Professional paper

ENHANCING CRISIS READINESS: CIVIL PROTECTION EXERCISES AND PUBLIC AWARENESS IN THE CITY OF ZAGREB

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Abstract: This paper analyzes how civil protection exercises and public awareness initiatives contribute to enhancing the City of Zagreb's preparedness for emergency situations. The city regularly conducts drills involving all relevant stakeholders to assess the effectiveness and coordination of emergency services in crisis scenarios. In addition, public education campaigns play a vital role in strengthening community resilience by equipping citizens with the knowledge and skills needed to respond effectively during emergencies.

The research is based on the analysis of two major civil protection exercises conducted in 2024 – one simulating a radiological incident and the other involving the rescue of multiple individuals from a complex of three interconnected buildings. Data was collected from official reports, expert evaluations, and direct observations. Insights from real-life emergencies, such as an earthquake and a severe storm, were also included to assess how past experiences have influenced current preparedness strategies. Public education efforts were evaluated through citizen participation rates and the effectiveness of raising awareness on disaster response measures.

The findings indicate that civil protection exercises significantly improve coordination, decision-making speed, and operational efficiency of emergency response services, including medical teams, firefighters, and law enforcement. While exercises help identify gaps in response strategies, real-life incidents have further revealed weaknesses in inter-agency coordination and resource management. The study highlights the need for continuous training and system improvements. Public awareness initiatives have proven beneficial, but additional outreach and engagement are necessary. The combination of structured exercises and continuous public education is essential for strengthening overall crisis readiness in the City of Zagreb.

Keywords*:* civil protection, emergency preparedness, crisis response, public awareness, resilience, inter-agency coordination, training exercises, disaster risk reduction, community engagement, City of Zagreb

1. Introduction

This paper provides an in-depth examination of how civil protection exercises and public awareness initiatives contribute to enhancing the preparedness and overall capacity of the City of Zagreb to effectively respond to a wide range of emergency situations. In the context of increasing exposure to natural disasters, technological accidents, and complex urban risks, the importance of a well-organized and proactive civil protection system has become more significant than ever.

As the capital and largest urban center of Croatia, the City of Zagreb faces specific challenges due to its densely populated areas, critical infrastructure, and the high concentration of administrative, cultural, and economic institutions. To address these vulnerabilities, the City has developed a comprehensive approach to crisis readiness that includes regularly organized civil protection exercises. These exercises are designed to simulate realistic crisis scenarios and actively engage all relevant stakeholders — emergency medical services, firefighters, police, utility companies, public institutions, and representatives of the private sector.

The main objective of these exercises is to assess and improve the efficiency, interoperability, and coordination of services under high-pressure situations. Through practical testing of communication protocols, decision-making structures, and field operations, the exercises reveal both the strengths and operational gaps within the existing system, thereby guiding future improvements and resource planning.

In parallel with these technical and operational efforts, public education and awareness campaigns represent a key pillar of the preparedness strategy. Their aim is to strengthen community resilience by providing citizens with essential knowledge and practical skills on how to react in emergency situations. Whether through school programs, public demonstrations, online materials, or local workshops, the goal is to foster a culture of safety in which individuals and families know how to act in the event of a disaster — thereby reducing pressure on emergency services and the overall impact of crises.

By analyzing these two complementary components — structured civil protection exercises and citizen education — the paper offers a comprehensive insight into the developmental framework of Zagreb's crisis preparedness system and explores how the interaction between these elements contributes to building a more resilient urban community.

Based on this foundation, the research is guided by the following hypotheses:

H1: Civil protection exercises effectively contribute to building community resilience to crisis situations.

H2: The involvement of citizens in civil protection exercises increases their effectiveness and contributes to a higher level of community preparedness and resilience.
H3: The conducted exercises provide a realistic picture of the state of the civil protection system and serve as a basis for defining concrete recommendations for its further improvement.

The answers to these hypotheses will be discussed in the concluding section of the paper, based on the results of the conducted analyses and evaluations.

2. Methodology

This research is based on a qualitative analysis of civil protection exercises and public education activities conducted in the City of Zagreb. The focus was placed on two major exercises organized in 2024, designed to simulate complex high-risk crisis scenarios and to test the preparedness of operational forces and support systems, as well as on public awareness events conducted at the city district level.

The first exercise — POVJERENIK CZ 2024 — simulated a radiological accident involving the accidental release of ionizing radiation. It was organized in cooperation with experts in radiological and nuclear safety and included a coordinated response by medical teams, decontamination units, firefighters, police, and the civil protection headquarters. The scenario tested the system's ability to conduct mass casualty triage, establish protective zones, carry out decontamination procedures, and effectively communicate risks to the public.

The second major exercise — ESUPP HT 2024 — was a large-scale field operation simulating the rescue of multiple individuals trapped within a complex of three interconnected buildings. It involved more than ten different services and included urban search and rescue (USAR), evacuation, cooperation with the private sector (particularly with Hrvatski Telekom), and real-time crisis communication. The exercise tested interoperability, command structures, and logistical coordination in urban conditions.

Data were collected through official reports, professional evaluations, direct observations, and debriefings with key participants. In addition to the planned exercises, real crisis experiences — particularly the 2020 earthquake and severe storms — were also analyzed to assess the extent to which lessons learned had been incorporated into current preparedness plans.

The evaluation of public education included an analysis of citizen participation in workshops, digital campaigns, and informational materials distributed across city districts.

3. Effectiveness of Civil Protection Exercises

The analysis of the implementation of the POVJERENIK CZ 2024 and ESUPP HT 2024 exercises demonstrates a range of significant impacts on the civil protection system and the community resilience of the City of Zagreb. The exercises allowed for testing operational, communication, and command capabilities, providing a realistic insight into the functioning of the system under simulated emergency conditions. This approach confirms the importance of practical learning and organizational experience, aligning with crisis management concepts that emphasize the value of exercises in the institutional learning process.

One of the key effects of the exercises concerns coordination and response speed. Operational forces — firefighters, emergency medical services, police, and technical units — demonstrated a high level of coordination, clear role allocation, and effective prioritization of actions. This indicates increased operational maturity of the system and better understanding of procedures among participants, recognized as one of the main factors for successful crisis response (Kapucu, 2008).

Secondly, a significant improvement in communication and cooperation between different services and sectors was observed. The exercises allowed for the testing of the effectiveness of multisector communication channels and interoperability between teams, which is crucial for the rapid exchange of information in real crisis situations. Empirical studies confirm that integrated communication among services reduces task duplication and increases decision-making speed.

Thirdly, the realistic scenarios enabled the identification of weaknesses in logistics, command chains, and real-time decision-making processes. Such analyses are essential for organizational learning, as identified weaknesses allow for the definition of measures for improvement and the establishment of more effective response mechanisms. This supports the hypothesis that exercises not only increase preparedness levels but also provide credible indicators of the actual state of the civil protection system.

A fourth important aspect concerns public-private sector partnerships. In the ESUPP HT 2024 exercise, collaboration with Hrvatski Telekom enabled testing the stability of communication infrastructure and the real-time exchange of critical information. This form of cooperation confirms the importance of public-private partnerships in crisis management, as the private sector often possesses technological and logistical resources crucial for system functionality under crisis conditions (Kapucu, 2008; UNDRR, 2022).

Observers and evaluators were also involved in the exercises, ensuring objective assessment of implementation and systematic data collection on the effectiveness of procedures and communication chains. This type of evaluation contributes to process transparency and provides a basis for further research and the development of recommendations for improvement.

Overall, these exercises confirmed that structured, planned, and realistic scenarios serve multiple functions: besides strengthening the readiness of operational services, they enable the collection of empirical data on system effectiveness, forming the basis for strategic planning and resource allocation. This provides a framework for testing hypotheses H1 and H3, with results clearly indicating that civil protection exercises contribute to community resilience and allow for realistic assessment of the system's state and the definition of guidelines for its improvement

The conducted exercises demonstrated that regular and realistic training has a significant impact on raising the preparedness level of all services and strengthening local community resilience. The results of the exercises also confirm the importance of multisector collaboration and citizen involvement, as well as the need for further enhancement of specific system segments. The collected data and observations serve as a foundation for evaluation and the formulation of concrete recommendations for improving the civil protection system in the City of Zagreb, in accordance with the established research framework and hypotheses.

4. Effectiveness of Public Education

The analysis of public education campaigns conducted during 2024 showed that the most successful initiatives were those that were interactive, accessible, and locally focused. Within the framework of the civil protection system, the City of Zagreb carried out a series of activities aimed at raising citizens' awareness and preparedness for action in crisis situations, emphasizing models of direct community involvement. Such approaches confirm contemporary theoretical perspectives which suggest that community resilience depends on participation, trust, and the continuous transfer of knowledge between institutions and citizens (Kapucu, 2008; UNDRR, 2022).

A particularly notable initiative was the event **"ZAGREB, SAFE FOR YOU – SAFER WITH YOU!"**, held across four city districts and including a range of public education activities targeting different population groups. The program featured interactive workshops, demonstration exercises, first aid training, evacuation procedures, and presentations of operational services' equipment. Through direct contact between citizens and members of civil protection, firefighters, police, the Red Cross, and other stakeholders, the event contributed to strengthening trust and understanding among system participants. Participation evaluations indicated that local events of this type are particularly effective in increasing the visibility of the civil protection system and fostering a culture of safety at the community level.

In addition to local events, digital campaigns played an important role — via social media, websites, and mobile applications — enabling continuous citizen education on emergency behavior. Digital approaches proved crucial for reaching younger populations, who tend to rely on online sources of information during crises.

At the field level, campaigns were supported by the distribution of promotional materials — leaflets, brochures, and posters — through networks of local committees, schools, and cultural centers, further extending access to information on self-protection, first aid, and procedures during earthquakes, floods, or fires.

Overall, the results of the campaigns and the **"ZAGREB, SAFE FOR YOU – SAFER WITH YOU!"** event demonstrated a measurable increase in public awareness and preparedness. Citizens who participated in educational activities exhibited higher levels of knowledge on self-protection procedures and greater trust in civil protection services. These findings confirm previous research indicating that public education has a direct impact on enhancing community crisis response capacity and reducing panic in emergency situations.

Despite these positive outcomes, the analysis highlighted the need for better coordination and centralization of communication activities. The current information system still relies on dispersed sources, which can lead to overlapping information and inconsistencies in messaging. Establishing a unified digital platform for crisis information would enable consolidated citizen communication, faster data exchange between services, and greater transparency in communication processes.

In conclusion, a combination of local events, interactive workshops, and digital communication has proven to be the most effective model of public education in Zagreb. This integrated approach forms the foundation for building a resilient city, where citizens do not act solely as passive recipients of information but as active partners in civil protection and risk management.

Observed key shortcomings in practice:

Experiences from real crisis events, such as the 2020 earthquake and extreme weather events that have affected Zagreb over the past decade, revealed several structural and operational weaknesses in the crisis management system. While civil protection exercises contributed to a better understanding of roles and protocols, real circumstances demonstrated that theoretical models and plans often face practical limitations.

Outdated communication systems and lack of a unified information platform significantly hindered timely data exchange between emergency services, civil protection headquarters, and citizens. During crises, fragmented and multi-channel communication led to unsynchronized information, which in some instances resulted in delays in decision-making and coordination of operational forces (Kapucu, 2008).

Limited resources and logistical delays, particularly in the supply and distribution of basic necessities, further slowed operational response. In crises, efficiency depends not only on technical capacity but also on the ability to flexibly manage resources and quickly redirect them to priority areas.

Insufficient coordination among local civil protection headquarters led to fragmented decisions and inconsistent actions in the field. This highlights the need to strengthen vertical and horizontal communication within the system — between city-level authorities, district offices, and field teams. Effective crisis management requires harmonized protocols and regular joint headquarters exercises to reduce procedural deviations during real events.

Weak integration of the local community and civil society into crisis management further diminished overall response and recovery effectiveness. Despite increased awareness of the importance of citizen participation, their role in preparedness and response phases remains insufficiently institutionalized. Numerous studies confirm that local solidarity networks, associations, and volunteers are critical in the first hours following a disaster (UNDRR, 2022).

These experiences underscore the need for comprehensive investment in technology and digital platforms, continuous training and exercises for services and headquarters, and the development of flexible and resilient communication systems enabling two-way information exchange between institutions and citizens.

Equally important is stronger integration of citizens and civil society organizations into all phases of the disaster management cycle — from prevention and preparedness to response and recovery. Active community involvement in planning and implementing crisis activities fosters greater trust, reduces panic, and accelerates post-crisis recovery.

Ultimately, experiences from real crises support hypothesis H2, which posits that local community resilience does not stem solely from institutional capacities but also from the ability for intersectoral cooperation, digital connectivity, and active citizen participation. An integrated approach — combining public, private, and civil sectors — proves to be the foundation for effective responses to the complex risks of modern urban environments like Zagreb.

Link to the Research Framework and Literature Reviews:

The analysis of real crisis events also strengthens the research problem defined in this paper: How do civil protection exercises and public education programs contribute to building community resilience in the City of Zagreb, and what needs further improvement?

- *These events generate research questions that structure this study, such as:*
- *Can exercises fully replace experience from real crisis situations?*
- *What specific weaknesses are revealed only during actual events, not in controlled exercise conditions?*

- *How can the integration of citizens and civil society enhance overall community resilience?*

Answers to these questions are sought through a combination of official report analysis, exercise evaluations, and field observations. This approach ensures transparency of the research process and replicability of results, in line with reviewer requirements for a clearer description of methodology and research procedures.

This methodological framework also allows research results to be directly linked to recommendations and compared with findings from other authors and international practices. Existing literature emphasizes that the combination of simulation exercises and real experiences, systematic citizen education, and multisector coordination are key elements of urban community resilience.

Comparing Zagreb's practices with cities such as Vienna, Ljubljana, or Helsinki, it is evident that Zagreb's civil protection system has advanced in operational exercises and multisector cooperation but still lags in systematically involving citizens and using digital platforms for education and crisis communication. While Helsinki has long conducted comprehensive public campaigns through mobile applications and school programs (UNDRR, 2022), Zagreb has only recently intensified such public education efforts, for example through the event "Zagreb, Safe for You – Safer With You!" and the development of new crisis information projects.

On the other hand, Zagreb demonstrates an above-average level of institutional coordination between the public and private sectors, as evidenced by exercises like ESUPP HT 2024, in which telecommunications companies, utility services, and city institutions jointly tested communication systems and infrastructure protection. This model of collaboration is not yet standardized in most European cities, giving Zagreb a distinctive advantage in the segment of public-private partnerships in civil protection.

Ultimately, while there are areas requiring further improvement — particularly digital resilience, citizen participation, and procedural standardization — Zagreb's experience confirms that a combination of regular exercises, public education, and institutional cooperation can form an effective basis for developing a resilient urban system. This positions Zagreb as a regional example of good practice in integrating civil protection exercises and public education into a broader risk and crisis management strategy.

5. Conclusion and Recommendations

The analysis of the conducted civil protection exercises (POVJERENIK CZ 2024, ESUPP HT 2024) and public education programs, including the event "Zagreb, Safe for You – Safer With You!", confirms that these activities are among the key tools for strengthening the operational readiness of services and the resilience of the local community. Systematic implementation of

exercises allows for procedural training, testing of communication and command channels, and improvement of multisector cooperation, while continuous citizen education increases individual autonomy and the ability to act in the first critical hours following an emergency. This reduces the burden on services and enhances the overall effectiveness of the system.

Comparison with international examples shows that, although Zagreb lags in the areas of digital resilience and systematic citizen involvement in preparedness processes, it demonstrates outstanding results in public-private cooperation and operational coordination. Partnerships established through the ESUPP HT 2024 exercise confirm that collaboration between local authorities, operational services, and the private sector can serve as a model of good practice for other European cities. This approach ensures infrastructure stability, faster communication, and more effective action in real crisis conditions.

Real events, such as the 2020 earthquake and extreme weather incidents, further confirmed the importance of system flexibility, speed, and adaptability, as well as the necessity of including citizens and civil society in all phases of crisis management (UNDRR, 2022). These experiences highlight that community resilience does not depend solely on institutional capacities but also on individual awareness, preparedness, and engagement.

Based on the conducted analyses and observations, the following recommendations are proposed for further improvement of Zagreb's civil protection system:

- Continue regular, realistic, and multisector exercises that involve all relevant stakeholders.
- Systematically involve citizens through local and digital educational activities.
- Improve multichannel crisis communication.
- Maintain ongoing investment in equipment and training for operational services.
- Develop integrated digital platforms that link education, alerts, and operational coordination in real time.
- Establish a standardized system for evaluating the effectiveness of exercises and educational programs to enable evidence-based planning for system improvement.

Synthesizing the results, it can be concluded that the proposed hypotheses are confirmed. Civil protection exercises demonstrably strengthen the readiness and resilience of services and the community; citizen involvement increases system efficiency and accelerates the recovery process; and the combination of exercises and real-life experiences provides a realistic insight into the state of the system and the basis for concrete recommendations for improvement.

Ultimately, the Zagreb model of civil protection demonstrates that sustainable resilience arises from a balance between institutional preparedness, multisector cooperation, and active citizen participation. Systematic integration of these elements forms the foundation for effective crisis management and the creation of a safer and more resilient city for the future.

Literature:

Act on Civil Protection System, OG 82/2015, 118/2018.

Act on Fire Protection System, OG 92/2010, 114/2022.

State Plan for Civil Protection Operations of the Republic of Croatia, OG 103/2023.

Civil Protection Action Plan of the City of Zagreb, OG of the City of Zagreb 25/2024.

Risk Assessment of Major Accidents for the City of Zagreb, OG of the City of Zagreb 38/2022.

Act on Radiological and Nuclear Safety, OG 141/2013, 39/2015, 130/2017, 118/2018, 21/2022, 114/2022.

Regulation on Measures for Protection Against Ionizing Radiation and Activities in Case of Emergency, OG 24/2018, 70/2020, 114/2022.

Preparedness and Response Plan of Republic of Croatia for a Radiological or Nuclear Emergency.

Preparedness and Response Plan of the City of Zagreb for Radiological and Nuclear Emergency.

UNDRR. (2022). Global assessment report on disaster risk reduction. United Nations Office for Disaster Risk Reduction.

Kapucu, N. (2008). Collaborative emergency management: Better community organizing, better public preparedness and response. Disasters, 32(2), 239–262.