resource constraints are emphasized across interviews at all levels and function as a cross-cutting barrier. The respondents in public organizations describe a wide and demanding set of responsibilities. This seems to hamper both cross-border activities and crisis exercises in general. A local-level Swedish respondent claim: “we would need to do much more”. The war in Europe has added yet another layer of pressure, as preparations related to national defence must now be accommodated within already strained operations with limited resources.

A Swedish regional-level respondent describes the financial and logistical challenges of convening cross-border actors across a large geographic region, complicating efforts to maintain relational continuity.

I think it's not the ideas that are limiting, but rather the resources that are limiting. Also considering that we are in the process of building up the Total Defence, which consumes an enormous amount of resources. So, I believe that if we had just had the time and the people, then the ideas wouldn't be difficult to put into practice.

Synthesised, our findings indicate that resource scarcity is not incidental but structural, affecting all stages of cross-border capacity building and exercise design.

Cross-Border Networks

Several interviews underscore the importance of trust-based networks as a foundational enabler of cross-border cooperation. At regional levels, collaboration mainly takes part via a cross-border council that gathers the rescue services in both countries. Meetings are held one to two times a year. A Swedish regional-level respondent highlights the centrality of this cross-border council and the long-standing relational capital among Swedish and Norwegian actors. Another Swedish regional-level respondent describes the opposite side of the relational picture: strong Norwegian inclusion during major events but limited Swedish knowledge of who to contact and how networks are structured across the border. The respondent remarks: “[...] it's mainly that I don't know how they are organized, so you don't even know who to start talking to. They may have different legislation or be organized in another way.”

While ongoing collaboration at a strategic management level appears rare, several respondents express confidence that collaboration will function effectively when required. One Swedish local-level respondent notes:

During the pandemic, we also had weekly meetings with all the border municipalities on both the Swedish and Norwegian sides, where we could go through the rules that applied on each

side. Those meetings were extremely helpful, and they really emerged out of the crisis because there was a clear need for them. So, I imagine that if similar needs arise again, it will be easy for us to get in touch with one another. It works.

Respondents on both sides of the border report positive experiences of, and express an interest in continuing to exchange knowledge, lessons-learned, and methods across the border. Maintaining and extending relationships and collaboration is considered the most important action from a cross-border perspective, according to several respondents. A Swedish national-level respondent stresses the importance of personal contacts to keep the collaboration going. Taken together, the interviews portray a network landscape characterised by high goodwill but low interconnectedness, where continuity is fragile and dependent on individual relationships.

Risk Analysis

Several interviews highlight the difficulty of producing an actionable cross-border risk and vulnerability analysis (RVA) due to information-security restrictions and overly general previous attempts. Also, one Swedish region-level respondent points to incompatible data structures and differing levels of detail. When asked about the opportunities and challenges of developing a cross-border RVA the respondent noted:

Probably quite difficult, I suspect, because even the underlying data may have been produced at different levels of detail, with different parameters [...]. If there is a need, then it can certainly be solved in some way. You just have to live with the fact that it will be a bit like comparing apples and pears when you make comparisons. [...] But I also think that it would require quite substantial resources if you want to do it. There's an added challenge of translating data into another context as well.

At the national level, there is no mandate to produce a joint RVA, according to a Swedish national-level respondent. At the regional level, a cross-border RVA was developed during 2014–2016. We lack information about its status, but none of the respondents referred to using it. Several respondents considered a joint RVA valuable, yet difficult to achieve in practice. The greatest concerns expressed by Swedish respondents at both regional and local levels related to sharing classified information across the border. Together, these insights illustrate that a joint RVA is constrained by information security, data incompatibility, and resource requirements.

Communication

Although respondents on both sides of the border consider language barriers to be minor, several also emphasise that they cannot be ignored. A Swedish local-level respondent described communication as the most important aspect of cross-border exercises and pointed out differences in the terminology used in crisis management. This was echoed by a Swedish regional-level respondent, who also noted variations in radio communication protocols.

A moment when communication—or rather the lack of it—challenged cross-border collaboration occurred when Norway closed its borders during parts of the COVID-19 pandemic. The exchange of goods and personnel across the border is normally extensive, and two regional-level Swedish respondents expressed great surprise that the border suddenly became closed. One of them described the countries' different strategies as a “wake-up call” and stressed the importance of collaborating to keep society functioning. The other emphasised the need for predictability in how society responds to crises in the future.

DISCUSSION AND CONCLUSIONS

Understanding how barriers to cross-border preparedness manifest in practice is crucial not only for diagnosing weaknesses in current cross-border preparedness, but also for informing the design of joint exercises.

Interpretation of findings (RQ1)

Fragmented governance and unclear mandates hinder collaboration

Differences in legal frameworks, organisational responsibilities, and command-and-control structures align with findings from the ten-pillar framework, where governance and leadership are identified as the most critical and complex pillar (Kanteler & Bakouros, 2024a). A need to clarify roles, tasks and responsibilities and legal aspect was found also in Pilemalm and Yousefi Mojir (2020). Prior research on Nordic crisis management also shows that national systems, while similar in principle, diverge in practice and generate uneven expectations (van Well et al., 2018).

Weak and uneven networks reduce insight into cross-border conditions

The interviews demonstrate that institutionalised arenas for routine interaction are limited, which was also noted by Pilemalm and Yousefi Mojir (2020), who found a general lack of boundary-spanning forums in emergency management systems. As a result, collaboration depends on personal contacts and ad-hoc arrangements.

Technological incompatibilities and uncertainties regarding information sharing undermine shared situational awareness

In an increasingly digital society, insufficient interoperability between cross-border actors' IT systems, uncertainty about what information can legitimately be shared, and fragmented data practices are bound to obstruct collaboration, which is in line with previous research (Granholt et al., 2022; Meum & Munkvold, 2013).

Resource scarcity constrains participation and long-term capacity building

Previously identified limitations for exercises (e.g., Magnusson et al., 2018; Meum & Munkvold, 2013) appear to persist. Those responsible have difficulty finding time for (the planning of) exercises, let alone cross-border exercises.

Terminology and communication routines create operational friction

Although the languages in Sweden and Norway are mutually intelligible, varying definitions, procedural vocabularies, and communication protocols can introduce misunderstandings, an insight also highlighted in cross-border communication research (Granholt et al., 2022; Kalogiannidis, 2024). This has the potential to affect cross-border collaboration if not acknowledged.

Implications for cross-border crisis exercises (RQ2)*Exercises should explicitly rehearse governance and mandate ambiguities*

Given the fragmented responsibilities identified in the interviews and the governance pillar of the ten-pillar framework (Kanteler & Bakouros, 2024a), exercises should include activation routines, invitation procedures, and cross-system command and control alignment. This mirrors earlier recommendations for improving preparedness in Nordic cross-border regions (van Well et al., 2018). Exercises could also include questions such as those raised by Edwards (2009, p. 262): "What existing treaties and agreements will control relationships during the disaster?"

Joint methods for planning, execution and evaluation

A common competence base on the Norwegian and Swedish side should be built up, with joint collaborative exercises. Preferably, a repository of (standardised and reusable) cross-border exercises could also be created at EU level, with exercise goals focusing the pillars in Kanteler and Bakouros' (2024a) framework. Moreover, we propose that a unified, structured method is used for designing, running and evaluating exercises as a "target goal" (cf. Bakken et al., 2024; Venemyr, 2025). This is in line with the calls for increased standardisation from Magnusson and Wik (2023) and Kalogiannidis (2024).

Exercise design should prioritise network building

As Pilemalm and Yousefi Mojir (2020) note, and this study confirms, the lack of boundary-crossing arenas hampers coordination; therefore, exercises must include deliberate network-forming elements such as role-mapping and structured introductions. Ideally, communication lines and structures on each side of the border should be established beforehand, to facilitate communication at corresponding levels and functions across the border.

Information sharing and use of digital technology must be core training components

Consistent with earlier findings on challenges with WIS, RAYVN, and cross-border GIS integration (Meum & Munkvold, 2013; Granholt et al., 2022), exercises should incorporate tasks involving shared information systems, data interoperability, and metadata interpretation (cf. Adrot et al., 2025). In addition, authorities on each side of the border need to facilitate interoperability between national systems, and/or consider developing a common IT platform for interorganisational and cross-border exercises (cf. Magnusson & Wik, 2023).

Dilemmas regarding what information that could be shared or not, is also suitable training content in cross-border exercises. Where relevant, joint pre-work should be incorporated so participants can reconcile assumptions and practise cross-border interpretation of risk products prior to the main exercise.

Modular, resource-light formats are essential for feasibility

Our interviews suggest that while large-scale exercises remain important, iterative and modular training approaches may offer more sustainable learning in the cross-border context. The resource constraints identified mirror broader concerns about the capacity of local-level organisations to engage in time-intensive exercises (Magnusson et al., 2018; Pilemalm & Yousefi Mojir, 2020). Short tabletop exercises, and serious games can help maintain engagement without overburdening personnel. This includes low-threshold, modular training formats that can be integrated into existing routines such as monthly workplace meetings, e.g., short discussions on incident scenarios or basic card games focusing on Swe-Nor terminology or command structures. In addition, virtual tabletops can enable more frequent cross-border training by reducing barriers related to geographical distance and limited time resources (Magnusson & Wik, 2023). Also, distributed VR/AR solutions are being developed, that can provide less stressful and less costly simulation exercises (Eide et al., 2025).

Terminology and communication routines should be embedded into scenarios

Given the linguistic and conceptual frictions noted by the respondents and documented in previous Nordic cross-border communication studies (Granholm et al., 2022), exercises, or preparatory education/training, should force explicit clarification of terms, routines, and meanings, e.g., with the help of digital quizzes

Positioning the findings beyond the Nordic context

Our findings illustrate that cross-border crisis preparedness in the Värmland–Innlandet region is shaped by interconnected organisational, technological, and relational constraints that limit collaboration despite, similar crisis management systems and a strong goodwill between Swedish and Norwegian actors. These results resonate with earlier research showing that transboundary crises expose systemic weaknesses in coordination, information sharing, and institutional alignment (Ansell et al., 2010; Boin, 2019). They also echo studies documenting persistent challenges in Nordic cross-border cooperation in organisational differences and technological interoperability (Granholm et al., 2022). Taken together, these findings reinforce the argument that cross-border crisis preparedness is fundamentally a socio-technical system challenge, aligning with both Nordic governance analyses (van Well et al., 2018) and the cross-border collaboration literature (Kanteler & Bakouros, 2024a).

While this study focuses on a Swedish–Norwegian border region, the challenges identified closely mirror those reported in international crisis response contexts. Research consistently shows that interoperability problems persist even where formal coordination mechanisms exist, including unclear mandates, fragmented governance arrangements, incompatible information systems, and uncertainty regarding information sharing across organizational and national boundaries (Ansell et al., 2010). Similar issues have been documented in EU-level civil protection collaboration, where technical, organizational, and legal heterogeneity continues to limit effective joint action despite longstanding institutional frameworks (Kalogiannidis, 2024). This study contributes a microlevel, practice-oriented account of how such systemic challenges materialize in everyday preparedness work and how joint exercises can surface and address them. Innovative exercise formats such as virtual tabletops, AR/VR simulations, and serious games may also help navigate the time constraints that often limit cross-border training.

The findings indicate that cross-border crisis exercises need to move beyond generic collaboration goals and instead rehearse known friction points—unclear mandates, command arrangements, and technical interoperability challenges involving information systems, mapping tools, and equipment. Exercises that sidestep these issues risk creating a false sense of preparedness, whereas embedding concrete interoperability dilemmas into scenarios allows exercises to function as diagnostic tools that reveal critical coordination weaknesses before real crises occur (cf. Perry, 2004).

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