

Disaster risk planning in an evolving risk landscape: Barriers and enablers in the integration of land use and preparedness actors

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ABSTRACT

Effective disaster risk management in today's evolving risk landscape necessitates functional collaboration between land use planners and preparedness actors, such as fire and rescue services and crisis management organisations. This study investigates barriers and enablers to such collaboration through a combined exploratory scoping study and empirical survey conducted in Sweden, revealing both contrasting and corroborating findings. In particular, while the literature predominantly emphasises barriers to collaboration, most of the survey respondents did not perceive the presence of significant barriers. Among those who did, organisational structure and size were commonly cited. Additionally, although practitioners identified resource availability as a critical enabler, this dimension remains underexplored in the literature. The corroborating findings include persistent barriers to effective collaboration, such as fragmentation, ambiguous responsibilities, limited data sharing, conflicting priorities, and differing risk perceptions. Resource limitations regarding funding, personnel, and expertise also hinder effective collaboration. The findings highlight the need for improved institutional and policy frameworks to strengthen coordinated planning and enhance resilience against emerging risks. This research contributes to disaster risk science by bridging theoretical and practical perspectives, supporting more integrated and adaptive responses to complex risk environments.

1. Introduction

Disaster risk management (DRM) is increasingly challenged by the accelerating pace of societal change, particularly due to the climate crisis and the imperative of a green transition. Land scarcity underscores the necessity of urban densification, which includes the redevelopment of brownfields [1] and the protection of greenfields. These efforts are crucial to sustainable development [2,3], but the finite nature of land often results in spatial conflicts between various land uses and stakeholders [4]. Prevailing planning trends, such as *Urban Consolidation* [5], *New Urbanism* [6], *Smart Growth* [7], and *Sustainable Urbanism* [8], aim for a compact city. However, spatial constraints in city areas pose a growing risk [9] through increased exposure to hazards and potentially higher disaster losses [9, 10].

Land use planning (LUP) shapes the physical development of society and plays a crucial role in managing these spatial conflicts, including a preventive function in mitigating risks [11] and facilitating risk-sensitive urban planning [12]. Still, addressing identified risks does not always eliminate them [13]. Individual risks may be mitigated to a certain extent or even accepted [14], resulting in an aggregated incremental risk increase known as *hazard creep* [15,16]. Furthermore, some risks can be ignored despite existing evidence, referred to as *black elephants* [17], while other risks — the *black swans* — are represented by unforeseen events based on current

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knowledge and beliefs [18–20]. New and unforeseen risks can also emerge through risk transfer, resulting from the efforts of one actor to mitigate known risks [21].

These evolving risk aspects underscore the need for DRM to anticipate surprises and recognise the limits of their preventive measures. This highlights the importance of integrating resilience into traditional preventive-focused risk management [22–26], which can enhance long-term, focused, and holistic management of risks [27]. Key actors embodying the reactive resilience-inducing dimension of DRM in a risk-sensitive urban planning perspective include fire and rescue services (FRS) and crisis management (CM), together referred to as preparedness actors (PA). FRS strengthens societal resilience through its adaptable rescue operations that respond to adverse events. CM contributes to societal resilience by ensuring the continuity of essential societal services, including critical infrastructures. Hence, both actors ensure that systems sustain or restore their basic functionality. Together with LUP, which represents the preventive dimension, they form a DRM system – a *system-of-systems* – comprising three subsystems [28].

The emphasis on FRS and CM as preparedness-focused in the present description does not imply that these actors lack a preventive perspective or that they do not strategically plan their necessary capabilities and measures through risk analyses, which may also embody a preventive perspective. However, in contrast to LUP, the primary task of FRS and CM is nevertheless to increase resilience, where resilience here is interpreted as ‘*The ability of the system to sustain or restore its basic functionality following an event (risk source)*’ [24]. Although each subsystem has its own priorities, they also share a common and overarching goal of ensuring societal safety, which is the implicit purpose of the overall DRM system. The benefits of a collaborative and holistic multi-actor approach are emphasised in the risk governance concept [29,30], the multi-layered safety approach utilised in flood risk management [31], and in discussions about risk-sensitive urban planning [12,32].

A key approach to achieving the integration between the actors is through coordinated risk-related planning processes, where preventive risk management [33] and preparedness for adverse events [34] can be aligned to leverage the capabilities of all involved actors; an operationalisation of the integration of risk and resilience. In this study, risk-related planning processes refer to the dynamic interactions between LUP and PA across the entire lifecycle of urban development and crisis management. This includes pre-delivery collaboration (such as integrating risk assessments into land-use plans during their development, before formal adoption and implementation) as well as post-delivery adaptation (such as revising already adopted and operational plans in response to disasters or operational challenges). These processes encompass both preventive measures (e.g., risk-sensitive land use regulations, spatial planning) and preparedness/resilience-building activities (e.g., emergency response planning, crisis management strategies). The essential point is that feedback between preventive and reactive actors – the system elements in the *system-of-systems* – may create synergistic improvements in overall risk reduction: systematic learning from incidents and operational practice strengthens preventive measures and response capacity [35].

Although bidirectional feedback between system elements is vital for effective system operation [36], collaboration among diverse actors with different objectives can present significant challenges [28,37]. Meanwhile, research at the household level shows that even individual preparedness measures often fail due to barriers such as lack of awareness, uncertainty about resource access, and perceived unnecessary actions [38]. These patterns – where intentions do not translate into action – reflect the institutional challenges that occur when risk management must be integrated across sectors with differing mandates and priorities. In uncertain contexts, it is difficult for multi-actors to process information and make effective decisions: ambiguity, information asymmetry, uncommon categorisation and organisational fragmentation make effective and adequate risk management difficult [39–42]. These challenges may also further exacerbate differences in risk perceptions shaped by framed information [15,43] and a lack of shared views among actors [44]. Furthermore, risk management outcomes may remain confined to the originating entity [45], reinforcing fragmentation among actors. Finally, legal and institutional frameworks are shaping the processes, potentially creating misaligned priorities and ambiguous responsibilities [29].

Therefore, it is essential to understand the factors that affect the feedback between elements to ensure an effective system. Communication barriers *during* crises have been explored by Fischer et al. [46], while Olsén et al. [47] have studied the capabilities needed for collaboration within a comparable context, both focusing on factors pertinent to inter-actor understanding, information sharing and the management of information security. Moreover, Ganeshu et al. [48] have investigated actor interaction in a systematic literature review, identifying barriers and enablers that influence risk-sensitive urban planning. Their study focuses on climate-induced risks and incorporates the perspectives of a diverse array of stakeholders. Their findings indicate that the most significant external barriers – those beyond the control of the organisation – are related to political factors, policies, and legislation. The key enablers identified include the role of political support for inter-actor collaboration, advocacy for an apolitical approach, reinforcement of relevant legislation, development of adaptive policies, and establishment of transparency and accountability within the governance structures that oversee this collaboration [48].

Despite increasing attention to actor collaboration in the literature, specific research on barriers and enablers in the risk-related planning process context remains limited. However, considering the transformations in land use caused by contemporary challenges, the significant role of LUP in risk-sensitive urban planning, and the urgent need for active integration with PA, it is imperative to enhance our understanding of the barriers and enablers that shape this collaboration. This study aims to bridge this gap by investigating the following research question:

What barriers and enablers influence the interaction between land use planners, fire and rescue services, and crisis management in risk-related planning processes?

The research question was explored through a limited exploratory scoping study of peer-reviewed literature and a survey targeting relevant actors. Given that specific statutory requirements and organisational structures influence how actors collaborate, data collection was limited to a particular national setting (Sweden), thereby ensuring a coherent context.

The remainder of this paper is structured as follows. Section 2 outlines the methodological approach; Section 3 presents the findings

of the scoping study and the survey; and Section 4 discusses the corroborating and contrasting findings based on the scoping study and the survey, including the implications of these findings. Finally, Section 5 provides the conclusions.

2. Methods

Methodological triangulation was used to address the research question. This included a scoping study aimed at synthesising knowledge from existing literature in the specified context, along with a questionnaire survey designed to gather new empirical material within a practical context. The two methods used aim to complement each other, allowing cross-verification of the results obtained [49].

2.1. Scoping study

The scoping study was inspired by the methodology derived from the frameworks established by Arksey and O'Malley [50] and Levac et al. [51]. As an exploratory scoping review rather than a comprehensive systematic literature review, this approach acknowledges limitations in analytical depth and the ability to draw definitive conclusions from the literature synthesis alone. However, given the study's dual-method design and resource constraints, the scoping study approach was deemed suitable to provide a sufficient literature baseline for comparison with empirical survey findings, rather than aiming for exhaustive coverage of all relevant publications.

The approach involved searching for articles related to the concepts of 'risk assessment', 'land use planning', and 'preparedness actors' with keywords and synonyms, as reported in Table 1. To maintain the breadth of the search, terms such as 'barriers' and 'enablers' were intentionally excluded as keywords; however, they were examined in subsequent stages. The keywords were developed iteratively through preliminary scoping searches, with terms gradually expanded until thematic saturation was achieved in the retrieved results. Although additional keywords may exist, the set reported was considered sufficient for the study's purpose of identifying key collaboration themes between LUP and PA, balancing comprehensiveness with search manageability. This does not exclude the possibility of supplementary terms but ensures the chosen combination effectively captures the core literature without unnecessary noise.

Conference papers were systematically excluded to maintain a high-quality standard while reducing the literature volume. The search parameters were restricted to the title, abstract, and keywords and confined to the following domains: *Decision Sciences*, *Engineering*, *Earth and Planetary Sciences*, *Environmental Science*, and *Social Sciences*. These domains were selected to capture the interdisciplinary nature of DRM research, encompassing technical risk analysis (Engineering/Earth Sciences), planning/policy perspectives (Decision/Social Sciences), and environmental hazard contexts (Environmental Science). Other domains (e.g. Energy, Computer Science, Agricultural/Biological Sciences, Medicine, Business/Management, and natural science/humanities fields) were excluded as they were not deemed relevant to the study's focus on institutional and organisational aspects of LUP-PA collaboration. Furthermore, the Scopus database was used exclusively because it is a comprehensive and curated abstract and citation resource for peer-reviewed literature [52]. This single-database approach, though it limits source diversity and comprehensiveness compared to multi-database searches, was a deliberate methodological choice. As the study integrates literature synthesis with empirical survey data rather than functioning as a standalone systematic review, the scope of Scopus was considered sufficient to identify key themes for comparison with practitioner perspectives, acknowledging the consequent reduction in the generalisability of literature findings. The search was executed on 23 May 2024, yielding a total of 499 results.

Inclusion/exclusion criteria guided the selection of relevant articles retained for subsequent thematic analysis [49]. Articles were included if they.

Table 1
Keywords with synonyms in the Scopus search.

Risk assessment	Land use planning	Preparedness actors
hazard assessment	LUP	civil protection
risk management	urban planning	fire authority
risk governance	spatial planning	fire brigade
risk science	physical planning	fire and rescue service
risk analysis		fire department
		rescue services
		contingency planning
		crisis management
		preparedness planning
		disaster management
		public safety
		response planning
		emergency management
		crisis response
		resilience management
		emergency response

- Focused on accidents, emergencies, and disasters – events with consequences of such a nature that they lead to rescue efforts and can be considered extraordinarily severe
- Explored how PA interact with LUP in planning contexts

Conversely, articles were excluded if they.

- Primarily addressed evaluations of disasters, economic losses, or insurance
- Focused on calculations, simulations, and software, including GIS

Furthermore, the study covers disaster types requiring coordinated municipal responses across LUP, FRS, and CM, such as natural hazards, technological accidents, and societal disruptions. Although approaches to disaster onset and mitigation vary by type, the focus remains on barriers and enablers to inter-actor collaboration in risk-related planning processes, covering both pre-delivery planning and post-implementation adaptation across all hazard categories.

The reason for the exclusion and the number of articles excluded in each step are reported in Table 2.

As a result of the exclusion process, 17 articles were included in the thematic analysis. Since only peer-reviewed articles were included, further quality assessment of the included articles was not considered warranted.

Thematic analysis was conducted inductively and guided by the research question. Jurisdictional and system differences across LUP and PA actors were noted as potentially relevant contextual factors during analysis. However, given the limited number of included articles, these variations were not analytically distinguished, as insufficient data prevented the robust identification of jurisdiction-specific patterns. Nevertheless, legal and policy-related factors explicitly shaping barriers and enablers were nonetheless identified as specific contextual examples where present.

When reviewing the literature, barriers and enablers to collaboration were tagged as contextual examples (CEs) in a Zotero library. The process was iterative and repeated until saturation was reached. The CEs were then organised in a spreadsheet and finally clustered into overarching themes.

2.2. Survey

The survey data presented in this paper are a minor part of a more extensive study. The questionnaire consisted of 80 questions, five of which were explicitly designed for this study. The remaining questions were reserved for a conference paper [53] and a future research project.

This study focused on questions related to barriers and enablers for horizontal collaboration between LUP and PA in municipalities across Sweden. The survey included the three key actors in Swedish DRM: LUP, FRS, and CM (the latter two representing PA). These actors were selected due to their central roles in risk-related planning processes, as well as their distinct but interconnected legal mandates. Accordingly, the survey addresses collaboration across various stages of planning and preparedness, including both preventive and post-implementation contexts.

In Sweden, all three actors operate on the municipal level but are usually, but not exclusively, organised in administratively separate units. All actors shall, by requirements, base their planning on risk analyses. LUP shall report the risk considerations in a comprehensive plan, FRS in an action plan for planning the preventive and operative rescue service and CM in a risk and vulnerability analysis aiming to identify extraordinary events threatening societal safety. All three actors operate under their own legislation. LUP under *Planning and Building Act* (SFS 2010:900; Plan-och bygglag), FRS under *The Civil Protection Act* (SFS 2003:778; Lagen om skydd mot olyckor), and CM under the *Act on Municipal and Regional Measures in Preparation for and During Extraordinary Events in Peacetime and During Heightened Alert* (SFS 2006:544; Lagen om kommuners och regioners åtgärder inför och vid extraordinära händelser i fredstid). In addition to these acts, each has more detailed regulations and general recommendations issued by the respective responsible state authority, further shaping their operational mandates and planning requirements. This legal and organisational separation provided a unique context to examine how institutional fragmentation shapes collaboration.

Three versions of the questionnaire were created, each tailored to the specific language and context of the three actors while keeping the question content consistent. The differentiation allowed for targeted questions relevant to each actor concerning the other two actors. The questions were designed for clarity, bias avoidance, and to prevent double-barreled queries [49]. The respondents had the opportunity to provide additional information in free text in all relevant cases. All questions were voluntary and included a 'Do not know' option. One question was open-ended, and the responses to this question were clustered into themes. A theme was considered

Table 2

The number of excluded articles with justification in the three steps: by title, by abstract, and by full text.

The primary reason to exclude articles ...	by title	by abstract	by full text
Dealing with calculations, simulations, and software, including GIS, as the primary focus	109	54	3
Not focusing on actor interaction in the planning situation	84	148	42
Not focusing on accidents, emergencies or disasters	18	1	0
Dealing with evaluations of disasters, economic losses, or insurance as the main focus	11	3	0
Relevant actor (LUP or PA) missing	0	2	6
Duplicate	0	0	1
Total number of exclusions per stage	222	208	52

valid if more than one respondent responded consistently.

Although the scoping study was exploratory and themes emerged in the analysis, the survey was primarily based on predetermined fixed response alternatives. Therefore, to leverage differences in methods, the response alternatives were not explicitly linked to the findings of the scoping study. This deliberate independence was chosen after careful consideration: while an initial approach contemplated directly linking survey items to literature themes, it was determined that such linkage risked constraining responses and potentially missing novel perspectives not captured in existing research. The closed response options were instead developed iteratively by the author, informed by both practical expectations and the researcher's understanding of the field, though not strictly dictated by the scoping study findings. This approach allowed space for unanticipated barriers and enablers to emerge.

In addition, free-text responses were allowed to mitigate this risk further and verify response option comprehensiveness. These open-ended fields were utilised by some respondents and confirmed that the predetermined categories adequately covered the range of experiences without significant omissions. Moreover, seven participants representing LUP, FRS, and CM reviewed the response alternatives, questions, and survey using a pilot questionnaire [54], providing essential feedback that enhanced relevance and validity.

The survey was distributed by email to each actor in large, medium, and small municipalities in all 21 counties in Sweden, where applicable, resulting in 183 of Sweden's 290 municipalities being invited. Invitations were sent to the selected municipalities via email, directed to designated contacts for LUP, FRS, and CM where available, or to municipal general inboxes otherwise. Recipients were explicitly instructed to forward the appropriate questionnaire version to the responsible functional role within their municipality (one for each actor), ensuring coverage of all three DRM subsystems. Due to the low initial response rate, the invitation was extended to include a total of 427 municipal entities, comprising 127 FRS, 149 LUP offices, and 151 CM offices ($n = 427$). The final mailing strategy was to include all remaining FRSs and their corresponding municipalities. The FRSs posed a limitation since in Sweden, they are often organised in associations that cover multiple municipalities.

Responses were received from 35 LUP offices, 29 FRS offices, and 26 CM ($n = 90$), representing 69 different municipalities across 17 of the 21 Swedish counties. The distribution of the represented municipalities was thus broad both geographically and in terms of size. Furthermore, since the purpose of the survey was to include professional actors within a specific statutory and organisational structure, the response rate was considered the best available and sufficient.

Data from the three questionnaires were compiled in IBM SPSS 29.0.2. Statistical tests were used to investigate significant differences among various responses. Chi-square tests were used for nominal questions, and the Kruskal-Wallis independent sample test was performed for ordinal questions due to three independent variables [55]. Also, the questions and answers were originally in Swedish and translated into English.

3. Literature and empirical findings

This section reports findings from the two data sources independently. Section 3.1 presents results from the scoping study, and Section 3.2 presents results from the survey. Synthesis of findings across sources is conducted in Section 4.

Table 3
Articles included in thematic analysis, sorted by author name and indexed for reference.

Index	Author and year	Title
{1}	Britton and Lindsay (1995)	Integrating City Planning and Emergency Preparedness: Some of the Reasons Why
{2}	Chmutina et al. (2014)	Role of urban design and planning in disaster risk reduction [56,57]
{3}	Dąbrowski et al. (2021)	Adaptive capacity of the Pearl River Delta cities in the face of the growing flood risk: Institutions, ideas and interests [58]
{4}	Esmail et al. (2022)	Integration of flood risk assessment and spatial planning for disaster management in Egypt [59]
{5}	Greiving et al. (2012)	Linking the actors and policies throughout the disaster management cycle by "Agreement on Objectives" – a new output-oriented management approach [60]
{6}	Greiving et al. (2006)	Management of natural hazards in Europe: The role of spatial planning in selected EU member states [61]
{7}	King et al. (2016)	Land use planning for disaster risk reduction and climate change adaptation: Operationalizing policy and legislation at local levels [62]
{8}	Koshy et al. (2022)	Handling Compounded Uncertainty in Spatial Planning and Humanitarian Action in Unexpected Floods in Wayanad, Kerala: Towards a Contextualised Contingency Planning Approach [63]
{9}	March (2016)	Handling Compounded Uncertainty in Spatial Planning and Humanitarian Action in Unexpected Floods in Wayanad, Kerala: Towards a Contextualised Contingency Planning Approach [64]
{10}	Neuvel and Van Den Brink (2009)	Flood risk management in Dutch local spatial planning practices [65]
{11}	Oukes et al. (2022)	Enhancing the Use of Flood Resilient Spatial Planning in Dutch Water Management. A Study of Barriers and Opportunities in Practice [66]
{12}	Pilone et al. (2016)	Municipal Emergency Plans in Italy: Requirements and drawbacks [67]
{13}	Prenger-Berninghoff et al. (2014)	The connection between long-term and short-term risk management strategies for flood and landslide hazards: Examples from land-use planning and emergency management in four European case studies [68]
{14}	Roslan et al. (2021)	Transformation towards Risk-Sensitive Urban Development: A Systematic Review of the Issues and Challenges [69]
{15}	Ruane et al. (2020)	Disaster Risk Reduction in Bushfire Prone Areas: Challenges for an Integrated Land Use Planning Policy Regime [70]
{16}	Sapountzaki et al. (2011)	Disconnected policies and actors and the missing role of spatial planning throughout the risk management cycle [71]
{17}	Stoop (2003)	Critical size events: A new tool for crisis management resource allocation? [72]

3.1. Scoping study findings

Table 3 presents the articles included, sorted by author name, and indexed for use in the following analysis. The articles span from 1995 to 2023, showing sparse publications in the early years and more frequent appearances later.

As Table 4 shows, the included articles have been published in 11 different publications, with no more than two published in one publication.

A review of the references within each article was performed to identify the relationships among the articles. As Fig. 1 illustrates, a small cluster features several interrelationships between {5, 6, 13, 16} and three additional relationships between {4} and {10}, {14} and {7}, and finally between {15} and {9}.

The analysis of the articles has identified contextual examples (CEs) of barriers and enablers that influence the interaction between LUP and PA. These CEs serve as illustrative examples of barriers and enablers reported in the scoping study, many of which have nuanced differences yet share similarities. When grouping the CEs, four overarching themes (T1-T4) emerged, as shown in Table 5, together with a description of which article the respective theme is found in and the sum of the number of occurrences n of the theme. These themes provide a comprehensive overview of the key factors that affect the relationship between LUP and PA. It should be noted that while theme T3 centres around the practical challenges with resource limitations and capacity, the remaining themes focus on the inter-relationships between the actors: institutional structures and data sharing (T1), alignment of priorities and risk perceptions (T2), and role clarity and mutual understanding (T4).

Barrier-related CEs are presented in Table 6, denoted as CEBs, and enablers in Table 7, denoted as CE. These tables present in which article and the number of occurrences n respective CE was found. All articles included except {5} contain CEs related to barriers, and among them, CEB1 (*Fragmentation and institutional barriers restrict effective collaboration*) is by far the most frequently reported barrier, found in 14 of 17 papers; the other CEs related to barriers range from two to six occurrences in the literature.

In general, enabler-related CEs were found in 12 of the 17 articles {1, 2, 4-6, 8, 9, 13-17}. Among these CEs, there is a more even spread in occurrences n compared to barriers. The most common enabler was CEE1 (*Active efforts are required to improve mutual understanding among actors*), which was found in six articles. The other CEs were found in two to four articles.

3.2. Survey findings

This section presents the survey findings, highlighting key findings related to the barriers and enablers reported.

3.2.1. Barriers

Barrier-related questions in the survey were initiated with questions about the presence of barriers and were followed up with different questions depending on the answer. Respondents who reported no perceived barriers were asked to describe the reason for not perceiving barriers, while the others were asked to describe the barriers.

The perceived presence of barriers

The respondents were asked a general question about perceived barriers to collaboration. The question was expressed: 'Are there any barriers to collaboration between you and [XX] today?', where [XX] denoted the respective actor. The results are found in Fig. 2 and reveal that most respondents do not perceive significant barriers to collaboration. The responses showed variations due to the interaction between different actors, and these differences are significant ($p = 0.019$). In the following, the arrows represent the interactions, where FRS→LUP, for example, means how fire and rescue services perceive barriers in interacting with land use planners.

Based on frequency, the FRS→LUP, FRS→CM, and CM→LUP relationships are identified as the most problematic, with the highest proportion of respondents perceiving barriers. The CM→FRS relationship shows the fewest perceived barriers. The figure also reveals that the LUP reports the highest percentage of uncertainty concerning perceived barriers with CM.

The same data set was also analysed by the size of the municipality, as seen in Fig. 3, showing that the proportion of respondents who perceive barriers is proportional to the size of the municipality. Furthermore, the reported uncertainty for the question increases with the size of the municipality. However, the difference is not significant ($p = 0.129$).

Table 4

List of scientific journals in which the included articles are published.

Publication	Article
Built Environment	{9}
International Journal of Disaster Resilience in the Built Environment	{7}
International Journal of Mass Emergencies and Disasters	{1}
Journal of Environmental Planning and Management	{5, 10}
Natural Hazards	{16}
Natural Hazards and Earth System Sciences	{6, 14}
Planning Theory & Practice	{8, 11}
Progress in Disaster Science	{4}
Safety Science	{12, 17}
Sustainability	{14, 15}
Urban Design and Planning	{2}
Urban Studies	{3}

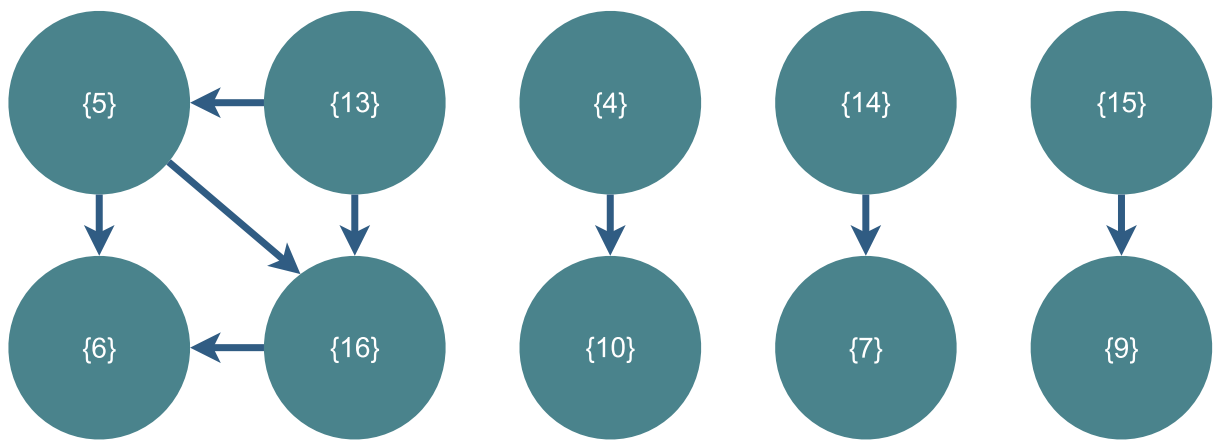


Fig. 1. Articles with relations based on citations. Articles without connections to other included articles were excluded from the figure.

Table 5

Themes identified in the scoping study and the number of occurrences *n* of the theme in the literature.

Overarching themes	Literature	<i>n</i>
T1: Institutional structures and data sharing dynamics	{1-4, 6-17}	16
T2: Alignment of priorities and risk perceptions	{1, 3, 7, 9, 10, 13-17}	10
T3: Resource availability and capacity	{2, 4, 11, 14-16}	6
T4: Role clarity and mutual understanding	{2, 4-6, 14, 15}	6

Table 6

CEs of the barriers found in the literature included in the scoping study. The overarching themes T1-T4 are in parentheses. Each CE was given a code: CEB1 to CEB16. The middle column presents the article where the CE is found, with an index from Table 3. The rightmost column presents the number of occurrences *n* where the CE is found in the literature.

Barrier-related contextual examples (CEBs)	Literature	<i>n</i>
CEB1: Fragmentation and institutional barriers restrict effective collaboration (T1)	{1-4, 6-11, 13-16}	14
CEB2: A focus on development among LUP often takes precedence over risk considerations (T2)	{1, 3, 7, 9, 10, 15}	6
CEB3: Policy documents lack cohesion and alignment across sectors (T1)	{3, 8, 11, 12, 14, 16}	6
CEB4: Ambiguity or uncertainty around responsibilities creates inefficiencies (T4)	{2, 8, 10, 11, 14}	5
CEB5: Gaps in stakeholder engagement and information sharing impede effective coordination (T1)	{6, 10, 13, 14, 16}	5
CEB6: Conflicts between long-term and short-term goals lead to imbalanced priorities (T2)	{3, 9, 13, 14}	4
CEB7: Diverging goals, responsibilities, and priorities among actors hinder effective collaboration (T2)	{13-16}	4
CEB8: Lack of trust and limited mutual understanding among actors hinder effective collaboration and decision-making (T4)	{2, 9, 14, 15}	4
CEB9: LUP may accept higher risks in decision-making, prioritising other factors (T2)	{10, 15, 17}	3
CEB10: Risk management is only one of many competing aspects that LUP must address (T2)	{13, 15, 17}	3
CEB11: A lack of specialised competence hampers effective collaboration between LUP and PA (T3)	{4, 14, 15}	3
CEB12: Limited human resources further constrain integration efforts between LUP and PA (T3)	{2, 11, 14}	3
CEB13: Insufficient funding limits the integration of LUP and PA (T3)	{14-16}	3
CEB14: Differing perceptions create challenges in aligning strategies (T2)	{15, 17}	2
CEB15: Legal frameworks for data sharing between actors are often inadequate (T1)	{6, 13}	2
CEB16: PA often prioritises response efforts over prevention and preparedness, limiting proactive risk reduction (T2)	{9, 16}	2

Table 7

CE of enablers found in the literature included in the scoping study. The overarching themes T1 and T4 are in parentheses. Each CE is given a code: CEE1 to CEE6. The middle column presents the article where the CE is found, with an index from Table 3. The rightmost column presents the number of occurrences *n* where the CE is found in the literature.

Enabler-related contextual examples (CEEs)	Literature	<i>n</i>
CEE1: Active efforts are required to improve mutual understanding among actors (T4)	{2, 4-6, 14, 15}	6
CEE2: Information flows between actors need to be structured (T1)	{4, 6, 13, 17}	4
CEE3: Policy frameworks should be updated to reduce institutional fragmentation (T1)	{4, 8, 15, 16}	4
CEE4: Information technology can enhance integration and promote a shared understanding (T1)	{13, 14}	2
CEE5: Institutional cultures must foster collaboration and open communication (T1)	{15, 16}	2
CEE6: Organisational structures need reform to address fragmentation and silos (T1)	{8, 9}	2

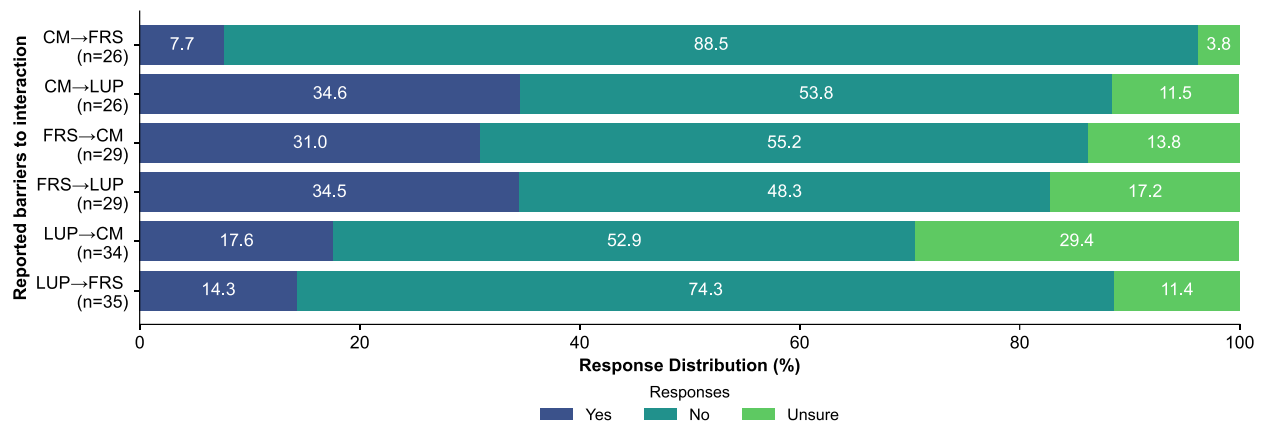


Fig. 2. Barriers to collaboration between the different actors, reported by the respondents. Different actor interactions are indicated with arrows on each bar, and response distribution is presented in per cent in each bar. The parenthesised number represents the sum of responses in each bar. $\chi^2 = 21.331$, $df = 10$, $p = 0.019$.

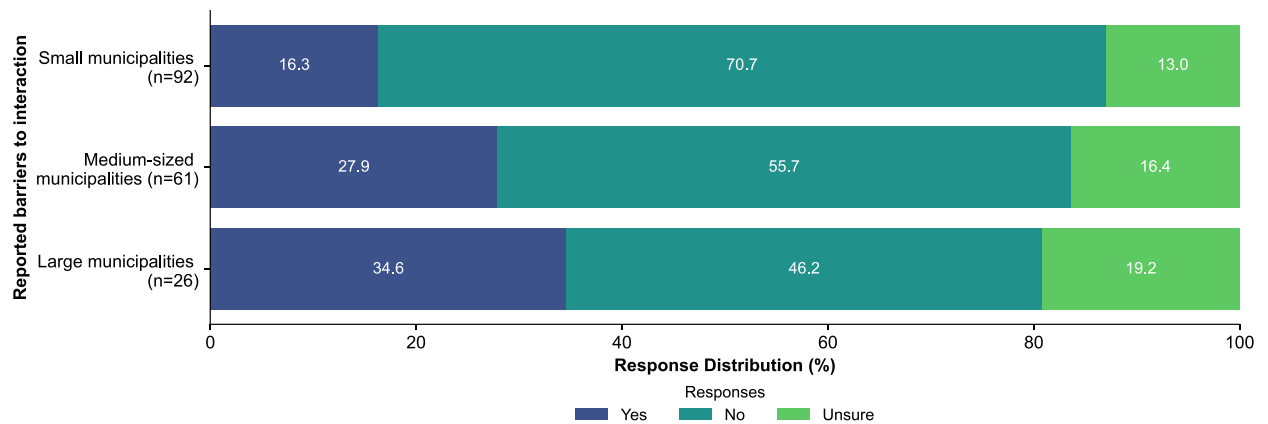


Fig. 3. Barriers to collaboration between the different actors, reported by the respondents. Each bar represents different municipality sizes, and the response distribution is presented in per cent in each bar. The parenthesised number represents the sum of responses in each bar. $\chi^2 = 7.132$, $df = 4$, $p = 0.129$.

Respondents who reported that they did not perceive barriers in the previous question were asked, ‘Describe why you do not see any barriers to cooperation with [XX]’, where [XX] denoted the respective actor. The responses to this question were in free text since the question was open-ended. Therefore, responses were analysed, and emerging themes were noted. The themes were defined as comments that occurred more than once and are listed in Table 8 in descending order. Due to the few responses, breaking down the answers by actor interactions was not meaningful. The results indicate that shared and/or small organisations were perceived as success factors in friction-free collaboration. Regular meeting series and continuous dialogue were also perceived as positive factors.

Barrier characteristics

Respondents who reported that they perceived barriers to collaboration in the previous question were asked, ‘What barriers can you

Table 8

Reasons for barrier-free collaboration from thematic analysis of free-text responses, with percentages in parentheses. The number of occurrences (n) of the reason is presented to the right.

Reason	Explanation	n
R1 (34%)	Shared affiliation within the same administration or organisation	14
R2 (22%)	Small municipality/organisation	9
R3 (17%)	Regular meetings and continuous dialogue	7
R4 (7%)	Located in the same building	3
R5 (5%)	Effective communication channels	2
R6 (5%)	Aligned objectives and common vision	2
R7 (5%)	Organisational and policy-related conditions	2
R8 (5%)	Operating within the same process	2

identify?'. Responses based on predefined response options, as well as free-text fields, were given on a fourth-grade Likert scale. The frequency of perceived importance of each barrier is reported in Fig. 4. The lack of time/resources (B1) was the most frequently reported barrier, probably reflecting the universal challenge of balancing operational demands with collaboration efforts. Subsequently, a lack of knowledge of each other's expertise (B2) has been frequently reported. This suggests that understanding or appreciating each other's capabilities and roles is a significant barrier to effective cooperation. The high frequency of respondents reporting confidentiality (B3) as a barrier 'to some extent' indicates that the barrier is not a major issue but could occasionally limit information sharing. The following barriers, B4-B7, are reported to a lesser extent. The results suggest that most barriers were perceived 'To some extent', indicating that they are not universally or overwhelmingly experienced while they exist. Some categories have notable 'Not at all' responses, suggesting that specific barriers may not be broadly applied to respondents. 'Fully and completely' responses were relatively rare, which may indicate that most barriers are not considered absolute or insurmountable. However, it should be noted that none of the proposed barriers are completely excluded, but different actors perceived their importance differently. It should also be noted that the fraction of uncertain values stands out for B6 (*Different perceptions of the severity of risk among actors*), which may indicate difficulty in evaluating this response option.

Respondents were also allowed to describe additional barriers in free text. However, these were mentioned with low frequency, suggesting that these were isolated problems. The factors raised include issues of geographical distance, unfamiliarity (with cooperation), and municipal associations creating specific barriers. In particular, two responses indicated that political agendas affect LUP decisions.

3.2.2. Enablers

Regarding enablers, the respondents were asked, 'What could have improved cooperation between your organisation and [XX]', where [XX] denoted the respective actor. The suggested enablers derived from the survey are illustrated Fig. 5. Similar to the barriers in Fig. 4, the highest-rank enablers were related to inter-actor understanding (E1 and E3) and resource issues (E2).

Data were collected to determine the relationship between each actor. However, the Kruskal-Wallis test did not reveal any significant differences in the responses between the actors. Therefore, a summary of the reported enablers of all actor relations is presented to provide a more straightforward presentation of the results. The results indicate varying levels of agreement on the effectiveness of different enablers in improving collaboration. Increased knowledge of the areas of expertise/competence (E1) stands out as the most critical enabler, aligning with barrier B2 and strengthening its importance. This enabler is followed by the need for more resources (E2), which is aligned with B1 and corroborated. The third top-ranked enabler is the need for an increased understanding of the objectives and challenges of the different actors (E3), which is related to B2 and B5 and sheds light on the perceived importance of inter-actor understanding. Subsequent enablers, E4 through E7, have received comparatively less attention; however, it is evident that national guidance is perceived as more important than regional and local guidelines or requirements.

However, it should be noted that clearer and more robust legislation (E7) is perceived as the least important among these enablers. Similar to the barriers mentioned above, the respondents did not exclude any proposed enabler, suggesting that collaboration is

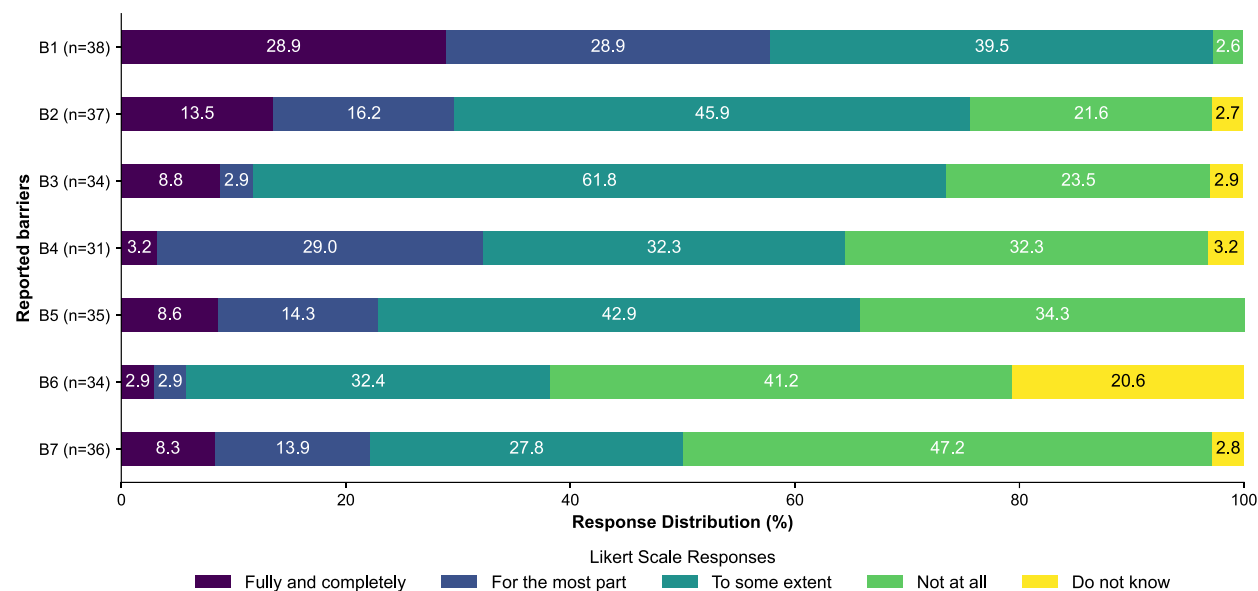


Fig. 4. Reported barriers to interaction B1-B7 from all actors, sorted in ascending order of the most dismissive response on the Likert scale ("Not at all"). The numbers in the bars represent the response distribution on the Likert scale for each bar. The parenthesised number on the Y-axis represents the number of responses. Barrier codes: B1 = Lack of time/resources; B2 = Lack of knowledge of each other's expertise; B3 = Confidentiality; B4 = Administrative problems; B5 = Completely different goals among organisations; B6 = Different perceptions of the severity of risk among actors; B7 = There are no incentives for collaboration.

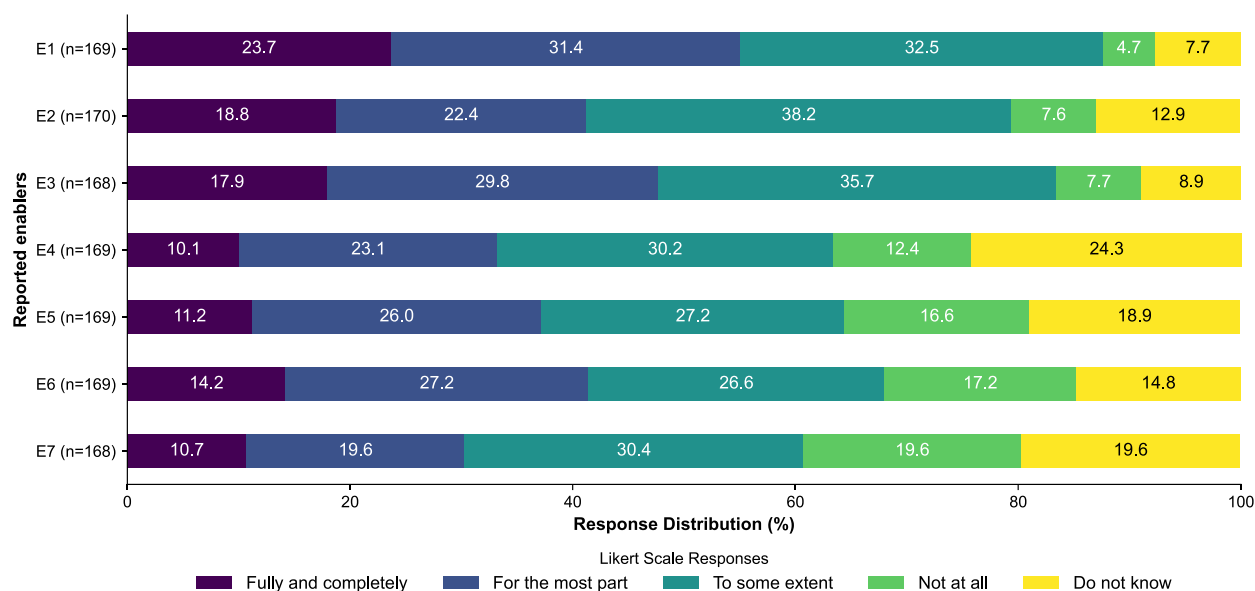


Fig. 5. Reported enablers E1-E7 from all actors, sorted in ascending order of the most dismissive response on the Likert scale (“Not at all”). The numbers in the bars represent the response distribution on the Likert scale for each bar. The parenthesised number on the Y-axis represents the number of responses. Enabler codes: E1 = Increased knowledge of each other's areas of expertise/competence; E2 = More resources; E3 = Increased understanding of the objectives and challenges of different actors; E4 = More precise guidelines/requirements from the national level; E5 = More precise guidelines/requirements from the regional level; E6 = More precise guidelines/requirements from the local level; E7 = Clearer/stronger legislation.

perceived to be influenced by all enablers to varying degrees. It should also be noted that the uncertainty is considerably higher concerning enablers than barriers, especially regarding the effects of policy changes (E4-E7).

The free-text answers gave isolated proposals, indicating that the respondents did not perceive a common key enabler besides the predefined response alternatives.

4. Discussion

This enhanced understanding of barriers and enablers, drawn from both theoretical literature and practical perspectives, lays the foundation for further research and more effective policies. While the empirical findings reflect Swedish municipal governance, the scoping study's international themes offer broader conceptual insights. The comparative methodology highlights the strengths and limitations of each approach.

The four overarching themes (T1-T4) are corroborated not only by previous theoretical contributions but also by empirical responses from practitioners, increasing the validity and credibility of the study as a whole. However, the survey results also reveal contrasting findings, which are discussed in the following sections. Thus, the different approaches provide a more nuanced perspective on the research question than the individual ones.

4.1. Contrasting findings on barriers

The first contrasting finding centres around the perceived presence of barriers. Considering the findings of the scoping study, which suggest that the collaboration between LUP and PA is often fraught with barriers (CEB1-CEB16), it is worth noting that, in total, 62% of respondents did *not* identify any barriers to interaction (Fig. 2). However, there were significant differences when comparisons were made between different actor interactions. In particular, Fig. 2 reveals asymmetries regarding perceived barriers: LUP reports perceived barriers with FRS to a lesser extent than the opposite. The same asymmetry applies to perceived barriers for CM with FRS, which is reported to a greater degree than the opposite. In general, PA perceived barriers to collaboration with LUP more than the opposite. Regarding the CM/LUP relationship, LUP stands out as having a high uncertainty about CM, but among CM, there is relatively low uncertainty about LUP.

The second contrasting finding concerns the reasons given by respondents who did not report any barriers. The responses (Table 8) revealed that shared administrations/organisations, small municipalities, and co-localisation were common explanations for the perception of a lack of barriers to collaboration. However, the evidence for this conclusion is weak because it was a follow-up question dependent on the previous answer. Nevertheless, this finding is consistent with Fig. 3, which indicates that smaller municipalities are associated with a lower perception of barriers (and reduced uncertainty regarding the question), while larger municipalities exhibit the opposite trend. The finding also aligns with the free-text answers related to barriers. However, while the reviewed literature indicates

that this trend has not previously been emphasised, the finding aligns with a study conducted by Almklov and Antonsen (2025), which demonstrates how the co-location of police, fire, and health emergency call centres has enhanced collaboration and development.

These asymmetries and context-dependent explanations can partly be understood in relation to the statutory and organisational separation between the actors. In the Swedish governance system, LUP is embedded in a legally regulated and multi-stage review process under the Planning and Building Act, where draft plans are circulated through mandatory consultations and referrals to a wide range of authorities and stakeholders, including FRS and other preparedness actors. This formalised procedure institutionalises interaction and ensures that risk-related considerations are systematically invited into the planning process. In contrast, no corresponding legally mandated multi-stage iterative review process exists for CM and FRS. From this perspective, the lower barrier perception reported by LUP may reflect both its stronger formal control over the process and the fact that interaction with PA is already proceduralised, whereas PA actors may more frequently experience limited influence over physical planning decisions with operational consequences for the specific actor.

4.2. Corroborating findings on barriers

Table 9 below presents the relationship between the survey findings and the literature included in the scoping study. The table is organised by overarching themes, followed by barriers identified in the survey and CEs from the scoping study. The results indicate that the survey findings and CEs support all themes. However, the CEs of the scoping study provide more specific and nuanced insights than the broader barriers identified in the survey. For instance, B2 (*Administrative problem*) is a general category, whereas the corresponding CEs detail specific administrative challenges.

Three survey responses (B3, B4, and B7) and four CEs (CEB1, CEB3, CEB5 and CEB15) support theme T1, indicating that both practitioners and scholars regard the barrier as significant. Although B4 was ranked as a moderate barrier (4 out of 7) in the survey, CEB1 and CEB3 were among the most frequently cited barriers in the scoping study. The highly ranked barrier B3 corresponds to CEB15 in the scoping study and was, therefore, one of the least frequently mentioned barriers. On the contrary, the low-rank B7 corresponds to CEB5, which exhibited a relatively high citation frequency. Although both methodologies reinforce the overarching theme, there are discrepancies in the emphasis that practitioners and academics place on specific barriers.

Two survey responses (B5 and B6) and seven CEs (CEB2, CEB6, CEB7, CEB9, CEB10, CEB14, CEB16) support theme T2. Although B5 ranks among the lowest barriers in the survey, the number of CEs also indicates shared support, albeit with varying levels of importance assigned to each barrier. In contrast, B6 and CEB9/CEB14 show a more balanced significance regarding the importance of barriers.

Theme T3 is reinforced by the barrier with the highest ranking (B1) of the survey and three CEs (CEB3, CEB11, CEB13) from the scoping study, of which CEB3 is frequently cited. Finally, theme T4 is supported by high-ranked B2 and two CEs (CEB4, CEB8), of which CEB4 is frequently supported. This alignment further supports the importance of T3 and T4 both in empirical and theoretical contexts.

Table 9

Relations between barriers reported in the survey and the scoping study.

Theme	Barriers (survey)	CEs (scoping study)
T1: Institutional structures and data sharing	B3: Confidentiality	CEB15: Legal frameworks for data sharing between actors are often inadequate
	B4: Administrative problems	CEB1: Fragmentation and institutional barriers restrict effective collaboration CEB3: Policy documents lack cohesion and alignment across sectors
	B7: There are no incentives for cooperation	CEB5: Gaps in stakeholder engagement and information sharing impede effective coordination
T2: Alignment of priorities and risk perceptions	B5: Completely different goals among organisations	CEB2: A focus on development among LUP often takes precedence over risk considerations CEB6: Conflicts between long-term and short-term goals lead to imbalanced priorities CEB7: Diverging goals, responsibilities, and priorities among actors hinder effective collaboration
		CEB10: Risk management is only one of many competing aspects that LUP must address CEB16: PA often prioritises response efforts over prevention and preparedness, limiting proactive risk reduction
	B6: Different perceptions of the severity of risk among actors	CEB9: LUP may accept higher risks in decision-making, prioritising other factors CEB14: Differing perceptions create challenges in aligning strategies
		CEB3: Limited human resources further constrain integration efforts between LUP and PA CEB11: A lack of specialised competence hampers effective collaboration between LUP and PA
		CEB13: Insufficient funding limits the integration of LUP and PA
T3: Resource availability and capacity	B1: Lack of time/resources	CEB4: Ambiguity or uncertainty around responsibilities creates inefficiencies CEB8: Lack of trust and limited mutual understanding among actors hinders effective collaboration and decision-making
T4: Role clarity and mutual understanding	B2: Lack of knowledge of each other's expertise	

A conclusion derived from Table 9 is that the two methodologies reinforce the overarching themes. Although practitioners and scholars highlight different aspects of the theme, there is considerable alignment between survey responses and the insights gained from the literature revealed by the scoping study. This consistency strengthens the validity of the identified themes and underscores the complementary nature of the qualitative and quantitative findings.

From a governance perspective, this convergence not only reflects shared empirical observations but also highlights structurally embedded interaction challenges. The separation of preventive land-use planning from preparedness, response, and continuity management assigns responsibility across sectoral boundaries that are formally distinct yet practically interdependent. As a result, coordination depends on voluntary collaboration rather than mandated joint decision-making. This institutional setup helps explain why fragmentation, responsibility ambiguity, and misaligned priorities persist across both practitioner experiences and the reviewed literature, despite longstanding policy ambitions for integrated risk governance.

4.3. Contrasting findings on enablers

Two contrasting findings related to enablers emerged in the analysis.

First, enabler E2 (More resources) was frequently reported in the survey but did not emerge among CEs in the scoping study. This discrepancy could indicate that resource availability is perceived as a fundamental prerequisite for all enablers rather than a distinct enabler, making it less explicitly discussed in the academic literature. In contrast, practitioners may experience resource constraints as a direct and tangible barrier, leading them to prioritise additional resources as a key enabler. The frequent ranking of this enabler in the survey highlights its practical importance in real-world collaboration efforts. Although theoretical perspectives may focus on structural, procedural, or cultural enablers, the survey responses indicate that other enablers may encounter difficulties in achieving effectiveness in the absence of sufficient resources, such as funding, personnel, or technological support. Therefore, even if implicit in the literature, the strong emphasis among practitioners on this enabler underscores its importance and warrants further attention in research and policy discussions. The strong emphasis on resources can also be interpreted as a structural feature of the governance system rather than as an isolated organisational issue. Although collaboration is widely promoted as a normative ideal in both policy and research, it is not certain that the statutory framework provides the necessary resources for joint analysis, cross-sectoral planning, or lasting coordination. Instead, collaboration can be incorporated as a supplementary layer for organisations that already possess limited resources. In this context, a lack of time, personnel, and analytical skills serves as a significant barrier to the integration of multiple actors, regardless of formal ambitions. The findings thus indicate that resource constraints are not just marginal but are essential in shaping how risk-related planning cooperation is practically carried out.

Second, while the scoping study review identified numerous nuanced enablers for collaboration, which were noted as CEs, the specific CEs were not represented in the survey responses (CEE2, CEE4-CEE6). This discrepancy can be attributed to the intrinsic differences between the qualitative insights and the quantitative nature of the survey instruments. Although the survey allowed respondents to select from predefined response options and add up to three additional enablers, it may not have fully captured the complex situational factors emphasised in the literature. Furthermore, respondents may have interpreted the survey items differently than the CEs identified in the scoping study, or these enablers may be less prominent in their immediate operational experience compared to the broader theoretical perspectives provided by the scoping study.

An explanation for why some enablers are strongly supported in both data sources, while others are weak or absent, lies in differences in statutory and institutional arrangements across jurisdictions. The Swedish system is characterised by strong municipal autonomy in physical planning, combined with sectorally organised preparedness responsibilities. The international literature on disaster risk governance may be based on other systems with stronger elements of national coordination, mandatory inter-actor planning, or dedicated risk management authorities with different mandates. These structural differences influence both the barriers and enablers for collaboration and help explain why specific enablers may appear less influential in the current material.

4.4. Corroborating findings on enablers

Table 10 illustrates the connection between the survey findings and the literature found in the scoping study. It is organised by main themes, with the corresponding barriers identified in the survey and CEs drawn from the scoping study.

Theme T1 is supported by four enablers from the survey (E4-E7) and one moderate-ranked enabler identified in the scoping study (CEE3). Two enablers associated with theme T4 (E1 and E3) were ranked high. It was also supported by the CE most frequently cited from the scoping study (CEE1). In summary, themes T1 and T4 are strongly supported by both practitioners and academic scholars. Additionally, a similar emphasis is placed on the support enablers from the survey and CEs from the scoping study. The strong practitioner support for enablers E4-E7 reflects calls for clearer governance structures across national, regional, and local levels, in line with CEE3's focus on policy framework reform to address institutional fragmentation.

However, enablers explicitly linked to the overarching themes T2 and T3 were absent in the literature included in the scoping study. This gap suggests that while these themes are relevant in the broader discussion, specific enablers facilitating collaboration within them were not prominently identified. One reason may be that the enablers related to these themes are more implicit or overarching rather than explicitly framed in the literature or survey. Structural or systemic factors could support themes T2 and T3 without being individually recognised as distinct enablers.

Table 10

Relations between the enablers reported in the survey and the scoping study.

Theme	Enablers (survey)	CEs (scoping study)
T1: Institutional structures and data sharing	E4: More precise guidelines/requirements from the national level E5: More precise guidelines/requirements from the regional level E6: More precise guidelines/requirements from the local level E7: Clearer/stronger legislation	CEE3: Policy frameworks should be updated to reduce institutional fragmentation
T4: Role clarity and mutual understanding	E1: Increased knowledge of each other's areas of expertise/competence E3: Increased understanding of the objectives and challenges of the different actors	CEE1: Active efforts are required to improve mutual understanding among actors

4.5. Methodological limitations

This study employs a focused methodological design that deliberately limits scope to ensure depth within specific contexts, providing targeted insights into LUP-PA collaboration.

The scoping study relies on a deliberately narrow and strictly defined set of inclusion criteria and a single-database search, resulting in a limited number of articles. This outcome reflects not only methodological boundaries but also the limited volume of research that explicitly addresses the interaction between LUP, CM, and FRS as distinct yet interrelated functions. The evidence base is therefore not intended to be statistically representative of all possible jurisdictions or governance models. Instead, the literature synthesis is best understood as mapping a focused but relevant segment of the field, centred on these specific actor roles, while the survey results are rooted in the legal and organisational framework of the Swedish municipal DRM system. Together, these components provide a coherent, though necessarily limited, picture of barriers and enablers that is most directly relevant to Sweden and to countries with similar decentralised structures and responsibilities. Subsequent studies could mitigate these limitations by adopting a more inclusive search strategy and integrating additional databases.

The use of a survey for data collection also poses several challenges. First, the survey has the advantage of including a relatively large population in a structured and consistent way. However, its disadvantage is that it relies on predefined response alternatives. Response alternatives may be insufficient or rigid, not allowing for nuanced responses. Terms such as ‘collaboration’ and ‘barriers’ can be interpreted differently depending on the professional background and experience. Furthermore, even after expanding the mailing to 427 municipal entities, responses remained limited (35 LUP, 29 FRS, 26 CM from 69 municipalities), restricting statistical power but still allowing for broader coverage within Sweden's governance framework. Second, respondents may also have been influenced by the order in which the response alternatives were given. Third, the responses were generally provided by individuals representing the actor, which may be unrepresentative of the whole organisation. However, explicit instructions, meticulously designed language, open response fields, and pilot testing should have enhanced the validity of the findings. While the pilot group was explicitly asked whether they could choose an appropriate answer for all the questions, their feedback indicated that the response alternatives were sufficient. Fourth, the ranking of barriers and enablers in Figs. 4 and 5 does not align with the order in which the response alternatives were presented in the questionnaire, suggesting that the order of the response alternatives did not significantly influence the respondents. Fifth, legal differences are likely to impact the relevance of identified barriers and enablers [29], making survey findings system-specific. The results should therefore be interpreted as analytically transferable rather than directly applicable across different jurisdictions. Nonetheless, the cross-jurisdictional commonality of the core themes signals inherent LUP-PA challenges. Future studies could expand databases, incorporate interviews, and enable cross-national comparisons.

4.6. Implications for risk and safety science and collaboration

The scoping study and the empirical data from the survey have implications for the field of risk and safety science as an academic discipline, as well as for the efforts of practitioners to facilitate effective collaboration.

Although there are no notable debates or evident conflicts among the articles in the scoping study, the limited connections between these articles (see Fig. 1) indicate that there has not been a considerable advancement in knowledge over the years on the specific topic. Therefore, a knowledge gap exists in interdisciplinary risk assessment in this aspect, as indicated by the wide distribution of journals reflected in the search results, as shown in Table 4.

More specifically, the study also revealed a knowledge gap on enablers. The imbalance between barriers and enablers found in the scoping study may demonstrate a bias toward barriers rather than enablers. Numerous studies prioritise diagnosing problems over proposing solutions, which may explain the absence of explicit documentation regarding enablers associated with T2 and T3. Furthermore, although the scoping study identified several enablers (CEE1-CEE6), empirical support for their effectiveness was notably lacking. Moreover, the survey uncovered significant uncertainty among respondents about enabler-related questions, highlighting the need for practitioners to improve their understanding of the issue.

These knowledge gaps warrant further exploration, as fragmented collaboration between LUP and PA due to barriers increases the likelihood that urban developments will lack sufficient risk mitigation measures, whether from the *preventive*, *reactive*, or *both*

perspectives. Consequently, if bidirectional feedback is ineffective and actors do not adapt, communities may be exposed to risks that could otherwise be reduced.

The challenges can be illustrated using the *Red Queen Principle*, proposed by Heylighen [73], referring to Lewis Carroll's book *Through the Looking-Glass* [74]: when The Red Queen tells Alice that in her world: 'it takes all the running you can do, to keep in the same place'. The principle suggests that continuous adaptation is necessary merely to maintain the status quo in dynamic environments. As urban risks evolve due to climate change, densification, and technological advancements, static DRM approaches quickly become obsolete. The necessity of ongoing adaptation and transformation of actors' capabilities [28] is apparent, which the principle underscores. Without such adaptation, risk governance efforts risk falling behind, leaving urban areas increasingly vulnerable to emerging threats.

5. Conclusions

This study explored barriers and enablers in collaborative planning within an evolving risk landscape. In this context, friction-free, bidirectional feedback between the preventive and the reactive parts of the DRM system-of-systems is essential. Integrating LUP and PA helps operationalise risk and resilience aspects and offers a foundation for continuous adaptation and holistic response to present and future challenges.

The literature included in the scoping study and the empirical data from the survey combined theoretical and practical perspectives on collaborative planning. Triangulation of these sources revealed both contrasting and corroborative findings regarding barriers and enablers to the integration of the actors.

The contrasting findings point to substantial gaps between the literature identified in the scoping study and the perceptions of practitioners. While the literature in the scoping study frequently reports barriers to collaboration, the majority of survey respondents did not report such barriers. Among those who did, organisational structure and size were the most commonly cited causes. Moreover, while the literature largely overlooks resource availability, practitioners identified the need for additional resources as a key enabler.

The corroborative findings from both sources included persistent barriers to effective collaboration, including fragmentation, unclear responsibilities, limited data sharing, conflicting priorities, and varying risk perceptions. Additionally, funding, personnel, and expertise constraints were found to hinder effective interaction between actors. Conversely, several enablers were consistently acknowledged, such as building inter-actor trust, fostering shared risk perspectives, and institutionalising structured collaboration through clearer policies and frameworks.

Overall, the findings fill a gap in the literature by clarifying which barriers and enablers influence the interaction between land use planners, crisis management, and fire and rescue services in risk-related planning processes. At the same time, the research also highlights the need for further research in order to support the overarching goal of planning for safety in an evolving risk landscape.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the author used Grammarly to improve the clarity, grammar, and overall language quality of the text. After using this tool, the author(s) reviewed and edited the content as needed and take full responsibility for the content of the published article.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data availability

Data will be made available on request.

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