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Reviewers: **doc. Ing. Helena Chládková, Ph.D.**
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Faculty of Business and Economics

prof. Ing. Zuzana Kapsdorferová, PhD.
University of South Bohemia in České Budějovice
Faculty of Economics

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CONTENT

RISK MANAGEMENT IN PUBLIC CIVIL PROTECTION POLICY: A JOINT INCIDENT COMMAND DECISION MODEL UNDER ASYMMETRIC INSTITUTIONAL ADAPTATION IN GREECE

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Abstract

The article examines how Asymmetric Institutional Adaptation (AIA) affects the multi-level governance of disaster risk in Greece and proposes the Joint Incident Command Decision Model (JICDM) as an instrument for more targeted escalation of the involvement of the General Secretariat for Civil Protection (GSCP). Drawing on research conducted with GSCP officials and Fire Service Commanders, the article develops three composite indices that capture perceived risk intensity, the quality of institutional coordination, and the level of capacity and organizational learning. These indices are grouped into three tiers (low, medium, high), enabling the identification of distinct "profiles" of risk and governance in mainland, island, and mixed areas. The findings indicate that Fire Service Commanders systematically report higher levels of risk, coordination, and capacity compared to GSCP officials, and that AIA manifests more strongly in the dimensions of governance and capacity than in the perceived intensity of risk itself. The JICDM is formulated as a decision tree that links the three indices to threshold rules for joint incident command, with a central element being the "critical profile" of high risk combined with low governance or capacity, which mandates joint command activation, whereas more favourable profiles permit more decentralized leadership accompanied by targeted interventions to strengthen coordination and learning.

Keywords: Asymmetric institutional adaptation (AIA), Disaster risk governance, Decision model, Incident Command System, Joint Incident Command Decision Model (JICDM), Multi-level emergency management

JEL Classification: H12, H83, Q54

List of Abbreviations

- **AIA** – Asymmetric Institutional Adaptation
- **CapI** – Capacity Index
- **CI** – Coordination Index
- **DRG** – Disaster Risk Governance
- **FS** – Fire Service

- **GSCP** – General Secretariat for Civil Protection
- **ICS** – Incident Command System
- **JDM** – Joint Decision Model
- **JESIR** – Joint Emergency Services Interoperability Principles
- **JICDM** – Joint Incident Command Decision Model
- **RI** – Risk-Impact Index

1. INTRODUCTION

Over the past decade, a series of extreme events , such as heat waves, large-scale forest fires and catastrophic floods, have persistently highlighted the limits of modern disaster risk governance systems in Europe and internationally (Sylves, 2015; UNDRR, 2023; OECD, 2024; Statista Research Department, 2025). Greece is a typical high-risk case, combining recurrent hydrometeorological and forest hazards with intensifying climate pressures and consistently ranks among the most affected EU countries in terms of human losses and cumulative economic losses (Statista Research Department, 2026; EFFIS, nd; Germanwatch, 2025). Despite the increase in public spending on fire protection and the creation of new civil protection structures, recent assessments continue to highlight a mismatch between formal institutional commitments and actual resilience on the ground (European Commission, 2024; OECD, 2024).

The Sendai Framework for Disaster Risk Reduction 2015 - 2030 (UNDRR, 2015) is now the main international policy framework for risk governance, emphasizing not only understanding risk, but also clear roles, cross-sectoral coordination, investment in resilience and preparedness for effective response. However, international experience shows that formal adoption of such frameworks does not automatically ensure meaningful implementation on the ground, particularly when organizational capacities, coordination relationships and shared decision-making processes remain weak or unevenly distributed (UNDRR, 2023; UNDP, 2004).

In the same vein, the Incident Command System (ICS) has been established as a key organizational model for managing complex incidents, because it offers a standardized structure, clear roles, and the ability to coordinate action by many agencies (Bigley & Roberts, 2001; Buck et al., 2006; FEMA, 2017). However, its implementation in multi-level administrative environments is not simply a technical issue, but depends on whether the organizations involved have a common understanding of their roles, sufficient institutional capabilities, and common operational rules of command (Jensen & Waugh, 2014; Nowell et al., 2018).

Sendai Framework and the Incident Command System (ICS), there is a persistent gap between formal policy planning and operational resilience in the field. This gap is particularly evident in multi-level governance systems, where formal institutional compliance does not

necessarily translate into effective coordination during crises (Jensen & Waugh, 2014; Nowell et al., 2018; Domorenok et al., 2021). Greece is a typical case of a system with high "institutional density" but continuing weaknesses in coordination and prevention. Despite successive legislative reforms (Government Gazette, 1995; Government Gazette, 2020; Government Gazette, 2026) and increasing spending, the response to extreme events highlights structural limits to cooperation between central government, fire services and local governments (OECD, 2024; Wardropper et al., 2025; Blioumi, 2025).

The purpose of the article is to empirically investigate Asymmetric Institutional Adjustment (AIA) in the Greek system and to develop a Joint Administrative Decision Making Model (JICDM). The research seeks to answer:

1. How is AIA reflected in the perceptions of the General Public Health Service and Fire Department executives?

2. Which composite indicators (RI, CI, CapI) can be derived to measure risk and capacity?

3. How can these indicators define transparent rules for escalating central involvement?

4. What are the theoretical and economic implications of this model for the efficient allocation of resources?

The contribution of the article is twofold. First, it uses primary data from surveys of Civil Protection General Secretariat and Fire Service Commanders, explicitly structured around the four priorities of the Sendai Framework, to construct three composite indicators – the Risk -Impact Index, the Coordination Index and the Capacity Index – that empirically capture patterns of asymmetric institutional adaptation in a multi-level environment. Second, it translates these findings into a Joint Incident Command Decision Model, a threshold-based decision-making framework that links combinations of risk profiles, coordination and capacity with clear rules for when and how the central civil protection authority should escalate its involvement in a joint command regime.

The structure of the article is as follows. The next section presents the theoretical framework for risk governance, the ICS and the AIA. This is followed by the methodological approach and the development of the composite indicators. This is followed by the empirical results and the JICDM. The last section discusses the theoretical and policy implications of

the findings for disaster risk governance in Greece and in comparable administrative environments.

2. THEORETICAL FRAMEWORK

2.1. The Sendai Framework as a risk governance architecture

The Sendai Framework for Disaster Risk Reduction 2015 - 2030 (UNDRR, 2015) is the central international policy framework for disaster risk -management in the post -Hyogo period. In contrast to previous approaches that placed greater emphasis on operational response, Sendai shifts the emphasis towards a preventive and systemic logic, where risk is not viewed as a single natural event but as a result of the interaction of hazard, exposure, vulnerability and institutional capacity.

The importance of Sendai lies not only in the content of its four priorities – understanding risk, strengthening risk governance, investing in resilience and strengthening preparedness for effective response and recovery – but also in the fact that it sets out a governance architecture. This framework requires the participation of multiple institutions, the interconnection of levels of governance and a clear allocation of roles and responsibilities between state and non-state actors, recognizing that disaster risk reduction cannot be achieved solely through technical tools or piecemeal operational interventions (UNDRR, 2017; OECD, 2017; IFRC, 2025).

In this sense, Sendai should be seen as a framework for institutional coordination and not simply as a set of regulatory guidelines. Its effective implementation presupposes at least three institutional conditions: clarity of responsibilities, functional mechanisms for horizontal and vertical coordination, and sufficient organizational capacity to translate formal commitments into daily administrative practice. In other words, Sendai does not only assess whether policies and plans exist, but whether public institutions are able to internalize, coordinate and implement them in real risk situations.

This emphasis explains why the issue of Sendai implementation cannot be reduced to an analysis of institutional compliance. International experience and interim evaluations of the framework show that many administrations have formally aligned with its principles, but have not developed correspondingly deep governance, organizational learning and cross-sectoral

coordination capacities (OECD, 2020; UNDRR, 2023). Thus, the gap between institutional adoption and substantive implementation remains one of the most critical problems of modern disaster risk governance.

This is particularly important in multi-level governance environments, where the implementation of Sendai depends on the cooperation of central authorities, operational agencies and local governments. In such environments, the same formal obligations can translate into very different levels of practical preparedness, coordination and capacity, depending on the institutional and organizational circumstances of each actor. For this reason, Sendai offers not only an international reference framework, but also an analytical starting point for examining the discrepancies between formal institutional adaptation and the actual functioning of risk governance.

In this article, Sendai is approached from precisely this perspective: not as an abstract normative model, but as a governance architecture that allows for the analysis of how institutional commitments translate or fail to translate into coordinated action within a multi-level civil protection system. This approach provides a bridge both to the discussion of asymmetric institutional adaptation and to the need for more explicit models of shared decision-making in complex risk situations.

2.2. Disaster risk governance and multi-level governance

The concept of "disaster risk governance" (DRG) refers to the set of institutions, mechanisms and processes through which public and private actors collectively manage risk (OECD, 2017; UNDRR, 2017). Effective DRG requires, at a minimum, three institutional conditions: (a) a clear allocation of responsibilities between levels of governance, (b) reliable coordination mechanisms within and between organizations, (c) sufficient organizational capacities (human, financial, technical) for the operational implementation of commitments (OECD, 2018; World Bank, 2024).

Multi-level governance adds another layer of complexity, as disaster risk is shaped and managed simultaneously at the international, national, regional and local levels (Domorenok et al., 2021; Fakhruddin & Sims, 2021). The literature on climate and disaster governance shows that discontinuities and overlaps between levels, for example between national strategy and local plans, often create "grey zones" of responsibilities, which in crisis

situations translate into delays, conflicts and inefficient use of resources (OECD, 2018; Germanwatch, 2025).

In the Greek context, multilevel risk governance is shaped by the interaction of international commitments (Sendai, Paris Framework), national legislation (Law 4662/2020 and subsequent amendments) and local/regional civil protection plans. Law 4662/2020 reorganized the National Mechanism for Crisis Management and Risk Response, establishing roles for the central level (GSCP), the Decentralized Administration, the Regions, the Municipalities and the Fire Brigade (Government Gazette, 2020). Although the institutional framework theoretically provides for clear lines of command and coordination, recent European assessments of fires and floods in Greece demonstrate that the practical implementation of these arrangements remains uneven, particularly with regard to the role of local government and its interface with the operational arm (European Commission, 2024).

The discussion on DRG intersects with the literature on "systemic" risk governance, which emphasizes that in modern, interdependent societies, risks cannot be addressed through isolated policies but require horizontal and vertical integration across sectors (e.g., spatial planning, health, climate, infrastructure) and levels (local - national - supranational) (Domorenok et al., 2021). This makes multilevel risk governance not just a management problem, but a field of continuous negotiation of responsibilities, resources, and legitimacy.

2.3. Implementation theory and street-level bureaucracy

The issue of implementation lies at the core of public administration, as policies are rarely implemented in the field exactly as they were designed at the central level. The classical literature has shown that between policy design and administrative action, a set of organizational, institutional and cognitive processes intervene that transform the initial content of the policy. In this context, implementation is not the final, passive stage of a linear policy cycle, but a space in which policies are redefined through practices, interpretations and negotiations.

The approach of Pressman and Wildavsky (1973) showed early on that as the levels of decision, the actors involved and the "crossing points" of a policy increase, the chances of deviation from the initial design increase. This problem is exacerbated in environments where objectives are unclear, mandates are multiple and coordination requirements are high.

Matland's (1995) ambiguity - conflict model reinforces this perspective, showing that, when political objectives are not fully defined and operational action depends on decentralized actors, the final form of the policy is largely determined during implementation rather than during initial design.

Lipsky's theory of street-level bureaucracy (1980, 2010) offers the most appropriate micro-theoretical tool for understanding this process. Frontline officials do not simply apply rules; they exercise discretion under conditions of time pressure, limited resources, imperfect information, and often contradictory instructions. To cope with these conditions, they develop routines, simplifying schemes, informal hierarchies, and judgment practices that in effect constitute policy itself as experienced in the field. In this sense, implementation is not simply the application of rules but a form of everyday policy production.

This perspective is particularly important in disaster risk management. In crisis environments, decisions are often made under uncertainty, time pressure and an incomplete picture of the event, while effectiveness depends on the coordinated action of many actors with different missions and administrative logics. In such conditions, formal procedures and operational protocols are not sufficient on their own to explain the actual behavior of organizations. Their implementation depends on how they are interpreted, prioritized and adapted by the actors closest to the event.

Weick's (1988, 1993) contribution to sensemaking critically complements this discussion. In crisis situations, organizational members do not simply follow prescribed scenarios, but try to understand what is happening, what the nature of the threat is, what the goals of action are, and what decision is legitimate and feasible. When institutional mandates are unclear or multiple, sensemaking processes take on even greater importance, because they directly influence how rules are translated into action. Thus, deviations in implementation arise not only from lack of resources or organizational weaknesses, but also from differences in the way actors themselves understand their role, the risk, and the necessary forms of coordination.

For this reason, the literature on implementation and street-level bureaucracy is particularly useful for analyzing frameworks such as Sendai and ICS. Both constitute normative and operational standards that require clarity of roles, a shared understanding of processes, and coordinated action across multiple organizations. However, their formal adoption does not in itself ensure that frontline workers will interpret them in a uniform manner or have the same capabilities to implement them. Instead, the implementation of these

frameworks is likely to vary depending on the organizational environment, access to resources, collaborative experience, and prevailing learning practices.

This is precisely what paves the way for the concept of asymmetric institutional adaptation. If policy is in practice produced through unequal conditions of discretion, interpretation and organizational capacity, then the implementation of a formally unified institutional framework is expected to exhibit systematic internal differentiations. The next subsection exploits precisely this theoretical starting point to position AIA as a more specific form of divergence between formal institutional harmonization and unequal practical implementation.

2.4. Decoupling and asymmetric institutional adjustment

Neo-institutional theory has long pointed out that organizations often adopt formal structures, rules, and patterns not only for functional reasons, but also to enhance their legitimacy vis-à-vis their institutional environment. In Meyer and Rowan's (1977) classic formulation, "decoupling" describes precisely this gap between formal organizational pronouncements and the actual practices of everyday operation. Organizations may appear fully aligned with dominant institutional norms, while in practice maintaining routines and logics of action that deviate significantly from their formal commitments.

In the field of disaster risk governance, this concept is particularly useful. States and public organizations can adopt international frameworks, establish strategies, create indicators and reform organizational structures according to Sendai or other standards, without this implying that daily administrative and operational practice is transformed to the same extent. The existence of formal institutional density can therefore coexist with limited organizational learning, weak coordination and insufficient operational preparedness.

However, the concept of decoupling is not sufficient on its own to capture all forms of deviation that occur in practice. Decoupling mainly describes a vertical gap between the formal organizational level and the actual operation. It does not sufficiently explain why, within the same administrative structure and under the same institutional commitments, different units, roles or levels of management may systematically exhibit unequal degrees of internalization and application of the same framework. In other words, decoupling illuminates the gap between "norm" and "practice", but less the internal differentiations of the same organizational field.

The concept of asymmetric institutional adaptation (AIA) is introduced precisely to fill this analytical gap. AIA describes cases in which a single institutional framework is formally and relatively uniformly adopted, but is translated unevenly in practice, producing differentiated levels of implementation among actors subject to the same formal obligations. The point of emphasis is not simply that there is a distance between institutional proclamation and actual practice, but that this distance is not evenly distributed within the system.

In this sense, AIA shifts the analysis from the vertical to the horizontal level. The theoretical interest focuses not only on whether an organization "complies" or "does not comply" with an international framework, but on how the same formal obligation produces different patterns of adaptation across units, services, or levels of governance. This differentiation is not accidental, but is linked to unequal organizational conditions, differentiated coordination capabilities, unequal access to resources, and different degrees of organizational learning.

In this approach, AIA is conceptualized as a three-dimensional phenomenon. First, it involves a cognitive asymmetry, i.e., unequal awareness, understanding, and internalization of the institutional framework by frontline actors. Second, it involves a structural asymmetry, i.e., unequal access to critical governance conditions, such as role clarity, coordination mechanisms, accountability, and resources. Third, it involves a practical asymmetry**,** i.e., divergent patterns of readiness, collaboration, learning, and operational action, even when formal rules are common.

The analytical utility of AIA is twofold. On the one hand, it allows us to explain why institutional alignment with frameworks such as Sendai or ICS does not necessarily lead to homogeneous organizational adaptation. On the other hand, it offers a more precise theoretical tool for multilevel governance environments, where divergences occur not only within an organization, but also between organizations or levels of government that are called upon to cooperate on common events. In such environments, AIA is not simply an indication of "imperfect implementation", but a structural feature of the way in which institutional change is diffused and reconstituted in practice.

This paper studies a multi-level risk governance system, where uneven adaptation is not limited within a ministry but is diffused between the central Civil Protection administration, the Fire Department and the local government. From this perspective, AIA functions as the crucial theoretical link between the implementation debate and the need for more explicit and operational models of shared decision-making in complex risk situations.

2.5. The Incident Command System and the logic of joint command

The Incident Command System (ICS) was initially developed in the United States in response to coordination failures observed in large-scale wildfires and has gradually evolved into a broader organizational model for managing multi-hazard incidents (Bigley & Roberts, 2001; Buck et al., 2006). Its main goal is to provide a common, modular, and scalable command structure capable of coordinating multiple organizations under conditions of pressure, uncertainty, and rapid change in the operational environment. Its central features include a clear division of roles, a single chain of command, common terminology, the ability to adapt to the size of the incident, and the standardization of key command functions (FEMA, 2017).

International experience, however, shows that implementing ICS in multi-level governance environments is not a simple technical exercise, but a profound institutional reform. Studies from the USA, Australia and Europe show that the performance of ICS depends on the extent to which: (a) organizations share a common understanding of roles and responsibilities, (b) there is trust and experience of joint exercises, (c) mechanisms for joint decision making have been incorporated and not just parallel presence of services at the incident (Jensen & Waugh, 2014; Nowell et al., 2018).

The logic of joint command is particularly critical in environments where no single organization has the complete information or operational scope to manage a complex incident. In such cases, effective command depends not only on determining "who has authority," but on the ability of multiple actors to develop a common operational picture, jointly assess risks, and arrive at coordinated decisions. Failure at this stage often leads to fragmentation of action, competing commands, delays, and suboptimal resource allocation.

Of particular importance at this point is the experience of models such as the British JESIP (2018) and the Joint Decision Model (JDM), which attempt to transform the idea of interoperability into an explicit process of joint decision-making. The main contribution of these approaches is that they recognize that cooperation cannot be based only on the goodwill or empirical knowledge of commanders, but needs commonly accepted sequences of questions, a common frame of reference and simple rules of operational judgment. In other

words, joint command is effective when it is based on institutionalized processes of common interpretation of the situation and not only on formal predictions of the coexistence of actors.

This issue is particularly important for the Greek case. Despite the formal harmonization of the civil protection system with principles compatible with the ICS and the strengthening of the central command capacity, the practical establishment of a functional joint command between the General Secretariat of Civil Protection, the Fire Department, Regions and Municipalities remains institutionally and operationally incomplete. The discrepancies in capacity, coordination and organizational readiness between levels of governance make it uncertain when the joint command should remain decentralized and when a stronger central involvement is required.

This is where ICS connects to the central argument of the article. In conditions of asymmetric institutional adjustment, joint command cannot be taken for granted as a result of formal design. Instead, it requires explicit criteria, shared decision logics, and escalation mechanisms that take into account not only the level of risk, but also the actual quality of governance and institutional capacity of the participating actors. From this perspective, ICS provides the basic organizational logic, but the gap remains at the level of operational rules for joint decision in environments of uneven institutional adjustment.

2.6. Institutional framework for Civil Protection in Greece

The Greek civil protection system has been shaped through a long process of institutional reforms, which culminated in recent years with the reorganization of the National Mechanism for Crisis Management and Risk Response through Law 4662/2020 and with the more recent interventions of Law 5281/2026 (Government Gazette, 2020; Government Gazette, 2026). The current framework adopts key concepts of modern risk governance, such as the disaster management cycle, resilience, prevention, preparedness, response and coordination, and attempts to organize the relevant responsibilities in a multi-level system that connects the central, regional and local levels.

At the core of this system is the General Secretariat for Civil Protection, which exercises strategic planning, staff coordination and supervision of the national mechanism, while the Fire Brigade functions as the main operational arm in the field. At the same time, the Regions and Municipalities carry critical responsibilities in terms of prevention, local

preparedness, contribution to organized evacuation and assistance in dealing with the effects of disasters. The institutional structure is, therefore, inherently polycentric and requires continuous cooperation between bodies that differ in terms of resources, expertise and operational burden.

Law 4662/2020 (Government Gazette, 2020) was decisive because it attempted to establish a more coherent system of definitions, roles and phases of disaster management, while strengthening interoperability, volunteerism and the institutional position of civil protection within the public administration. The subsequent amendments of 2026 (Government Gazette, 2026) moved towards further organizational and operational rationalization, placing greater emphasis on multi-level cooperation, operational lessons learned, incident assessment, and improved prevention, preparedness, and response structures. These interventions show that the Greek system does not remain static, but is in a process of continuous institutional adaptation under the pressure of recurring crises.

Despite this significant institutional density, the Greek experience shows that the existence of rules and the formal distribution of responsibilities do not automatically imply functional coherence (Blioumi 2025; Papadopoulou and al., 2025). This is precisely what makes the Greek case theoretically and empirically suitable for the analysis of asymmetric institutional adaptation. The question is not only whether the institutional framework provides for cooperation between the General Directorate of Fire Services, the Fire Department, Regions and Municipalities, but also whether these bodies have comparable governance conditions and sufficient capacity to operate in a meaningful joint command regime when the risk escalates. From this perspective, the institutional framework of Greece does not simply function as a descriptive background for the analysis, but as a crucial empirical field in which the tensions between formal reform and uneven practical implementation can be observed.

3. DATA AND METHODOLOGY

3.1. Research design

The empirical analysis is based on a quantitative, cross-sectional research design, aiming to capture and compare the perceptions of executives of two critical components of the national civil protection mechanism: the central command center GSCP and the operational arm in the

field (Fire Service). The selection of variables constitutes an operationalization of the four priorities of the Sendai Framework (2015 - 2030).

Each index corresponds to a distinct strategic priority of the Sendai Framework. The Risk-Impact Index maps onto Priority 1 (Understanding disaster risk), with variables selected to capture the perceived frequency, severity, and vulnerability of hazards as reported by respondents. The Coordination Index maps onto Priority 2 (Strengthening disaster risk governance) and comprises variables reflecting role clarity, the functioning of coordinating bodies, and the application of ICS protocols. The Capacity Index maps onto Priority 3 (Investing in resilience) and includes variables on staffing adequacy, training, equipment, and organizational learning.

At the same time, the variables were selected to measure the three dimensions of Asymmetric Institutional Adaptation, thereby enabling the diagnosis of the gap between formal design and actual practice. Cognitive asymmetry is captured through the RI, structural asymmetry through the CI and selected components of the CapI, and practical asymmetry through the CapI together with preparedness practices (Priority 4).

3.2. Population and sample

The choice of population and sample is guided by the study's theoretical interest in asymmetric institutional adaptation within a multi-level disaster risk governance system. Against this backdrop, the analysis focuses on two groups of actors occupying crucial, yet distinct, positions in the national civil protection mechanism: staff of the GSCP, as the central strategic and coordinating level, and Commanders of Regional Fire Service units, as the main operational arm in the field. Comparing these two groups makes it possible to investigate AIA within a single institutional framework in which formal obligations are shared, while organizational conditions and roles differ.

In the case of the GSCP, the target population comprised all civilian staff involved in planning, coordination, prevention, preparedness, and evaluation functions in the field of civil protection. The size of this staff was determined on the basis of Article 25 of Presidential Decree 151/2004 (Government Gazette, 2004), which specifies the permanent personnel of the GSCP, supplemented by fixed-term employees hired from 2020 onwards to cover the above-mentioned needs. A census approach was adopted, aiming to include all eligible staff,

and a total of 74 valid responses were obtained, corresponding to a high coverage rate for the organization (67.3%) and allowing for findings with substantial internal validity at the central level.

For the Fire Service, the target population was defined as Commanders of frontline Regional Fire Service units, who are responsible for translating GSCP directives and operational doctrines, including elements of ICS and national plans, into practice. The questionnaire was purposely distributed to Commanders through the operational hierarchy so as to cover mainland, island, and mixed areas, as well as different hazard profiles. In total, 56 fully completed questionnaires were returned out of 66 distributed; although this does not constitute a full census of all Commanders, it provides sufficient variation in terms of geographical coverage (mainland, islands) and service characteristics (mainland, island, and "mixed" experience), ensuring internal diversity of the system for analysing patterns of governance, capacity, and risk.

The sample covers only two critical pillars of the civil protection system and not all involved actors (such as the Hellenic Police or the National Emergency Aid Centre). The selection of these two sub-systems does not allow for statistical generalization to the entire Greek public sector, but serves the purpose of "theoretical sampling" of a critical policy field in which both risk intensity and institutional intervention density are exceptionally high (Flyvbjerg, 2006). The emphasis is thus not on quantitative representativeness of the overall civil protection system, but on in-depth exploration, through "indicative patterns," of those nodes where institutional alignment with Sendai and operational practice intersect most directly.

3.3. Research tool

The questionnaire was designed from the outset with the aim of operationalizing the implementation of the Sendai Framework at the level of the daily work of civil protection executives (street-level Sendai implementation). Each Sendai strategic priority was translated into a separate thematic block, with Likert-type statements (1 = strongly disagree to 5 = strongly agree), referring to the perceptions, experiences and practices of the respondents in their immediate organizational environment.

The four blocks are as follows (Blioumi, 2026; UNDRR, 2015):

- P1 - Risk Understanding: includes questions on awareness of risk types, understanding of vulnerability and exposure, use of risk information in daily work and familiarity with relevant data and analysis. This block operationalizes Sendai Priority 1 and corresponds to the cognitive dimension of AIA.
- P2 - Governance and Coordination: captures the perceived quality of institutional arrangements, clarity of roles and responsibilities, functioning of coordination mechanisms, existence of accountability processes and coherence of strategies at central - regional - local government levels. Corresponds to Sendai Priority 2 and the structural dimension of AIA.
- P3 - Investment for Resilience / Organizational Learning: focuses on issues of resources, education, training, and organizational learning. Includes questions regarding the existence of feedback mechanisms, business evaluation, recording and dissemination of experiences (after-action reviews, lessons learned). It is linked to Sendai Priority 3 and combines the structural and practical dimensions of AIA.
- P4 - Preparedness and Participation: records preparedness practices, exercises, collaborations with other agencies, risk communication with citizens, use of social media, and degree of community involvement in co-designing plans. Corresponds to Sendai Priority 4 and the practical dimension of AIA.

The development of the questions was based on international risk governance and Sendai implementation assessment tools, such as the UNDRR indicators for monitoring the Framework (UNDR, 2022), the iGOPP tool for assessing DRM governance (Lacambra et al., 2015) and the OECD Guidelines for Assessing Institutional Capacity in Risk Reduction (OECD, 2019).

3.4. Data collection process

Data collection in the GSCP was carried out over a predetermined period of time in the form of an online survey, which was distributed to all eligible executives of the organization. The collection period (27/10 – 06/11/2025) allowed for sufficient response time, while reminders were provided to maximize participation. A total of 74 valid responses were received, which constitute a census sample of the specific population.

The survey of Fire Service Commanders was also implemented through a structured questionnaire, based on the same conceptual framework and the same blocks P1 - P4. The distribution was done through the functional hierarchy of the Fire Service, aiming to cover different types of services (mainland, island areas). 56 fully completed questionnaires were collected, which, although not a census of all Commanders, offer enough internal variety for the analysis of governance, capacity and risk patterns.

Both surveys followed standard ethical standards for public sector research[1], in particular anonymity of responses, voluntary participation, informed consent and avoidance of collecting personal data that could identify individuals or specific services.

3.5. Composite indices RI, CI, CapI

The use of composite indices in the study of risk, vulnerability and resilience has expanded significantly over the last twenty years, allowing the concise capture of complex phenomena in a single metric (UNDP, 2004; OECD, 2018). In the field of disaster management, composite indicators are used to assess:

- the quality of governance and public policy in the field of DRM,
- readiness and operational response capacity,
- the overall risk or resilience profile of areas.

The international review shows that most composite indicators are based on: (a) selection of individual variables through an empirical or expert process, (b) standardization/scaling (usually 0 - 1 or 1 - 5), (c) simple or weighted composition (often an average) (Ramli et al., 2020; OECD, 2018). Despite methodological differences, the common goal is to provide decision makers with a tool that condenses information and allows comparisons between

[1] Permission to administer the questionnaire to the personnel of the General Secretariat for Civil Protection was obtained from the Directorate of Education of the General Secretariat for Civil Protection via e-mail on 20 October 2025. Permission to administer the questionnaire to the Commanders of the Fire Departments was granted by Order No. 64034Φ.403.1/13-11-2025 of the Training Directorate of the Fire Department Headquarters.

regions or organizations, as well as the application of "if - then" rules for prioritizing resources and interventions (UNDRR, 2023; World Bank, 2024).

In this paper, the Coordination Index (CI), Capacity Index (CapI) and Risk-Impact Index (RI) are designed as operational performance of the four priorities of the Sendai Framework and the three dimensions of AIA, with the aim of supporting simple, transparent rules of joint decision-making within the framework of a Joint Incident Command Decision Model.

3.5.1. Coordination Index (CI): governance and coordination

The Coordination Index (CI) captures the perceived quality of governance and coordination in the field of civil protection, focusing on priority 2 of the Sendai Framework ("Strengthening disaster risk governance") (UNDRR, 2015). Theoretically, CI is directly linked to the structural dimension of asymmetric institutional adjustment, as it reflects the extent to which street-level actors have a clear role, functional coordination mechanisms, and effective accountability structures (OECD, 2017).

In this approach, CI is considered to be composed of individual dimensions such as:

- clarity of responsibilities between the GSCP, the Fire Department, the Region and the Municipality,
- existence and functioning of formal coordination bodies
- quality of vertical communication (center - Region - Municipality) and horizontal interconnection (between services),
- degree of utilization of common ICS plans, protocols and procedures in real conditions.

Empirically, CI elements are drawn from the questions of the "Governance and Coordination" axis (P2) in the questionnaires of the GSCP and the FS, as well as from selected elements of P4 concerning inter-organizational cooperation (Blioumi, 2026). A high CI value indicates that stakeholders perceive a clear, functional governance framework, while a low CI value indicates structural asymmetry. The same formal arrangements lead to different degrees of actual coordination depending on the unit or region.

In relation to AIA, a low CI value in high-risk areas (high RI) is a critical signal of "structural asymmetry", which justifies the enhanced involvement of the central command center within the framework of the Joint Incident Command.

3.5.2. Capacity Index (CapI): institutional and operational capacity

The Capacity Index (CapI) aims to capture organizational capacity for prevention, preparedness and response, focusing on investment in human, material and knowledge resources, in line with Sendai priority 3 ("Investing in disaster risk reduction for resilience") (UNDRR, 2015). Theoretically it is linked to both the structural and practical dimensions of AIA, as it highlights whether the formal commitment to investing in resilience is accompanied by actually available and utilized means (OECD, 2018).

The international literature on "capacity" indicators in civil protection underlines that capacity must be viewed as a multidimensional quantity, which includes at least:

- staff adequacy (number, specialization, experience),
- level of education and systematic training,
- availability of critical equipment and infrastructure,
- organizational learning: after-action reviews, feedback mechanisms, knowledge management systems (OECD, 2018).

In this article, CapI draws on individual elements from the "Resources/Investments/Organizational Learning" axis (P3) and related elements of P2 - P4 (e.g. access to training, involvement in exercises, existence of business evaluation mechanisms) in the two samples (GSCP, FS). High CapI values indicate that the institutions possess and utilize substantial administrative and operational capacities, while low values signal a "structural capacity gap", even if the institutional framework requires high standards (World Bank, 2024).

In the AIA scheme, regions or organizational units with low CapI embody the "structural" and "practical" asymmetry. Typically equivalent Sendai and ICS obligations fall on an unequal resource base, leading to a different level of substantive implementation.

3.5.3. Risk-Impact Index (RI): perceived risk and impact

The Risk-Impact Index (RI) captures the perceived intensity and probability of a hazard, as well as the severity of potential impacts on human lives, infrastructure and socio-economic functions, in line with Sendai Priority 1 ("Understanding disaster risk") (UNDRR, 2015). Unlike CI and CapI, RI is not about "what the system can do", but "how exposed and vulnerable the system is to specific risks", as they are perceived by executives.

The international literature on risk and vulnerability indicators uses combinations of factors such as frequency/intensity of threats, population and infrastructure exposure, socio-economic characteristics, history of losses and damages (UNDP, 2004; Germanwatch, 2025; UNDRR, 2023). In this paper, RI focuses on the "perceived" risk by the Governors and executives themselves, as a combination of:

- assessment of probability/frequency of catastrophic events in the area of responsibility,
- perception of the potential severity of the impacts (human, economic, institutional),
- awareness of critical weaknesses in infrastructure or institutions that increase vulnerability.

Empirically, the RI is composed of selected elements of axis P1 ("Risk Understanding") and related questions concerning risk and impact assessment, as recorded in the common questionnaire used in the GSCP and the FS (Blioumi, 2026). High RI values indicate that actors themselves perceive their environment as high risk/high impact, which, combined with low CI/CapI values, creates a condition of "asymmetric pressure"; a high threat, but low institutional capacity to deal with it.

3.6. Statistical methods

The statistical analysis was designed to link the survey's empirical data in a systematic way to the development of the Joint Incident Command Decision Model (JICDM). Construct validity was assessed through Exploratory Factor Analysis (EFA) on the variables capturing

the four priorities of the Sendai Framework, using minres extraction and oblimin rotation (Fabrigar & Wegener, 2012; Costello & Osborne, 2005), which confirmed the tripartite distinction between risk, coordination, and capacity. The suitability of the data for factor-based aggregation was verified by a KMO value of 0.850, indicating "very good" sampling adequacy, and by Bartlett's test of sphericity with $p < 0.001$, confirming that inter-item correlations are sufficiently high to support factor extraction (Field, 2018).

Subsequently, for each factor composite indices (Risk-Impact Index – RI, Coordination Index – CI, Capacity Index – CapI) were calculated as the mean of their constituent Likert-scale items (1–5), thereby avoiding subjective weighting schemes. Internal consistency was documented using Cronbach's alpha (α).

To examine differences across governance levels, independent t-tests and one-way ANOVAs were conducted with RI, CI, and CapI as dependent variables and, as factors, the GSCP_FS variable (GSCP staff versus Fire Service Commanders) and the type of high-risk area (mainland, island, mixed). Assumptions of homogeneity of variances (Levene) and normality were tested in all cases, and both p-values and effect sizes (Cohen's d, η^2) are reported. In parallel, descriptive statistics (means, standard deviations, minimum/maximum values) and the 25th and 75th percentiles of RI, CI, and CapI were computed and used as thresholds to classify the indices into low, medium, and high levels.

Finally, the categorical versions of RI, CI, and CapI were used to construct scenarios of combined risk – governance – capacity profiles and to develop simple threshold-based decision rules, which form the core of the proposed JICDM for joint decision-making under conditions of asymmetric institutional adaptation. Each index was classified into low, medium, and high levels using the 25th and 75th percentiles of the sample distribution as cut-off points, thereby ensuring that thresholds are derived from the empirical data rather than from arbitrary distributional assumptions.

4. Results

4.1. Exploratory Factor Analysis results

The overall Street-Level Sendai Implementation Index (SLSII) paints a picture of moderate implementation depth. With a composite mean of 3.25 (SD = 0.53) on a 1 – 5 scale, the sample sits in the middle of the implementation continuum, indicating neither

comprehensive internalization of the Sendai Framework nor wholesale disengagement. However, a closer look at within-block and cross-block variation reveals a systematic pattern that sits at the empirical core of this article: implementation levels are not uniform across dimensions but are skewed in ways that are consistent with asymmetric institutional adaptation.

In the P1 block (Risk Understanding), the most analytically revealing finding is the sharp divergence between conceptual and procedural subdimensions. Items P1.1 – P1.6, which measure general risk awareness, understanding of vulnerability and local hazard profiles, and the use of risk information in everyday decision making, yield mean scores between 2.95 and 3.39 (SD = 0.96 – 1.08), indicating moderate and uneven substantive risk comprehension. By contrast, items P1.7.1 – P1.8, which capture familiarity with emergency procedures, legal frameworks, and standard operating protocols, record substantially higher means between 4.22 and 4.34 (SD = 0.85 – 0.96). This divergence of more than one full scale point within the same block constitutes the clearest empirical manifestation of the cognitive dimension of asymmetric institutional adaptation: street-level staff know what the system prescribes, but their grasp of the underlying risk realities remains weaker.

The P2 block (Governance and Coordination) returns the lowest composite mean at 3.13 (SD = 0.69) and exhibits pronounced internal variance. Items relating to internal role clarity and formal vertical coordination structures inside the Ministry cluster in the 3.4 – 3.6 range, suggesting that internal hierarchies and lines of authority are relatively clear. In contrast, items that measure cross-sectoral coordination with other ministries and local authorities, accountability mechanisms, and the effective use of monitoring and feedback systems score considerably lower, around 2.6 – 2.9. This pattern points to structural asymmetry: governance arrangements are more developed internally than at the interfaces where disaster risk governance must connect across institutional boundaries.

Results for the P3 block (Investment for Resilience) show a composite mean of 3.23 (SD = 0.52), again masking important subdimension differences. Access to training opportunities and execution of routine operational procedures are rated at moderate levels (M ≈ 3.1 – 3.3), indicating that staff receive some form of capacity-building and follow established routines. Yet items that explicitly capture organizational learning practices — after-action reviews, systematic feedback loops, knowledge-sharing platforms, and the institutional capture of experience — score markedly lower (M ≈ 2.4 – 2.7). This

configuration aligns with a predominance of single-loop over double-loop learning: errors are corrected within existing frameworks, but the deeper reflective processes that would revise underlying assumptions are largely absent.

The P4 block (Preparedness and Participation) has a composite mean of 2.96 (SD = 0.62). Internal preparedness and communication practices within the Ministry tend to score above the midpoint (M ≈ 3.0 – 3.8), suggesting basic internal readiness routines. In contrast, items that measure external and participatory dimensions — community engagement, citizen participation in risk planning, use of social media for public risk communication, and multi-stakeholder exercises — consistently score lower (M ≈ 2.5 – 2.9). This points to an operational culture that remains inward-facing and procedurally oriented, with the participatory aspects of Sendai Priority 4 still weakly developed.

Taken together, these patterns depict a civil protection administration characterized by high formal compliance, strong procedural knowledge, and relatively established internal structures, but systematically weaker adaptation in areas that require cross-boundary governance, organizational learning, and external engagement. Rather than a simple implementation failure in which rules are ignored, the data reveal an uneven and unequal translation of a uniform formal framework into practice; a mosaic of implementation levels that is the empirical hallmark of asymmetric institutional adaptation.

4.2. Descriptive analysis for RI, CI, CapI

Descriptive analysis of the three composite indicators shows that, overall, participants perceive risk, coordination and institutional capacity at relatively medium to high levels, but with significant internal variation. The Risk-Impact Index (RI) has a mean of 3.31 (SD = 0.88, range 1.50 - 5.00), with a 25th percentile at 2.54 and a 75th percentile at 3.83, indicating that approximately the top 25% of the sample perceive a significantly higher level of risk and impact than the average. The Coordination Index (CI) has a mean of 3.15 (SD = 0.76, range 1.50 - 5.00), with a 25th percentile at 2.57 and a 75th percentile at 3.77, indicating a satisfactory but not homogeneous level of perceived institutional coordination.

The Capacity Index (CapI) shows a slightly higher mean (3.29) and a smaller standard deviation (SD = 0.61, range 2.07 - 4.80), with the respective 25th and 75th percentiles at 2.93 and 3.72. This means that the majority of responses are concentrated in medium-high values,

but a significant portion of approximately 25% of cases records low institutional capacity, below 2.93. These limits (25th - 75th percentile) are used to categorize each indicator into low, medium and high levels and, subsequently, to identify profiles of areas and services where high risk coexists with low CI and/or CapI. These “tiers” are the starting point for the formulation of the Joint Incident Command Decision Model scenarios in the next subsection.

4.3. Differences between GSCP and Fire Service executives

The analysis of differences between GSCP and FS Commanders revealed consistent, statistically significant patterns of asymmetric institutional adjustment. Independent t -tests showed that FS Commanders reported higher values on all three indicators, with small-medium to medium-high effect sizes (RI, CI, CapI, $p \leq .032$). The corresponding ANOVAs with GSCP_FS factor confirmed these differences, while the Commanders’ means were consistently higher on all three indicators. Overall, operational commanders in the field perceive greater risk but also stronger institutional capacity and coordination than central staff officers, a finding critical to the design of the JICDM escalation rules.

4.4. Differences by place of service

The analysis of differences by service location (mainland, island, mixed experience) shows that geographical and functional specificities are mainly associated with governance and institutional capacity. For RI, no statistically significant differences emerge ($F(2,127) = 1.43$, $p = .243$), so the perceived risk intensity remains relatively homogeneous. On the contrary, for CI and CapI, significant differences are recorded ($F(2,127) = 3.41$, $p = .036$ and $F(2,127) = 4.04$, $p = .020$ respectively), with some island and mixed areas combining moderate/high RI with lower CI and CapI values, i.e. typical cases of asymmetric institutional adjustment. These spatial patterns offer critical input for the JICDM, allowing for targeted escalation and enhancement of the GSCP's engagement in specific categories of high-risk areas.

4.5. Construction of Joint Incident Command Decision Model (JICDM)

In this subsection, the findings for the RI, CI and CapI indicators are transformed into an operational JICDM, which defines clear and transparent rules for activating, escalating and enhancing the involvement of the GSCP in conditions of asymmetric institutional adjustment.

Step 1: Three-level categorization RI, CI, CapI

Each indicator is categorized into low, medium and high levels, using the 25th and 75th percentiles of its distribution in the total sample. The percentiles option allows for the definition of "tiers" of risk, governance and capability without requiring normality on the Likert scales.

- RI: < 2.54 = low, 2.54–3.83 = medium, > 3.83 = high
- CI: < 2.57 = low, 2.57–3.77 = medium, > 3.77 = high
- CapI: < 2.93 = low, 2.93–3.72 = medium, > 3.72 = high

Step 2: RI - CI - CapI Scenario Table

Based on this triple scale, a scenario matrix was formed that combines the RI, CI and CapI levels and corresponds each combination to a situation characterization and a specific role of the GSCP in the joint command (Table 1).

"Table 1. RI - CI - CapI combinations and the role of the GSCP in the Joint Incident Command Decision Model**"**

Scenario	**RI**	**CI**	**CapI**	**Status characterization**	**Joint decision level & role of the General Secretariat**
A1	Low	High	High	Low risk, strong governance and capacity	Joint command at local/regional level; GSCP in monitoring/advisory support role; normal readiness.

A2	Low	Medium	Medium	Low risk, moderate institutional base	Local/regional joint command with periodic GSCP updates; emphasis on CI/CapI preparation and improvement.
B1	Medium	High	High	Moderate risk, strong system	Joint command led by Municipality/Region and PS; GSCP sets guidelines without a direct operational role; enhanced readiness.
B2	Medium	Medium	Low	Moderate risk, structural capacity weaknesses	Joint command with mandatory "plan for reinforcement"; GSCP approves reinforcement of resources and exercises and monitors implementation.
B3	Medium	Low	Medium /Low	Moderate risk, weak governance	Enhanced coordination role of the GSCP; joint command with "co-chairmanship" of the GSCP; mandatory review of plans.

C1	High	High	High	High risk, strong governance and capacity	Local/regional joint command with "increased mandate"; GSCP increases alert level but leaves operational leadership in the field.
C2	High	Medium	Low	High risk, adequate governance but low capacity	Immediate joint decision of Municipality/Region-FS to escalate forces; GSCP commits additional resources and imposes exercises after the incident.
C3 (crucial)	High	Low	Low	High risk, serious governance and capacity deficit	Automatic activation of "Enhanced National Alert": central role of the General Staff in the joint command, mandatory presence in the field, immediate reallocation of resources and complete review of plans after the event.

a Note: RI, CI and CapI levels are defined based on the 25th - 75th percentiles (low/medium/high). Each scenario corresponds to a standardized combination of risk,

governance and capability and suggests the minimum required role of the GSCP in the joint incident command.

Source: Own processing

Step 3: JICDM as a decision tree

In favorable cases (e.g. A1) the risk is low and the institutional framework is strong, so the joint command is organized mainly at the local/regional level and the GSCP is limited to a monitoring and strategic advisory role. In intermediate scenarios (B2, B3), where the risk is medium but CI and/or CapI are weak, the model foresees an enhanced coordination role for the GSCP, with mandatory plan review and targeted reinforcement plans. In the "critical" scenario C3, the rule is automatic escalation with the GSCP assuming central coordination.

In this way, the JICDM functions as a threshold-based decision tree, bridging quantitative evidence of asymmetric institutional adaptation (RI, CI, CapI) with practical rules of shared decision-making in civil protection. Combining statistical modeling with lessons from the literature on multilevel risk governance and joint incident command, it offers a transferable tool for organizations seeking to align field decisions with the principles of the Sendai Framework under heterogeneous institutional capacities.

4.6. Basic principles of decision rules

The decision rules proposed to be adopted in the JICDM are based on four basic principles:

1. Principle of asymmetric attention: When RI is high, but CI and/or CapI are low, the system must mobilize disproportionate attention and support from the central level, because the "institutional capacity to absorb" risk is limited (UNDRR, 2023).

2. Principle of subsidiarity with guarantee: Where CI and CapI are sufficiently high, decisions can remain more at the local/regional level, with the GSCP mainly playing a supporting/monitoring role. However, the DGS retains the right to intervene if RI exceeds critical limits.

3. Principle of proportionality in escalation: The worse the RI - CI - CapI combination (higher risk, lower governance/capability), the higher the alert level, the involvement of the GSCP and the reallocation of resources should be (OECD, 2018; World Bank, 2024).

4. Principle of conditional learning: Cases of high CI and CapI with repeated high RI must not only be addressed operationally, but also be exploited as "learning hubs" so that their experience can feed into improvements in areas with lower indices (Argyris, Schön, 1978).

4.7. Joint Decision Process

In addition to what is decided (rules), the model must also clarify how decisions are made. This is where the logic of Joint Decision Models such as JDM of JESIP (2018), adapted to the Greek reality.

The proposed Joint Decision Process can be structured into five steps, which are repeated cyclically in an event:

1. Shared situational awareness:

Mayor/Regional Governor, Regional Director and GSCP representative (where required) gather available data on the incident (fire fronts, hydrological data, weather forecast, critical infrastructure, etc.).

2. Joint assessment RI - CI - CapI**:**

Based on the pre-calculated profiles of the area (RI, CI, CapI) and current information, they agree on which category (low/medium/high) each indicator falls into for the specific event.

- For RI, the update may take into account particular seasonality or a specific threat.
- For CI and CapI, the value is considered fixed for the duration of the planning period, but may be revised periodically.

3. Scenario mapping:

The combination RI - CI - CapI is placed in the matrix of Table 1 and the corresponding scenario is identified (e.g. C2, C3). This acts as a "starting point" for decisions, so that there is a common understanding of the severity and institutional constraints.

4. Joint decision on actions:

Based on the scenario, the Joint Command decides:

- alarm level,
- escalation or not of forces,
- need for enhanced involvement of the Public Transport Authority (e.g. parking of additional vehicles, involvement of other services),
- activation of specific evacuation plans, protection of critical infrastructure, etc.

5. Documentation and feedback:

Decisions are documented with reference to RI - CI - CapI and the scenario used, so that after the event they can be assessed for adequacy and proportionality (Argyris, Schön, 1978; OECD, 2018). This stage supports organizational learning and the gradual improvement of both indicators and thresholds.

The codification of these steps into standard operating procedures (SOPs) and training scenarios is a critical prerequisite so that the JICDM does not remain a theoretical scheme but is integrated into the daily practice of executives.

4.8. Integration into the institutional framework and practical implications

To be effective, the proposed JICDM needs to be integrated into the existing civil protection institutional framework, without creating a "parallel" system. For example, it could:

- to explicitly provide in regulatory acts/circulars of the GSCP that decisions on activation, escalation and reinforcement in fires and floods are taken based on predefined RI - CI - CapI profiles per region,

- to integrate the RI - CI - CapI matrix and the Joint Decision Process into the Local and Regional Civil Protection Plans, as a mandatory annex,

- to use the indicators and scenarios as a basis for joint GSCP - FS - Local Government Organizations exercises, so that those involved become familiar with the logic of thresholds and the language of joint command.

In practice, the adoption of JICDM can contribute to:

- reducing the time it takes to make critical decisions by offering a common, pre-agreed frame of reference,

- greater transparency and accountability, as decisions can be interpreted retrospectively based on indicators and not just "intuitively",

- in the targeted allocation of civil protection resources, as areas with a combination of high RI and low CI/CapI will emerge as priorities for investments in institutional capacity building.

In this way, the Joint Incident Command Decision Model functions as an "operationalization" of asymmetric institutional adaptation: it transforms a mainly diagnostic concept (AIA) into a concrete system of decision rules, which allows the GSCP and local/regional actors to react in a manner adapted to the real capabilities and risks of each region, effectively aligning the Sendai Framework with everyday ICS practices.

The three-dimensional RI - CI - CapI diagnosis acquires particular importance when seen in the light of recent institutional reforms in Greek civil protection, in particular Law 4662/2020 as reformed by Law 5281/2026. Law 4662/2020 reorganized the National Mechanism for Crisis Management and Risk Response, defining basic concepts (risk, vulnerability, resilience), fundamental functions (prevention, preparedness, response, recovery) and roles for the GSCP, local government and the Fire Service (Government Gazette, 2020).

Law 5281/2026 came to build on this basis, proceeding with a comprehensive reform of the system of prevention, preparedness and response to forest fires and other disasters, with particular emphasis on the restructuring of the National Mechanism and the establishment of

the principle of multi-level cooperation (articles 3 - 4), on the creation of new mechanisms for drawing operational lessons (reporting committees, risk and loss databases) and on the strengthening of the Fire Operations Directorate and the upgrading of the Fire Academy, including the Preventive Fire Protection Directorate (articles 84, 85, 85A of Law 4662/2020, as amended). These reforms are directly linked to the three dimensions RI - CI - CapI; The principle of multi-level cooperation and the strengthening of the crisis planning and management councils in the Civil Protection System aim to improve the CI, creating more stable coordination and common strategy mechanisms (articles 4, 83 of Law 4662/2020, as amended), the establishment of new directorates, such as the Preventive Fire Protection Directorate, and the upgrading of the Fire Academy strengthen the CapI, investing in specialized legislative, technical and educational support for prevention and operational readiness, while the restructuring of the national database of risks, threats and losses and the institutionalization of reporting and evaluation mechanisms for major incidents can improve the accuracy and usefulness of the RI, offering more reliable information on local and national risk (articles 3, 7B, 7C, 7D of Law 4662/2020, as amended).

The JICDM is not confined to the Greek case; it is intended as a transferable framework for the international community. Asymmetric Institutional Adaptation (AIA) is a shared challenge across multi-level governance systems worldwide, where official designs frequently diverge from operational realities on the ground. At the same time, the JICDM model draws directly on the international civil protection literature, building on the logic of ICS and the UK JESIP model as established reference standards, while its indices constitute an operational translation of the four priorities of the Sendai Framework.

Crucially, JICDM introduces a “meta-rule”: it specifies not only how actors should decide together, but also who should participate, and with what intensity, given the risk and capacity profile of a territory. In doing so, the model helps governments worldwide to avoid unnecessary over-concentration of resources in already strong areas and to focus instead on “high-risk, low-capacity zones.”

5. Discussion

5.1. Asymmetric institutional adaptation

The analysis of the RI, CI and CapI indices shows that asymmetric institutional adaptation (AIA) is not an abstract notion but manifests empirically as a set of cognitive,

structural and practical asymmetries between the central strategic level and the operational level, as well as between different types of high-risk areas. At the cognitive level, Fire Service Commanders report higher perceived risk than GSCP officials, which is consistent with the logic of street-level bureaucracy and suggests that everyday engagement with incidents leads to a more intense and empirically grounded perception of risk compared to the more abstract assessments made at the centre.

Structural asymmetry emerges from differences in the CI between GSCP and the Fire Service and between categories of areas. In particular, some island and mixed jurisdictions combine high risk with lower levels of institutional coordination, indicating that identical Sendai/ICS formal provisions do not everywhere translate into the same effective capacity for cooperation. Similarly, the CapI shows that practical capacity for managing and learning from events is unevenly distributed, with some services having developed stronger local resilience routines while others remain more dependent on central mechanisms or lag behind in terms of resources and training.

Taken together, these findings suggest that AIA is expressed not only as a vertical gap between formal design and practical implementation but also as a horizontal mosaic of unequal adaptation pathways within the same disaster risk governance system. This reinforces the article's theoretical claim that institutional compliance with international frameworks such as Sendai is not sufficient in itself to ensure uniform organisational preparedness, shared role understanding and comparable operational capacity across all levels of government.

5.2. Implications for governance

The combination of high RI with low or medium CI and CapI in some area categories empirically constitutes what the article defines as a "critical profile" of AIA. In such cases, institutional adaptation is insufficient to absorb risk, as physical risk is not matched by corresponding quality of coordination and implementation capacity. In this sense, the effectiveness of multi-level disaster risk governance depends not only on the clarity of formal responsibilities but also on the actual balance between risk, institutional coordination and organisational readiness.

This is particularly salient in the Greek case, where the legal framework has become increasingly dense, yet implementation remains uneven. The findings suggest that the distance between central design and local or regional capabilities is not merely an

implementation failure but a structural feature of how reform diffuses through a multi-level governance system. Disaster risk governance must therefore be understood not as a neutral technical function but as a process that needs to account for real inequalities in coordination, capacity and learning among the actors involved.

5.3. The contribution of the JICDM

This is precisely where the practical and theoretical contribution of the proposed Joint Incident Command Decision Model (JICDM) lies. The model is not simply another descriptive version of the Incident Command System; rather, it seeks to fill a gap in international practice by introducing empirically grounded criteria for when and to what extent central government involvement in joint command should be escalated. While classical ICS and JESIP-type Joint Decision Models explain how joint decision processes among agencies should be structured, they do not adequately specify when joint command can remain decentralised and when stronger central intervention is warranted.

The JICDM adds exactly this "meta-rule" by linking the level of risk to the quality of coordination and institutional capacity. Using thresholds for RI, CI and CapI, it translates the notion of incident severity from a broad political impression into a more transparent and reproducible quantitative logic through which GSCP involvement can be calibrated according to the actual profile of each area or service. In this way, the model provides a tool that bridges the statistical diagnosis of AIA with the institutional architecture of disaster risk governance, enabling a more targeted allocation of roles, resources and forms of support.

The importance of the JICDM is particularly evident in "critical" cases where high RI combines with low CI/CapI, indicating that local or regional structures do not possess sufficient autonomous capacity to absorb risk. In such scenarios, timely and institutionally defined strengthening of central involvement can reduce both the risk of delayed escalation and the risk of unnecessary over-centralisation in contexts where local capacity is already adequate. Finally, because the model's indices are structured around the priorities of the Sendai Framework, the JICDM is potentially transferable to other national civil protection systems facing similar multi-level governance challenges.

5.4. Limitations and future research

Despite its contribution, the study has several important limitations that must be considered when interpreting the findings. First, the sample covers specific categories of GSCP officials and Fire Service Commanders and does not include other key actors in civil protection, such as local government representatives or other first-response services. Second, the data are based on self-reported assessments using Likert scales, which are appropriate for measuring perceptions and experiences but may be affected by organisational or perceptual biases. Third, the composite indices RI, CI and CapI embed specific conceptual and statistical choices that may require adjustment in other institutional environments or future samples.

Moreover, the JICDM is presented here at a conceptual and statistical level and has not yet been systematically tested in real incidents or large-scale exercises. Future research could expand the sample to other actors, develop more polyphonic versions of the RI, CI and CapI indices, and experimentally test the use of the JICDM in exercise scenarios and tabletop simulations. Longitudinal monitoring of the indices in selected areas would also be valuable to assess whether interventions designed on the basis of the model actually reduce AIA and strengthen resilience over time.

6. Conclusions

This study aimed to investigate how asymmetric institutional adaptation manifests itself in the Greek civil protection system and how these patterns can be translated into an applicable JICDM for multilevel disaster risk governance (UNDRR, 2015; Domorenok et al., 2021). Based on primary data from GSCP executives and FS Commanders, structured around the four priorities of the Sendai Framework, the analysis highlighted distinct cognitive, structural and practical asymmetries between levels of governance and types of high-risk areas, empirically confirming the concept of AIA.

At the level of research questions, the results show, initially, that AIA is reflected in three dimensions; the FS Commanders perceive higher risk (RI) than the GSCP executives (cognitive asymmetry), the governance and coordination conditions (CI) differ both between agencies and between continental, island and mixed regions (structural asymmetry) and the institutional capacities/resources (CapI) are unevenly distributed in the system (practical asymmetry) (Lipsky, 2010; Matland, 1995; OECD, 2024). Subsequently, exploratory factor

analysis and reliability checks revealed three stable composite indices (RI, CI and CapI) that summarize these dimensions in a manner consistent with the literature on measuring governance and institutional capacity (Fabrigar, Wegener, 2012; DeVellis, 2017; Hair et al., 2019).

Then, the categorization of RI, CI and CapI into low/medium/high levels, using the 25th - 75th percentiles, allowed the formulation of a scenario matrix that links specific risk-governance-capability combinations with graded roles of the GSCP in the joint command (Costello, Osborne, 2005; Field, 2018). In particular, a "critical profile" (scenario C3) emerged, where high risk coexists with low governance and capacity, justifying automatic escalation to enhanced national alert and a central role for the General Directorate of Public Health (OECD, 2024). In contrast, scenarios with high or medium RI but strong CI and CapI support a more decentralized logic, with central management in a role of strategic guidance and monitoring, in line with the principles of ICS (Bigley, Roberts, 2001; FEMA, 2017).

By continuing to answer research questions, the JICDM contributes to the international discussion on ICS and Joint Decision Models, adding a layer of empirically grounded scaling rules that is missing from most existing standards (JESIP, 2018; Nowell et al., 2018). While ICS and JESIP focus on how the structure and decision-making process should be organized when the agencies are already established in a joint command, JICDM answers the "when" and "to what extent" the central government should be involved, based on objective risk and capacity indicators captured in the RI - CI - CapI indicators. In this way, it acts as a bridge between statistical diagnosis of AIA and institutional design, allowing the public administration to link decision-making in the field with the principles of the Sendai Framework without overlooking the heterogeneity of institutional capacities (UNDRR, 2015; Domorenok et al., 2021).

Despite the limitations of the sample, self-reported measurement, and the lack of application of the JICDM to real large-scale events to date, the findings suggest that the threshold-based decision rules approach can enhance both efficiency and accountability in civil protection systems (Pressman, Wildavsky, 1984; Flyvbjerg, 2006). The Greek case, as a country with high formal investment in civil protection institutions but persistent vulnerabilities, serves as a crucial example of how asymmetric institutional adaptation can be transformed from a problem into a starting point for planning. Further testing and adapting the JICDM in exercises, at other administrative levels and in different national contexts is a next

step, both for deepening the AIA theory and for developing practical tools that help public administrations manage disaster risk in a more targeted, transparent and compatible manner with the principles of multi-level governance (UNDRR, 2023; OECD, 2024; World Bank, 2024).

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