

INSTITUTIONAL COORDINATION IN COASTAL CRISES: LESSONS FROM THE CASE OF "TSAREVO 2023"

PhD student Maria Tsenova

Department of National and Regional Security

University of National and World Economy Sofia, Bulgaria

mmtcenova@abv.bg , mariya.cenova@unwe.bg

Abstract This study examines the flooding in the municipality of Tsarevo (September 5–6, 2023) as an empirical case for analyzing institutional coordination and the resilience of coastal infrastructure in the context of maritime risk management. The event was characterized by extreme rainfall intensity, high exposure of tourist infrastructure in riverine and coastal areas, and critical dependence on a limited number of linear transport links. The analysis finds that despite the timely operational response of the competent authorities, systemic deficiencies in the prevention and preparedness phases—including a lack of quantitatively defined escalation thresholds, non-operationalized standard procedures, and ambiguous allocation of the leading institutional role in escalation—affected the overall effectiveness of management. An integrated model based on complex risk, infrastructure redundancy, and clearly structured coordination between the Ministry of the Interior, the Ministry of Defense, and the Council of Ministers is proposed. The conclusions are applicable to coastal municipalities on the Bulgarian Black Sea coast and other areas of river-sea interface.

Keywords: Coastal risk; crisis management; infrastructure resilience; institutional coordination; maritime governance.

1. Introduction

Coastal municipalities represent a specific area of interaction between marine and continental processes, where hydrometeorological events have an amplified effect due to the geographical configuration, tourist exposure, and infrastructure concentration. In this context, risk management cannot be viewed solely as a matter for local administration, but as a component of the national security and maritime management system.

The flood in the municipality of Tsarevo in September 2023 is an example of a sudden extreme weather event that revealed vulnerabilities in both the infrastructure structure and the procedural organization of the institutional response. This study argues that the effectiveness of crisis management in coastal areas depends not so much on the normative distribution of competences as on the degree of their operationalisation through clear escalation mechanisms and infrastructure redundancy.

Methodologically, the study applies case analysis, regulatory review, and an analytical approach to risk analysis. The data are extracted from publicly available institutional sources and specialized scientific literature. The risk assessment is based on the available model

$R=H \times E \times V$, which allows for the interaction between hazard, exposure, and vulnerability to be examined in the context of the flood in Tsarevo (September 5-6, 2023).

2. Theoretical framework: coastal risk and complex vulnerability

The theoretical framework of the study considers coastal risk as a result of the interaction between natural processes, spatial development, and institutional capacity. Coastal areas are characterized by high dynamics and concentration of infrastructure and economic activities, which increases exposure to extreme events.

Complex vulnerability includes both the physical resilience of the environment and organizational and regulatory factors related to coordination and preparedness. In this sense, coastal risk is not only naturally determined but also depends on the degree of institutional preparedness.

The risk of flooding in coastal areas can be represented by the classic dependency adopted in the international framework for disaster risk reduction (UNISDR, 2009; IPCC, 2014), according to which risk is a function of hazard, exposure, and vulnerability, and is analytically expressed as:

$$R=H \times E \times V$$

In disaster risk management theory, risk is viewed as the result of the interaction between hazard, exposure, and vulnerability, where R (Risk) denotes the level of risk, H (Hazard) – the hazard, E (Exposure) – the exposure, and V (Vulnerability) – the vulnerability. A similar approach has been adopted in international frameworks for disaster risk reduction (UNISDR, 2009; IPCC, 2014).

Hazard (H) - Hazard is a natural or man-made process with the potential to cause damage. In the case of the flood in the municipality of Tsarevo (September 5–6, 2023), the hazard is expressed in extreme rainfall, intense surface runoff, and a sharp rise in river levels. This component is related to the natural environment and cannot be prevented by institutions, but it can be predicted and taken into account in planning.

Exposure (E) - Exposure indicates what is exposed to impact and to what extent. This includes the population, tourist flow, road and bridge infrastructure, as well as facilities located in the coastal zone. In Tsarevo, high exposure is due to construction near riverbeds and the seasonal concentration of people.

Vulnerability (V) - Vulnerability reflects the ability of exposed objects to withstand the impact. It includes both the physical resilience of the infrastructure and organizational factors - early warning, clear distribution of responsibilities, coordination between institutions, and readiness to respond. It is this component that is directly dependent on the quality of institutional organisation.

The logical technique used in the multiplicative model is multiplication, which emphasises the interdependence between the three elements. If there is no hazard ($H = 0$), there is no risk. If there is no exposure ($E = 0$), there are no objects that can be affected. If vulnerability is

minimal, damage can be significantly limited. This means that each variable directly influences the final result.

Application of the approach to the "Tsarevo 2023" case

The flood in Tsarevo shows high values for all three components simultaneously:

- H – extreme hydrometeorological conditions;
- E – significant concentration of population and infrastructure in risk areas;
- V – organizational and coordination deficits that affected the response.

The results of the empirical analysis confirm the conclusion that high risk cannot be explained solely by natural factors. It is the result of the interaction between the intensity of the natural phenomenon and the institutional capacity for management.

While the hazard cannot be controlled, institutional coordination has the potential to reduce exposure through timely warning and evacuation and to limit vulnerability through clear allocation of responsibilities and advance planning. In this sense, risk management becomes primarily exposure and vulnerability management.

3. Institutional coordination

Institutional coordination under the Disaster Protection Act Crisis management is carried out by local and national authorities depending on the scale. However, practical effectiveness depends on clearly defined escalation mechanisms.

According to the OECD guidelines (2014), critical risk management requires a comprehensive institutional approach, where effectiveness is not limited to the formal distribution of powers, but depends on effective coordination and systematic advance preparation.

In line with Comfort's (2007) understanding, effective crisis management requires adaptive coordination based on information exchange and inter-institutional interaction, rather than just a formal distribution of powers.

This is a typical scenario with very high rainfall intensity and structural vulnerability in terms of bridges, campsites, and riverside areas. The institutions responded quickly (state of emergency, rescue/evacuation operations, road management, follow-up engineering inspections, and funding), but systemic weaknesses—lack of disclosure (at the time), critical dependence on single bridges, and unclear "leadership" during escalation—suggest the need for standardized SOPs, infrastructure improvements, and stricter prevention. This case also supports the author's thesis: an integrated model of the Ministry of Interior, Ministry of Defense, and Council of Ministers, plus local plans with clear triggers, BG-ALERT scenarios, and engineering reinforcement of vulnerable points.

The Tsarevo case demonstrates that during floods, the intensity and structural vulnerability of bridges, campsites, and riverside areas interact in such a way that even an adequate initial response remains suboptimal if the following are lacking:

- operational SOPs with minute-by-minute deadlines for notification, command transfer, and resource escalation;
- a clearly defined lead agency in case of escalation (an unambiguous chain of command from the municipal to the national level);
- surplus and reserve capacity in critical linear assets (bridges/approaches) and sewer drains;
- geo-targeted communications (BG-ALERT scenarios, multilingual templates) and pre-planned evacuation corridors.

Empirically, the case validates the need for an integrated MVR-MO-MS model, in which military capabilities are activated in a targeted and timely manner in the event of a shortage of MVR and civil capacity, and local plans contain triggers and protocols for closing/diverting traffic and protected assembly points. Therefore, transforming the regulatory framework into disciplined processes and engineering safeguards for vulnerable points are necessary and sufficient conditions for shortening the response time of participants, reducing average annual losses, and increasing public confidence.

This conclusion is summarized for the Bulgarian coast and other river interfaces, where risk management requires both procedural discipline and infrastructure redundancy.

Objective public needs to ensure socio-economic well-being require continuous improvement of command and control in non-military crises at all management levels and for all entities to which the legislator has assigned relevant functions. This improvement should cover both the legally defined roles and responsibilities and the procedural and information mechanisms that ensure operational compatibility and timely decision-making.

Phase analysis

- Prevention – It has been observed that the concentration of tourist infrastructure in riverine and coastal areas significantly increases exposure.
- Preparedness – At the time of the event, the preparedness system had not been fully implemented and operationalized. There were no publicly defined quantitative thresholds for national escalation, nor were there clearly regulated mechanisms for early warning and mass notification (e.g., BG-ALERT), which limited the timely activation of coordination mechanisms.
- Response – The operational response was timely, but due to the rapid escalation of the situation, there were coordination challenges related to the involvement of diverse institutions and multiple institutional response capacities, characteristic of multi-layered management structures.

- Recovery – Recovery should be aimed at increasing resilience in accordance with the UNDRR (2015) principles of "Build Back Better." According to these principles, recovery should improve the state of infrastructure, enhance the institutional framework, and integrate lessons learned from the crisis.

Conclusion

The analysis of the case study highlights significant gaps in the phases of risk management (identification, assessment, prevention, preparedness) and in the actual crisis management (response and recovery). These deficiencies manifest themselves in delays and inconsistent decisions, fragmented coordination, and ineffective management of forces and resources, which in turn compromises the organization and implementation of evacuations and emergency rescue operations. Therefore, it is necessary to refine and operationalize procedures with clearly defined responsibilities and time standards, as well as to strengthen integrated communication and logistics flows in order to achieve consistency and effectiveness of actions at all stages of crisis management.

The analysis confirms that the formal distribution of competences is not a sufficient condition for effectiveness in the absence of a consistent critical regulatory review, risk assessment, and targeted measures to strengthen infrastructure resilience. In this context, the proposed integrated approach contributes to increasing predictability and limiting systemic vulnerabilities.

REFERENCES

ALDRICH, D. P., 2012. Building resilience. Chicago: University of Chicago Press. ISBN 978-0-226-01289-6.

BECKER, A., et al., 2018. Coastal infrastructure resilience. Ocean & Coastal Management. ISSN 0964-5691.

COMFORT, L. K., 2007. Crisis management in retrospect: knowledge, communication, coordination, and control. Public Administration Review. 67, 189–197. ISSN 0033-3352. Available at: <https://doi.org/10.1111/j.1540-6210.2007.00827.x> [accessed on 20 February 2026].

EUROPEAN ENVIRONMENT AGENCY, 2022. Climate risks and vulnerability in Europe 2022. Luxembourg: Publications Office of the European Union. ISBN 978-92-9480-535-5. Available at: <https://www.eea.europa.eu> [accessed on 20 February 2026].

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC), 2014. Climate Change 2014: Impacts, Adaptation and Vulnerability. Cambridge: Cambridge University Press. ISBN 978-1-107-05807-1.

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO), 2018. ISO 31000:2018 Risk management — Guidelines. Geneva: ISO.

NIKOLS, R. J.; CAZENAVE, A., 2010. Sea level rise and coastal vulnerability. *Science*. 328(5985), 1517–1520. ISSN 0036-8075. Available at: <https://doi.org/10.1126/science.1185782> [accessed on 20 February 2026].

OECD, 2014. Council Recommendation on Critical Risk Management. Paris: OECD Publishing. Available at: <https://legalinstruments.oecd.org> [accessed on 20 February 2026].

TIERNEY, K., 2014. *The Social Roots of Risk*. Stanford: Stanford University Press. ISBN 978-0-8047-9291-4.

UNITED NATIONS INTERNATIONAL STRATEGY FOR DISASTER REDUCTION (UNISDR), 2009. *UNISDR Terminology for Disaster Risk Reduction*. Geneva: United Nations.

UNITED NATIONS DEPARTMENT FOR DISASTER RISK REDUCTION (UNDRR), 2015. *Sendai Framework for Disaster Risk Reduction 2015–2030*. Geneva: United Nations. Available at: <https://www.undrr.org> [accessed on 20 February 2026].

YONCHEV, D., 2023. Use of unmanned surface vehicles in maritime operations. *Military Journal*. (2), Sofia: G. S. Rakovski Military Academy.

DISASTER PROTECTION ACT, 2006. State Gazette, No. 102 of 19 December 2006; amended and supplemented – State Gazette, No. 80 of 14 October 2011; amended and supplemented – State Gazette, No. 41 of 2017; amended and supplemented – State Gazette, No. 102 of 2023.

LAW ON THE MINISTRY OF THE INTERIOR, 2014. State Gazette No. 53 of 27.06.2014; amended and supplemented – State Gazette No. 13 of 2024; amended and supplemented – State Gazette No. 38 of 2025.

LAW ON THE DEFENCE AND ARMED FORCES OF THE REPUBLIC OF BULGARIA, 2009. State Gazette, No. 35 of 12.05.2009; amended and supplemented – State Gazette, No. 98 of 2016; amended and supplemented – State Gazette, No. 2 of 05.01.2024.

phd Maria Tsenova

ORCID iD: 0009-0005-8013-0386

Department of National and Regional Security

University of National and World Economy Sofia, Bulgaria

E-mail: mariya.cenova@unwe.bg