

A Participatory Approach to Embedding Cascading Crises Exercises in Local Riskscapes to Build Community Resilience

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ABSTRACT

Contemporary crises increasingly unfold as cascading processes, challenging conventional, event-based approaches to local preparedness and crisis response. While international frameworks emphasize community-level resilience, practical methodologies for operationalizing these principles in crisis exercises remain underdeveloped. This paper introduces a participatory, low-cost methodology for crisis scenario-based exercising embedded in local riskscapes. The approach integrates participatory mapping, expert interviews, co-creation and discussion of crisis scenarios, and collaborative development of preparedness recommendations, engaging community members, local authorities, and crisis response professionals. Drawing on two case studies from Lithuania, an external EU border-adjacent community and a strategically embedded urban locality, the paper illustrates how the suggested methodology helps identify locally important risks, reveal response constraints, and strengthen cross-sectoral collaboration. The paper shows that treating crisis exercises as pedagogical processes enhances shared situational awareness and preparedness, offering a transferable contribution to crisis exercise design and community-inclusive resilience building.

Keywords

Riskscape, cascading crises, co-creation, community resilience, crisis exercise.

INTRODUCTION

The increasing complexity of contemporary crises, often described as polycrises (Lawrence et al., 2024), has fundamentally altered the conditions under which local preparedness and response capacities must operate. Rather than unfolding as isolated events, crises cascade (Pescaroli & Alexander, 2016, Zuccaro et al., 2018), generating compound risks (Klasa et al., 2025) that challenge conventional crisis management approaches. In response, international policy frameworks, most notably the United Nations Sendai Framework for Disaster Risk Reduction 2015–2030, emphasize the critical importance of strengthening disaster resilience at the community level and enhancing preparedness through inclusive, locally grounded approaches. However, translating these principles into effective, practice-oriented preparedness strategies remains an unresolved challenge.

This study approaches local preparedness and crisis response through the lens of *riskscapes*, a concept that captures the social and spatial configuration of risks, vulnerabilities, resources, and response capacities within specific localities (Müller-Mahn et al., 2018). Riskscapes highlight lived, spatialized, and socially constructed

landscape of risks. From this perspective, communities are not merely recipients of crisis management interventions but active actors whose local knowledge and historically shaped experience are essential for addressing crises effectively. Yet, despite growing recognition of the value of community engagement, community-level preparedness – particularly in the context of crisis exercises – remains underexplored in both research and practice (Taylor et al., 2020; Kinateder et al., 2025).

A persistent limitation of current crisis response training lies in its focus on professional responders and organizational procedures, often neglecting collaboration with local communities and the integration of local knowledge. Many exercises are designed as top-down simulations that insufficiently reflect the complexity of real-world place-based crisis dynamics. Lithuania provides a salient example of this challenge. Communities located along the external border of the European Union and NATO, particularly near the Kaliningrad exclave of the Russian Federation, face intersecting and potentially cascading risks linked to geopolitical tensions, environmental and technological hazards. Cross-border collaboration in crisis response is highly restricted in this context. Therefore, local preparedness even more heavily depends on effective collaboration across sectors, including communities, municipal authorities, and local crisis response professionals.

Conceptually, this study builds on the literatures on cascading, compound crises and riskscapes, which emphasize how disruptions in one system can trigger secondary effects across interconnected domains. Such crises challenge linear planning assumptions and require preparedness approaches that foster shared situational awareness and collaborative problem-solving. Shared situational awareness is a common understanding between local communities and crisis management institutions of locally relevant threats, vulnerabilities, and appropriate courses of action. However, existing crisis exercise research has paid limited attention to how cascading crisis scenarios can be co-created at the local level in ways that are both methodologically robust and practically feasible (Özkaynak & Rodríguez-Labajos, 2010). Despite growing recognition of the complexity of contemporary crises, crisis exercise design literature has also paid less attention to place-based local riskscapes and to the role of community resilience and agency in how crises unfold. This paper addresses that gap by proposing a new participatory framework for simulation-based, locally embedded crisis exercises.

The crisis exercise design literature is advanced by introducing an empirically tested participatory, low-cost methodology for designing and conducting crisis exercises focused on cascading crises within local riskscapes. The proposed approach integrates participatory mapping, expert interviews, collaborative crises scenario development, and co-creation of recommendations involving community members, local authorities, and crisis response professionals. Rather than treating exercises as one-off training events, the methodology frames them as pedagogical processes that foster collaboration between community and institutions.

Empirically, the article draws on two case studies from Lithuania (Kybartai and Aleksotas) illustrating how cascading crisis scenarios were developed and enacted with diverse stakeholders operating at the local level. The cases were selected to demonstrate the applicability of the methodology in different local contexts, including border-adjacent communities and urban settings. The two cases represent “riskscapes” based on the analysis of objective risk data across different dimensions of risk (Telešienė et al., 2022). These locations have high levels of intersecting risks across different dimensions. Aleksotas, a community in the second-largest city, Kaunas, is located near the airport and faces several overlapping risks, including war mines from past conflicts, relatively high crime rates, and relatively high air pollution. Another example is Kybartai, a small village on the border with Russia, which is characterised by an ageing population, high unemployment, and the presence of a transit railway crossing. The primary target users of the methodology are local crisis responders, including municipal officials, local emergency service units, and sub-municipal actors, as well as community stakeholders directly involved in preparedness and response.

By contributing a transferable, participatory exercise design methodology tailored to cascading crises, this study advances research on crisis exercise pedagogy and resilience building. It responds directly to calls for innovation in accessible and resource-efficient training techniques and offers practical guidance.

This work-in-progress paper is primarily intended to present the crisis exercising methodology in a form that can be adapted, transferred, and replicated in other contexts. For this reason, the article focuses less on the full empirical findings of the individual case studies and more on the methodological logic, design, and sequence of steps that emerged from the authors’ research in Kybartai and Aleksotas. The following sections therefore first introduce conceptual foundations, then describe the main stages of the exercising methodology and then illustrate its application through two crisis scenario examples, one from the Kybartai case and one from the Aleksotas case. The broader empirical results of these case studies are to be presented in separate scientific papers; here, they are used selectively to demonstrate how the methodology was developed and applied.

CONCEPTUAL FOUNDATIONS: CASCADING CRISES, RISKSCAPES, AND CO-CREATION

Cascading crises differ fundamentally from single-hazard events or simple crisis escalation. Rather than representing a linear intensification, cascading crises involve qualitative shifts in the nature of the crisis itself, as environmental, technological, social, and institutional dimensions become sequentially and simultaneously affected. This perspective highlights crises as evolving configurations of hazards, vulnerabilities, sensitivities, and response dynamics (Pescaroli & Alexander, 2016, Zuccaro et al., 2018).

Cascading crises must also be distinguished from simultaneous crises, where multiple disruptions occur simultaneously within the same locality but lack a direct causal chain (Rice & Cullinan, 2022). While simultaneous crises primarily compete for limited response capacities, attention, and resources, cascading crises transform the riskscape over time. A single initiating hazard may generate secondary crises of a different type, producing layered and compounding impacts. For example, environmental stressors such as drought and heatwaves may elevate fire risk, which in turn can trigger technological accidents, public health emergencies, and socio-economic disruptions. Importantly, earlier hazards do not disappear as new crises emerge; their effects persist and interact, leading to cumulative pressures on communities and institutions.

Beyond hazards themselves, cascading processes may involve vulnerabilities, sensitivities, and response capacities. Each stage of a cascading crisis can reconfigure who is vulnerable, in what ways, and to which impacts. Vulnerability is therefore not static or confined to fixed social groups; it is situational and relational (Alam & Khalil, 2022). Different crisis phases activate different vulnerability profiles, often intersecting in ways that disproportionately affect individuals with limited mobility, chronic health conditions, or constrained access to resources.

Riskscape concept provides a useful lens for capturing these dynamics. Riskscapes conceptualize risk as a spatially and socially embedded, shaped by social relations and lived experience, among other factors. Riskscapes link material dimensions, such as physical threats, with discursive dimensions involving perceptions and communication about risks, as well as agency, referring to how people manage and live with those risks (Müller-Mahn et al., 2018). The constructed meanings, images, lived memories are important in the way people define risk of the specific territories beyond tangible materials or physical risks (Müller-Mahn, & Everts, 2013). Usually, they integrate the overlapping dimensions of risks, such as environmental, social and health-related aspects. The overlapping of multiple risks cannot be calculated and managed, and involves high uncertainty and unpredictability (ibid.). The distribution and management of risks in the settings of riskscapes involve power dynamics and social practices (Müller-Mahn et al., 2018).

In cascading crises, riskscapes are not stable but are continuously reshaped as new threats emerge, vulnerabilities shift, and response measures alter everyday conditions. Preparedness and response, therefore, must account for this fluidity rather than rely on static assumptions about risk and preparedness.

Within this context, *co-creation* plays a critical conceptual and practical role. Co-creation refers to participatory processes through which communities, local authorities, and crisis response professionals jointly generate knowledge, scenarios, and response strategies. Beyond producing tangible outputs, co-creative practices function as pedagogical spaces (Elvegård et al., 2024) where experiential and expert knowledge intersect. Through participatory mapping, expert interviews, collaborative scenario discussions, critical reflection, and joint formulation of recommendations, co-creation (in our case studies), enabled the articulation and recognition of local knowledge while simultaneously making institutional capacities, constraints, and responsibilities visible to the communities.

Crucially, co-creation shapes preparedness during the process itself (Horn et al., 2026). By facilitating direct in-person exchanges between communities and institutions, it influences risk perception, enhances self-awareness of preparedness, reduces misconceptions, and strengthens relational ties. These interactions foster trust, clarify coordination pathways, and increase willingness to cooperate and follow guidance during crises. In cascading crisis contexts - where uncertainty, transformation, and compounding impacts prevail - such capacities are as essential as material resources. Co-creation thus emerges not merely as a method, but as a foundational element of preparedness for cascading crises embedded in dynamic local riskscapes.

CRISIS SCENARIO BASED EXERCISING: A STEP-BY-STEP PROCESS

This subsection presents the crisis scenario-based exercise methodology applied in our research and outlines its potential applicability in crisis management training and preparedness contexts. The methodology is explicitly designed for the local, sub-municipal level and is grounded in the specific characteristics of local riskscapes. It places particular emphasis on the joint involvement of local communities and crisis management professionals, framing preparedness as a collaborative and place-based process rather than a solely institutional activity.

The methodological approach is structured as a multi-stage process that integrates four stages: (1) preparation stage, involving secondary analysis of available data and documents and stakeholder mapping; (2) participatory crisis scenario development, involving interviews with experts (stakeholders potentially involved in crisis response and management), participatory mapping with local residents and sub-municipal level specialists; (3) crisis scenario discussions, including validation with key local crisis management officials and several recurring focus groups with local communities; and (4) co-creation of recommendations, involving all stakeholders in a joint co-creation workshop.

The first *stage focuses on preparation* and establishes the empirical and contextual foundation for the crisis scenario-based exercise. Its primary objective is to develop an initial, evidence-informed understanding of the local riskscape in which the exercise is embedded. This stage focuses on synthesizing existing knowledge about emergencies that have historically affected the area, recent crises (if any), major risks and threats, available preparedness documents, data on the social vulnerability and resilience characteristics of local communities (e.g., from surveys or censuses)¹.

This stage also includes an examination of locally available preparedness and response documentation. In the Lithuanian context, this primarily consists of municipal-level crisis management and emergency planning documents, which outline formal responsibilities, response procedures, and institutional capacities, while also revealing implicit assumptions about risk prioritization and the spatial and social limits of preparedness.

The *participatory crisis scenario development stage* translates the preparatory analysis into a collaborative process of knowledge generation involving community members and local crisis management stakeholders. This stage is designed to research local risk perceptions, vulnerabilities, and response capacities.

A central component of this stage is participatory mapping, conducted with local residents and sub-municipal-level specialists, e. g. eldership leaders and community coordinators. Our example is illustrated in Figure 1. These workshops follow within-group heterogeneity principle and can be repeated several times, to make sure that diverse social groups and stakeholders are represented. Through facilitated exercises, participants are invited to identify and spatially locate (map) perceived sources of threats, discuss potential likelihood, and expected magnitude. Participants also identify and map places of heightened socio-spatial vulnerabilities, e. g. places where more elders live, districts of ethnic minorities with high levels of unemployment, etc., then would discuss vulnerability patterns, focusing on who may be affected and why. This process supports the visualization (mapping) of vulnerable zones, critical objects, and socially significant locations within the locality.

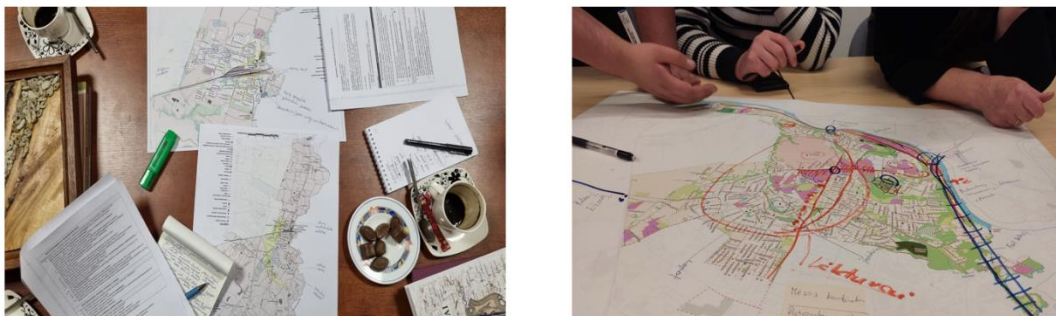


Figure 1. Participatory mapping workshops with local residents in Kybartai (left) and Aleksotas (right).

In addition to identifying risks and vulnerabilities, participants map existing and potential response-related resources. These include shelters and evacuation routes, formal and most importantly – informal gathering points, locations of assistance provision, and critical infrastructure relevant for crisis response. The mapping process also encourages participants to identify barriers and constraints that may hinder response, such as accessibility issues or infrastructural bottlenecks, for example, situations in which evacuation routes are constrained by railway crossings that are frequently closed.

Participatory mapping is complemented by interviews with local experts, broadly defined as actors who may assume responder roles during crises. This includes formal crisis management professionals, such as municipal

¹ We will not elaborate on the social vulnerability and resilience of communities in this paper and would rather refer the reader to the specific scientific literature dedicated to these topics.

preparedness officers, as well as locally embedded actors, including large-scale farmers or hunting associations, that hold equipment useful for crisis response. These interviews provide insights into response capacities, coordination practices, and anticipated challenges, helping to situate community-generated knowledge within practical response contexts.

Together, participatory mapping and expert input form the basis for the initial formulation of crisis scenarios. Importantly, this stage serves not only to generate scenario content but also to facilitate exchange between experiential local knowledge and expert knowledge. By creating a shared space for articulation and recognition of different forms of knowing, the participatory scenario development stage contributes to mutual understanding, enhances clarity regarding institutional as well as community roles and capacities, and lays the groundwork for subsequent scenario discussion and co-creation of recommendations.

In the third stage, preliminary crisis scenarios are validated and discussed. This stage involves a team of researchers developing a preliminary draft of crises scenario, that is realistic and based on the information from previous stages. The scenario is then validated with key local crisis management officials through a discussion. And then a series of focus group discussions with community members and stakeholders are implemented. It is important that different social groups with specific vulnerability characteristics participate in the discussions (e.g. consider age groups, gender, health status, etc.), so focus groups are repeated as many times as necessary. Here, it is recommended to follow the rule of within-group heterogeneity - different people can be included in the same discussion, as one of the goals of the discussion is to increase mutual awareness. Participants may include individuals involved in earlier stages as well as new participants, allowing for both continuity and the introduction of fresh perspectives. In order to assess the change in attitudes in the pre- and post-crisis scenario discussions, we recommend giving participants a short survey before and after these discussions, asking them about perceived crisis knowledge and preparedness, self-efficacy in crisis response, perceived community resilience, and trust in local and national crisis management institutions. Our research in Kybartai and Aleksotas shows that participation in a simulated crisis scenario discussion increases awareness of the need for preparedness, strengthens self-efficacy, and reinforces behavioral intentions to take more action in preparing for crises.

Crises scenarios include a detailed description of the locality, including its spatial characteristics and key geographic features, supported by maps and visual materials, followed by the description of relevant hazards and crisis events, including their sequencing over time, and examples of preparedness and crisis communication messages. Particular attention is paid to how initial threats may trigger subsequent events, allowing participants to explore temporal dependencies and cascading effects. The scenarios further incorporate context-specific descriptions of social vulnerability and resilience within local communities. Participants are invited to reflect on which groups may be affected, under what conditions, and how resilience resources may be mobilized or constrained as the scenario unfolds.

A central component of this stage involves the discussion of response actions, available measures, involved actors, reflection on communication messages, and potential response limitations. Participants collectively identify who would be expected to act at different stages of the crisis, what resources could be mobilized, and where constraints or bottlenecks may emerge. It is important that scenario discussions would incorporate communication, because it is an embedded element of crisis response. During discussions, participants review illustrative examples such as informational materials, public notices, or alerts, and discuss how communication practices may support or hinder response actions at different stages of the scenario.

The final stage of crisis scenario-based exercising consists of the *co-creation of recommendations* through a joint workshop involving all relevant stakeholder groups. This co-creative setting facilitates collective reflection on the crisis preparedness and response, identifies gaps in coordination and collaboration, and supports the development of context-specific, actionable recommendations. The co-creation workshop is a one-time event, and it brings together community members, local stakeholders, and crisis management professionals.

Participants reflect on results from previous three stages. During the workshop, participants are presented with a researcher-prepared overview of the results from the preceding three stages. In addition, a preliminary recommendations framework is introduced, developed on the basis of these empirical findings as well as insights derived from the relevant scientific literature and previous research. Depending on the outcomes of the first three stages, this framework may include recommendations related to the clarification and redistribution of institutional roles, adjustments to formal documents regulating preparedness and response, and the development of new institutional modes of operation. It may also encompass recommendations addressing crisis communication, the strengthening of community cohesion, and the enhancement of collaboration among different communities and stakeholder groups.

Across all stages, the methodology treats the exercise not only as a tool for testing crisis response procedures but also as a pedagogical process that strengthens collaboration, mutual understanding, and preparedness at the local level.

KYBARTAI RISKScape AND HYPOTHETICAL CASCADING CRISIS SCENARIO

This section presents the Kybartai case as an illustration to crisis exercising, outlining its local riskscape and the crisis scenario employed.

Kybartai is a small peripheral town located in the Suwalki Gap, a strategically sensitive area on NATO's eastern flank and along the external border of the European Union. Its riskscape is shaped by the intersection of geopolitical, infrastructural, environmental, and social conditions. As a border community, Kybartai is traversed by a cross-EU Russian transit railway, major transit roads, and international electricity transmission lines, while also hosting industrial facilities such as a fertilizer warehouse. At the same time, the locality is exposed to climate-induced droughts and prolonged heatwaves, technological and social risks.

The social vulnerability of the Kybartai community is shaped by aging population, that contributes to lower mobility and response potential due to limited use of digital media and alert systems. Low levels of formal education constrain understanding of safety guidance and crisis-related instructions, while economic fragility limits resources available for crises preparedness. Strong place attachment and low residential mobility reinforce social ties within the community but also reduce adaptability and might complicate evacuation processes.

Preparedness within this riskscape is characterized by low and largely unplanned engagement. Most households lack basic reserves of food, water, or survival supplies, and knowledge of civil protection measures is limited. Risk perception and preparedness are strongly anchored in historical experience rather than current risk signals. A notable gap exists between formal municipal crisis management arrangements and public awareness of available support, reinforcing an institutional-public disconnect. Against this background, a hypothetical cascading crisis scenario was developed for Kybartai, set in August 2026 (see Figure 2).



Figure 2. Structure of Cascading Crisis Scenario in Kybartai

The scenario begins with prolonged extreme heat and tropical nights, accompanied by hydrological drought and increasing water stress. An official warning to limit water consumption is issued, followed by escalating alerts. Environmental stressors elevate fire risk, culminating in a fire at a fertilizer warehouse located along the cross-EU Russian transit railway. The incident generates hazardous air pollution, disrupts rail transit, and immobilizes a Russian transit train within the locality, introducing geopolitical sensitivity into an already tense situation.

The crisis then cascades across sectors and domains. Air pollution and heat exposure create acute public health risks, triggering instructions to remain indoors and, subsequently, orders to evacuate affected areas. Evacuation processes are complicated by infrastructural constraints (access to main road is blocked because of fire and immobilized train) and mismatches between officially designated routes and residents' intended destinations.

The situation is further destabilized by provocations at the railway, from the passengers of stuck train, and a coordinated communicative attack via social media, aimed at spreading fear and uncertainty. Although corrective information is disseminated, the cumulative effects of environmental stress, severe fire, and information disorder significantly strain local response capacity.

Scenario-based crisis exercising should look for patterns in community response. E.g. in Kybartai, trust is strongly concentrated in local leadership figures - both formal, such as the local elder, and informal community coordinators, who function as primary anchors of authority and information. While this personalized leadership structure supports rapid mobilization in emergency situations, it also creates communication bottlenecks and fragility (hundreds of people contacting them at the same time). Institutional communication channels, including

municipal websites, are rarely used; residents rely primarily on national public broadcasting and on local leaders for guidance. It was important to notice uneven perceptions of personal agency, with agency remaining strong for normalized risks (like water shortages) and diminishing for unfamiliar threats (like evacuation because of fire induced air pollution). Critically, the scenario exposes the absence of administrative plans for cascading or multi-hazard crises and highlights justice-related blind spots, as certain groups risk being left behind during evacuation and response (community members did not talk about ethnic minorities).

ALEKSOTAS RISKScape AND HYPOTHETICAL CASCADING CRISIS SCENARIO

This section presents an illustration of the Aleksotas case, outlining its local riskscape and the crisis scenario employed.

Aleksotas is an eldership in Kaunas, the second-largest city in Lithuania, with historically inherited defense-related infrastructure. Situated in the southwestern part of the city, Aleksotas is physically separated from other urban areas by the Nemunas River and deep valleys of several streams. This natural separation shapes both everyday mobility and crisis response conditions, as access to the area from other parts of the city is limited to a small number of bridges crossing these waterways.

The locality is traversed by two transport infrastructures of international significance: the Via Baltica European road corridor, and the Rail Baltica railway line. These infrastructures are critical not only for local mobility but also as key international trade routes and nationally significant evacuation corridors. In addition, Aleksotas hosts a local airport for light aircraft. Owing to its location along the Nemunas River, Aleksotas is also particularly vulnerable to upstream incidents at the Kaunas Hydropower Plant (HPP), which is a protected critical infrastructure; a failure at this facility would result in catastrophic flooding.

The spatial structure of Aleksotas is predominantly monofunctional, characterized by extensive low-rise residential development, with multi-apartment housing and newer residential complexes emerging in recent development zones. Together, these characteristics position Aleksotas as a strategically embedded urban locality whose riskscape is shaped by infrastructural centrality, physical separation, and historically layered military and transport functions.

The social vulnerability and response potential of the Aleksotas are shaped by a distinct set of socio-demographic and spatial characteristics. Aleksotas exhibits relatively stable population dynamics, with slower population decline and low residential mobility in recent years, supporting sustained local knowledge of risks, continuity of social relations, and conditions for longer-term community resilience. The predominantly low-rise residential structure, combined with expansion of new suburban-style housing developments, creates uneven territorial patterns of preparedness: newer residential areas display lower levels of social cohesion and weaker preparedness practices. Community ties are similarly fragmented, with some areas characterized by strong, long-standing and sometimes institutionalized community networks, while others lack formal community structures, potentially constraining collective response and coordination during crises. There is a high share of working-age residents and children, which increases the potential for active engagement, volunteering, and self-organization, but simultaneously raises the number of dependent residents requiring special attention in evacuation. Higher overall educational attainment further strengthens capacity to use official guidance during emergencies.

Against this background, a hypothetical cascading crisis scenario was developed for Aleksotas (Kaunas), set in January 2027 (see Figure 3). The hypothetical cascading crisis scenario in Aleksotas begins with growing concern over an unusually high seasonal riverine flood risk. Rapid snowmelt and increased upstream water inflows raise river levels and prompt official warnings about potential flooding. For residents living in low-lying areas near the riverbank, the situation introduces uncertainty and heightened alertness, as everyday routines become overshadowed by the possibility of evacuation and disruption. At this stage, the threat is perceived primarily as environmental, but it already interacts with the locality's spatial characteristics, including limited access routes across the river.

The situation escalates when a hostile incident affects the Kaunas Hydropower Plant (HPP), damaging critical infrastructure and resulting in uncontrolled water release. Flood risk intensifies rapidly, and residents in the potential flooding zone receive evacuation instructions within a three-hour timeframe. For safety reasons, traffic across bridges over the Nemunas downstream of the HPP is suspended, significantly restricting movement between Aleksotas and other parts of the city. As evacuation efforts are underway, a further disruption occurs when a transport accident involving hazardous materials takes place on the Via Baltica corridor near Aleksotas. The release of toxic substances into the air, compounded by unfavourable wind conditions, introduces an acute public health threat. Residents within 3 km radius (does not include flood risk areas) receive instructions to remain indoors, or seek shelter in designated collective protection facilities, while the affected section of Via Baltica is closed, further constraining mobility and response options.

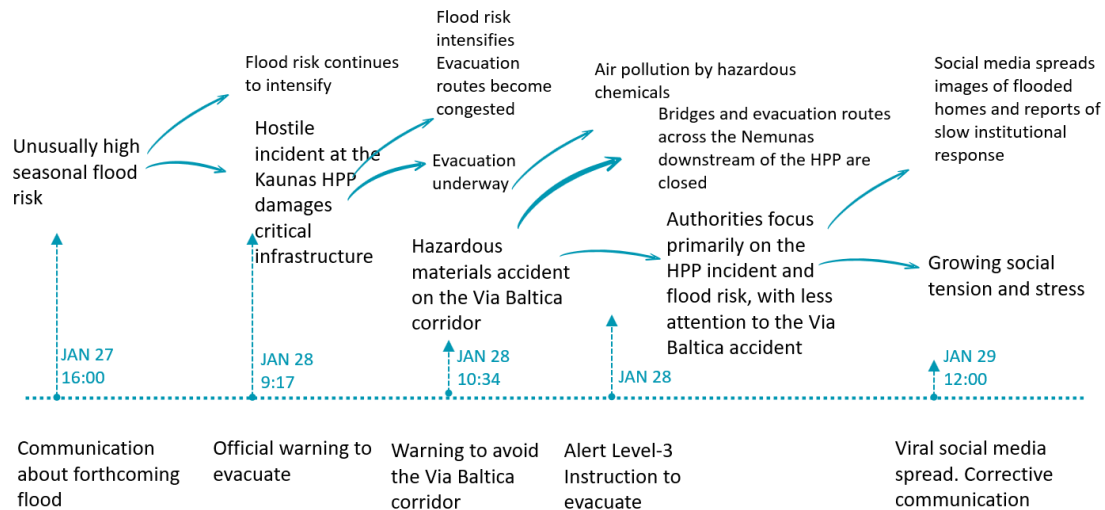


Figure 3. Structure of Cascading Crisis Scenario in Aleksotas

As the crisis unfolds, the cumulative effects of flood risk, evacuation difficulties, hazardous air pollution, and transport disruption begin to manifest socially. Information and emotionally charged content spreads rapidly through social media, amplifying frustration, fear, and a sense of institutional inadequacy. Public attention focuses on evacuation bottlenecks, flooded homes, damaged property, insurance-related concerns, and the limited accessibility of shelters during the air pollution incident. While tensions remain largely confined to online spaces and do not translate into physical unrest, the scenario illustrates how cascading crises can reconfigure local vulnerability, strain trust in institutions, and intensify social stress within a strategically important urban riskscape.

CONCLUSIONS

This study argues that cascading crises fundamentally reshape local riskscapes, producing dynamic configurations of hazards, vulnerabilities, and response constraints that cannot be adequately addressed through conventional, top-down crisis management exercises. By conceptualizing preparedness as a place-based, relational, and pedagogical process, the study discusses how participatory, low-cost crisis scenario-based exercises can help in training and resilience building at a local community level. The Kybartai and Aleksotas cases illustrate how participatory co-created hypothetical cascading crises scenarios might be developed, and might help define local risks and response limitations, while also showing the potential for strengthened collaboration between communities and institutions. It is important that communities and institutions develop shared situational awareness and recalibrate perceptions of preparedness and responsibility. Such crises exercise methodologies can particularly be valuable in contexts characterized by geopolitical constraints and limited cross-border cooperation opportunities. By embedding crisis exercises within local riskscapes and treating them as iterative learning spaces rather than one-off simulations, this study contributes to advancing crisis exercise pedagogy and offers a transferable approach for strengthening community-inclusive preparedness in the face of increasingly complex and cascading crises.

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ETHICS AND USE OF ARTIFICIAL INTELLIGENCE TOOLS

The research activities reported in this paper were conducted in accordance with applicable ethical standards and were approved by the Kaunas University of Technology Research Ethics Committee (approval date: 31 October 2024; approval No. M6-2024-26). Participation in interviews, participatory mapping activities, focus groups, and workshops was voluntary, and informed consent was obtained from all participants.

In preparing this paper, Scopus AI, provided through the Elsevier Scopus database, was used to support the identification and exploration of relevant scientific literature. As the authors' native language is not English,

ChatGPT (version 5.2) was used to assist with the translation of original Lithuanian-language materials and with English-language editing. All AI-assisted outputs were critically reviewed and revised by the authors, who take full responsibility for the content of the paper.

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