“GREEK WILDFIRE MANAGEMENT: A CASE STUDY ON COLLABORATION DURING WILDFIRES IN EVROS REGION.”

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MSc Thesis

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Abstract

As wildfires become increasingly frequent and severe, it is essential to integrate existing fire management practices for effective mitigation, especially given the growing threat posed by climate change. The purpose of this research is to explain the current challenges faced by the National Crisis Management and Risk Mitigation Mechanism in Greece, with a focus on the collaboration and coordination among national agencies during wildfire response.

Specifically, the study examines the roles and responsibilities of the Fire Service, Forest Service, and Civil Protection during the response to the Evros wildfire in August 2023, highlighting how inter-organizational coordination impacted the operations. By analyzing the mechanism, the research identifies the key challenges and obstacles that hindered effective collaboration and coordination among these organizations, while also exploring potential strategies for enhancing the Mechanism's effectiveness in future fire-related disasters.

The study employs short semi-structured interviews, and an online survey distributed to participants in the Evros fire incident, capturing their perspectives on the challenges faced during the response. Additionally, document analysis of the current legal frameworks provided insights into how these formal institutional factors shape organizational behavior in fire management.

The interpretation of the above methods is supported by several concepts. Employing institutional theory sheds light on the deeper structural aspects of organizations that influence fire response actions. Concepts of collaboration and coordination provide insights into organizational behavior during emergencies. The notion of legitimacy further examines how members perceived cooperation and how their actions were justified by others during the response to the Evros wildfire incident of 2023.

The main findings of this study emphasize the critical role of both formal and informal institutions in shaping organizational behavior and decision-making processes. The study also revealed that the outdated legal framework and bureaucratic delays significantly hindered effective collaboration and coordination during the response phase. The perceived legitimacy particularly for these organizations influenced by the outcome of the fire incidents. Furthermore, the study outlines that there is a big problem regarding the communication among the organizations which hinders the operations efforts. Lastly, it's important to stress that the weather conditions during the fires of Evros of 2023 are perceived by all the respondents as a catalyst factor that influences the outcome. The study concludes by recommending change to existing policies, better distribution of resources across all the involved organizations, improved communication channels, integration of local knowledge, and the establishment of a centralized fire management body. The Evros case reveals the urgent need for a holistic and integrated approach to wildfire management, which can enhance Greece's preparedness and response to adapt to the realities of climate change.

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List of abbreviations

CEP: Civil Emergency Planning

GSCP: General Secretariat of Civil Protection

D.G.: Directorate-General

EMODE: The Special Forest Fire Operational Units

ESKEDIK: The National Coordination Centre for Operation and Crisis Management

E.S.K.E.: Ενιαίο Συντονιστικό Κέντρο Επιχειρήσεων (in Greek). This means Unified Coordinating Operations Centre

EU: European Union

IOLAOS 2: A multidisciplinary planning instrument for wildfire preparedness setting objectives, roles and defining clear responsibilities for key actors, and coordinating procedures.

MS: Member States

NGO: Non-Governmental Organization

PE.K.E.: Περιφερειακά Κέντρα Επιχειρήσεων (in Greek). Means Regional Operational Centers

P.E.S.O.P.P.: The Regional Coordinating Civil Protection Authorities

P.S.E.A.: Τμήμα Πολιτικής Σχεδίασης Έκτακτης Ανάγκης και Πολιτικής Άμυνας (in Greek). Means the Department of Political Emergency Planning and Civil Defense.

SOPP: Civil Protection Coordination Body

STO: Συντονιστικό Τοπικό Όργανο (In Greek). Means Local Coordinating Body.

T.E.S.O.P.P.: The Local Coordinating Civil Protection Authorities

ΓΠΑ: Γεωπονικό Πανεπιστήμιο Αθηνών (in Greek). This means Agricultural University of Athens

ΚΥΑ: Κοινή Υπουργική Απόφαση (In Greek). Means Common Ministerial Decision

Ο.Τ.Α.: Οργανισμοί Τοπικής Αυτοδιοίκησης (in Greek). This means Local Government Organizations

ΦΕΚ: Φύλλο Εφημερίδας Κυβερνήσεως (in Greek). This means the edition of the official Greek Government Gazette.

1. Introduction

Residing in the era of Climate change exposes us to heightened risks linked to various extreme weather events such as droughts, high temperatures and strong winds (IPCC, 2021). The escalation in the frequency and intensity of these events can significantly impact the occurrence of wildfires such as unplanned or uncontrolled fires, affecting natural, cultural, industrial, and residential landscapes worldwide. (OECD, 2023; FAO, 2010). In recent years, an alarming increase in the frequency and intensity of wildfires observed in the Mediterranean region, especially in the southern fire- prone countries (Portugal, Spain, Greece etc.) which combined with the unique ecosystems found there, has created optimal conditions for these events to cause devastating disasters, leaving vast swaths of land scorched and ecosystems in peril (European Commission, 2023; Tedim et al., 2018). One contributing factor to this phenomenon is the changing demographics of rural areas, which increase the risk of wildfires. An aging population in farmsteads and villages is a notable trend that causes those areas to be abandoned and maintain them inactively. More critically, fuel loads, uncontrolled ecological succession, and the replacement of traditional land management in certain countries by industrial forest plantations were among the consequences of less land being actively farmed. Consequently, this has resulted in a reduction of breaks in fuel continuity, contributing to an unprecedented increase in the flammability of landscapes throughout the Mediterranean region (Xanthopoulos and Nikolov, 2019). Another significant factor is the influx of tourists into fire-prone regions, coupled with their lack of awareness regarding fire risks and the low preparedness of the Governmental agencies has exacerbated the situation, particularly in Southern European countries (Stoof and Kettridge, 2022). These combined with the prevailing modern societal approach of prioritizing control and resist to fire has created what is often termed the “wildfire paradox,” amplifying fire hazards in many places (Xanthopoulos, 2007; Tedim et al., 2020). The “wildfire paradox” emerged in the scientific literature to describe the unintended consequences of countries prioritizing primarily on wildfire suppression. This approach, in combination with the above-mentioned socio-environmental factors, results in an increased frequency of extreme wildfire events (EWEs) (Tedim et al., 2020). This emphasis on strong fire suppression tactics, as highlighted by Snider et al., (2006) has led to negative outcomes and increased of the problem. Additionally, the unpredictable, dynamics, and complex environments faced during the response to a fire, intensified the need of collaboration among a diverse group of organizations that need to facilitate effective emergency response (Bharosa et al., 2010).

In this perspective, this concern connects to another issue within the wildfire management. The examination of collaboration among various organizations which is essential for managing wildfires. According to Woong, (2019) research on this field recently start increasing focusing on factors that limited the performance of the collaboration among the different organizations. Nevertheless, another important key challenge in wildfire management is the lack of coordination among organizations involved in disaster response. Effective coordination is crucial, as its absence can lead to failures such as misallocation of resources, poorly timed relief efforts, etc., and consequently escalate crisis and increase causalities. Despite its critical importance, coordination in disaster response has received relatively less attention in scientific literature (Chen et al., 2008a).

In the Greek context, the lack of a robust National Mechanism to address key socio-economic and institutional factors hinders effective fire management, particularly in the face of climate change. Successful fire management under climate change requires strong adaptive capacity, which depends on scientific knowledge but also on social, economic, and political factors that influence the implementation of adaptation policies (Raftoyannis et al., 2014). Factors such as socioeconomic development, infrastructure, institutions capacity enhance an organization's ability to adapt, determining the effectiveness of wildfires management (Thornes, 2002). Especially, in Greece the unbalanced management of fires and the focus on fire suppression, with little emphasis on prevention and poor coordination among organizations, has led to increasing wildfire impacts in the last two decades (Xanthopoulos et al., 2019). Since 2000, wildfires have increased in intensity and frequency, resulting in a loss of tree cover amounting to 155,000 hectares from 2001 to 2022 (Tyukavina et al., 2022) and extensive burned areas. Throughout the period from 2000 to 2023, Greece witnessed four extreme wildfire events: the 2007 wildfires, primarily affecting the Peloponnese region, the wildfire in 2018 in a wildland-urban interface near to Athens when the fire claimed the lives of 102 citizens (Xanthopoulos and Athanasiou, 2019), the 2021 wildfire in Evia, burning 130,000 hectares of land (Xanthopoulos et al., 2022) and the wildfires in Evros in 2023, about which more details will be discussed in the paragraphs that follow (Figure 1).

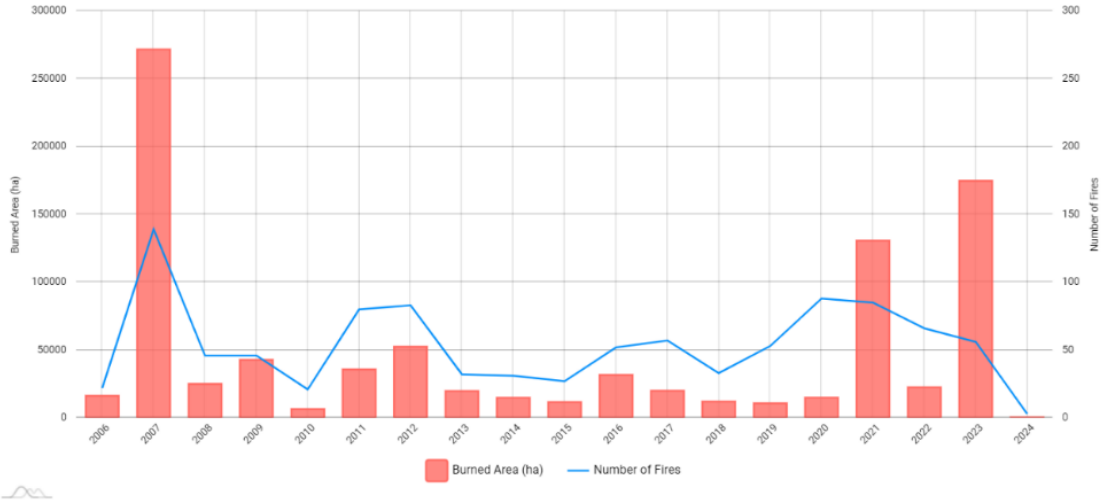


Figure 1: Annual Statistics (Burned area(ha) and number of fires) for Greece from 2006 until 2024 (EFFIS - Statistics Portal, n.d.-a).

1.1 Fire management in Greece

The challenges posed by these escalating wildfires necessitate a comprehensive understanding of the underlying factors contributing to their frequency and severity. In this context, Greece presents a particularly compelling case due to its unique socio-political landscape and environmental conditions (Palaiologou et al., 2021). As the nation grapples with the increasing complexity of wildfire management, it becomes imperative to examine the institutional developments that have shaped current practices and behaviors. The evolution of fire management policies, particularly the critical shifts in responsibilities among key organizations, has played a pivotal role in influencing the

effectiveness of wildfire response and prevention. Understanding these developments provides essential insights into the current challenges and sets the stage for analyzing the effectiveness of Greece's fire management strategies, starting with a crucial turning point in 1998.

A pivotal moment occurred in 1998 when the responsibility for fire suppression was transferred from the Forest service to the Fire service through Law 2612/1998 enacted by the government. This decision lacked scientific justification and was evidently politically motivated, stemming from the Forest service's underperformance in prior years (Xanthopoulos, 2004). This transition signaled the beginning of an era marked by escalating tension and reduced cooperation between the Fire service and Forest service (González-Cabán, 2008). The country's approach to managing wildfire changed after that with focusing mainly on suppression, while neglecting fire prevention measures (Xanthopoulos et al., 2020). Furthermore, the absence of a proactive wildfire prevention policy and the diminished role of the responsible organization, the Forest service due to insufficient funds and the understaffed and aging personnel hampering their ability to fulfill their responsibilities measures (Xanthopoulos et al., 2020). Additionally, through existing legal gaps (e.g. the provision of Article 100 of Law 4249/2014 is inactive) the coordination of prevention cannot be applied by the organization (Goldammer et al., 2019). Therefore, the complexity of coordinating 17 authorities across six ministries, each tasked with executing 11 institutional responsibilities, has led to a lack of effective coordination among state actors during incidents, exacerbating the challenges faced by Civil protection organizations. It's important to note that the new Ministry of Climate Crisis and Civil Protection created from the presidential decree 70/2021 has the purpose of coordinating with a more sufficient way the General Secretariat of Civil Protection (Civil protection) and serves as the administrative branch of the Fire service and the Civil protection (ΦΕΚ 161 A'). However, the recent wildfire in the Evros region once again underscored the continuum struggle of a nation grappling with its inability to effectively manage such events. During that summer, the European Union (EU) witnessed one of its largest wildfires, devouring a staggering 120,000 hectares of forest and agricultural land. This extreme event lasting over 10 days, has resulted in the death at least of 35 people and over 20 individuals sustaining injuries (Goyal, 2023).

In light of the socio-ecological impact of the aforementioned wildfire incidents in Greece, it becomes obvious that wildfire management is of a great challenge. Wildfire management distinguished into the pre-phase, response, and post-phase and it encompasses the emergency cycle (Cronstedt., 2002). The pre-phase includes the mitigation of the risks and the preparedness. The response phase is happening alongside the emergency and the post-phase is the recovery phase which includes the restoration measures of the affected area. Regarding the specific case study, the Wildfires of 2023 in Evros the Committee of the Geotechnical Chamber of Greece published a report in which part of their findings was the inadequacy of an effective cooperation action of interagency actors and coordinated efforts to contain the fire's spread. Similar observations have been made from scholars on previous occasions, indicating that the present situation is more complex, emphasizing the pressing necessity to foster collaboration among organizations for future mitigation of EWEs (Xanthopoulos, 2007; Xanthopoulos et al., 2019; Goldammer et al., 2019; Pandey et al., 2023; Kavalapoint, 2023). Hence, it is more than crucial to address the problem of collaboration among

organizations that operate, since extreme wildfire events increase on an internationally scale resulting in fatalities and incalculable ecological impacts.

1.2 The Case study

Evros, Greece 19 August 2023

In the paragraph that follows, the case study of a wildfire incident briefly described, shifting the focus to something more locally. The wildfire incident in the Evros region of East Macedonia and Thrace started on August 19, 2023, potentially ignited by lightning in the village of Melia village (Παπαδόπουλος, 2023). Although, the wildfire incidents included of two fires that eventually merged, the first started near the city of Alexandroupoli in the southern part of the forest while the second originated in the Dadia-Soufli forest (FAST, 2023). Over the course of 15 days, the fire spread through the Dadia- Lefkimi-Soufli National Park, resulting in a total burned area of 961,135.65 acres, of which 832,844.42 acres were forested (Figure 2) (Dasarxeio, 2023). Part of the affected area designated as a protected area since 1980 and as a National Park since 2006, the ecological significance of the park is huge, serving as a vital junction for migratory bird species travelling between Asia, Europe, and Africa, including vulture species like *Aegypius monachus*, *Neophron percnopterus* and *Gyps fulvus* (Geoland, 2023). The forest's flora is rich and diverse, predominantly composed of coniferous species such as Turkish pines (*Pinus brutia*) and Black pines (*Pinus nigra*) mixed with oaks (*Quercus spp.)* and other deciduous species characteristic of the Eu-Mediterranean and Para-Mediterranean vegetation zones (Management Unit of Evros Delta and Dadia National Parks - N.E.C.C.A., 2023). According to the report from the Committee of the Geotechnical Chamber of Greece, the wildfire significantly affected the coniferous forest, with 40% of the small core area of the National Park remaining relatively intact, while a portion of the burned area had also been affected by fires in the summer of 2022. Despite the ecological impact the fire caused huge damage to the socio-economic status of the area. During the occurrence of the fire 12 villages had been evacuated and the main hospital of Alexandroupoli city (Xanthopoulos et al., 2023). Unfortunately, during the fire, 26 individuals, including 20 immigrants attempting to cross the forest illegally, were tragically killed, while 25 more were rescued by firefighters (Γκουρμπάτση, 2023; Kathimerini.gr, 2023).

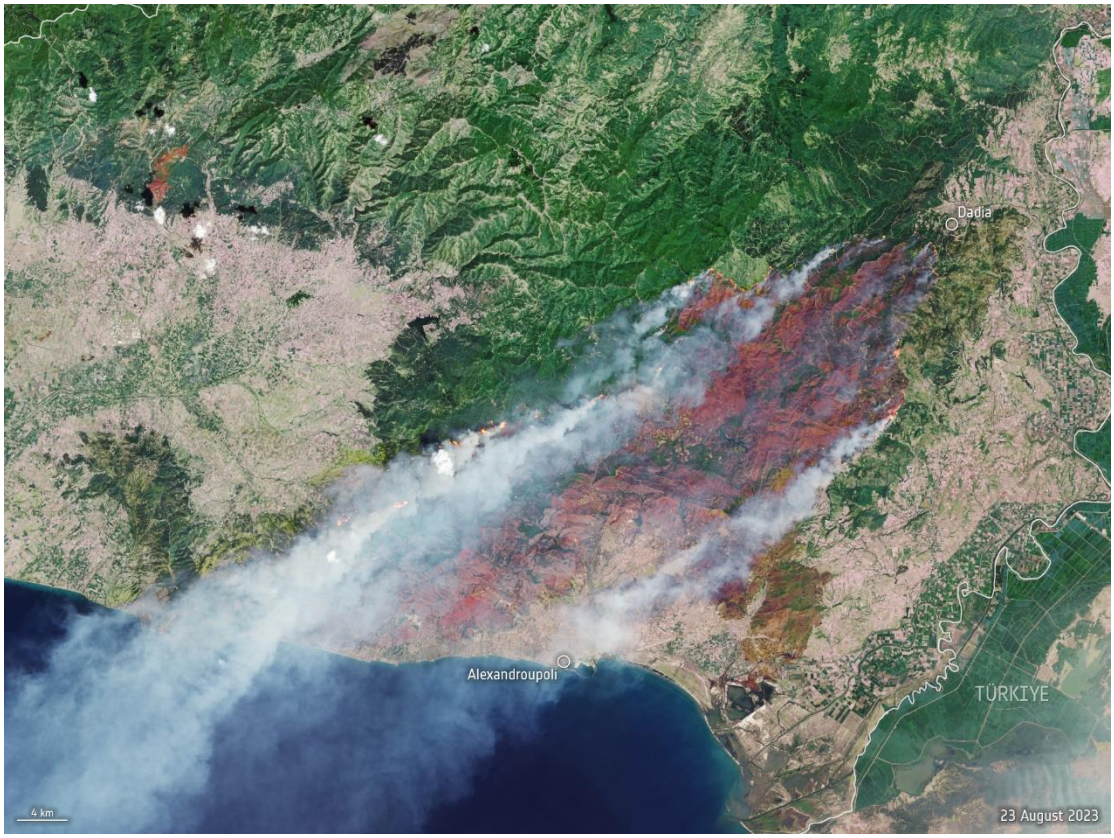


Figure 2: The 2023 wildfire event in the Evros region of Greece (Wildfires Continue to Rage in Greece, n.d.).

1.3 Research objective

Regarding the problem statement and the preliminary research, the objectives of this study are presented below. First, the research aims to explain how the wildfire paradox developed in this complex system and how this influences the collaboration and coordination between the three main organizations that are involved in wildfire management (Fire service, Forest service and Civil protection). Therefore, my focus account is on how these organizations are influenced by institutional factors that impact cooperation in mitigating the risk of wildfires. Secondly, by utilizing the case study of the wildfire incident from 2023 in Evros region, the aim is to examine through the lens of perceived legitimacy, how members of the three main organizations assessed the collaboration and coordination among them, during the response phase. This examination will enable me to identify if there are any kind of challenges and obstacles between the organizations. Finally, the study aims to explore future possibilities on how wildfire management in Greece can boost it National Mechanism for effective response and mitigation of future wildfire incidents.

1.4 Research question

In line with the research objectives, the main research question formulated to address the issues described earlier is as follows: “What are the lessons to be learned from the Evros wildfires incident of 2023 regarding the challenges to wildfire management in Greece?”
To answer the main question, the formulation of specific research questions was essential.

1. To what extent the formal institutions such as the laws, policies, and regulations within each of the three organizations (Fire service, Forest service and Civil protection), influence collaboration and coordination in wildfire management effort in Greece during the suppression phase.

2. How did the collaboration and coordination among the three organizations that were involved in the case study of 2023 be described through the lens of perceived legitimacy?
    - What are the members’ perceptions within each organization regarding the challenges and obstacles impeding effective interorganizational collaboration?
    - Are there differences in the challenges identified by members from each organization?

3. What are the future recommendations to enhance coordination and collaboration among organizations in Greek wildfire management?

2. Theoretical framework

In this chapter, I will discuss the main conceptual approaches that will support my research. Under these considerations, following institutional theory combining with the concepts of coordination, collaboration and legitimacy, will place my research in a wider context of fire management.

2.1 Institutional Theory

According to North, (1991) “Institutions are the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction.” The Institutions encompass the established and widely accepted social norms and regulations that guide human decision-making and conduct within societal frameworks and interactions with the environment (Steen-Adams et al., 2017). The distinguishment of the institutions in formal and informal will help to guide my focus. The formal institutions are easily feasible through laws, policies constitutions and are created through officially sanctioned channels, while the informal institutions been defined as “socially shared norms, usually unwritten, that are created, communicated, and enforced outside of officially sanctioned channels” (Helmke and Levitsky 2004). The organizations on the other hand defined as the players of the game and consist of individuals who operate within predefined formal structures with the aim of achieving specific objectives, such as those seen in organizations like Civil protection, Forest service, and Fire service (North, 1991). Importantly, these organizations can be influenced by institutional factors. Moreover, Institutions are complicatedly linked to management goals, serving as catalysts that shape organizational behavior. Institutional theory explores the fundamental elements of social structures, focusing on the process that led to their establishment. The distinction that North, (1991) discussed within this theory is between organizations and institutions. Organizations, as I said, are typically can be seen as entities that prioritize effectiveness, efficiency, and control over production. In contrast, institutional environments are understood to value normative expectations, legitimacy etc. (Fountain, 2001). In this study, the focus will be on understanding how policies and laws shape organizational behavior in wildfire management and particularly in the response to the fire, while acknowledging the interplay between formal and informal institutions. As noted by Steen-Adams et al., (2017), it will be acknowledged that these institutions may engage in complicated and unexpected interactions, ultimately influencing the behavior of organizations involved in wildfire management practices. Within this argument, Puffer et al., (2010) acknowledges that when there is a void in the institutions and particularly when the formal institutions exhibit weaknesses in structure or are absent then the existing norms and values as informal institutions step in to fill this institutional void.

2.2 Defining Coordination and Collaboration within the context of disaster management

Within the domain of disaster management and the mitigation of future disaster events, organizations are influenced by the institutions, and this can be seen in various interpretations of the "comprehensive framework for disaster management" also recognized as the: Prevention, Preparedness, Response and Recovery (PPRR) (Cronstedt, 2002) (Figure 3). Having established that Institutions can influence an organization's behavior, the focus now shifts to examining at how these crisis management-related organizations interact and cooperate with each other, while at the same time addressing their own priorities, capabilities, and responsibilities.

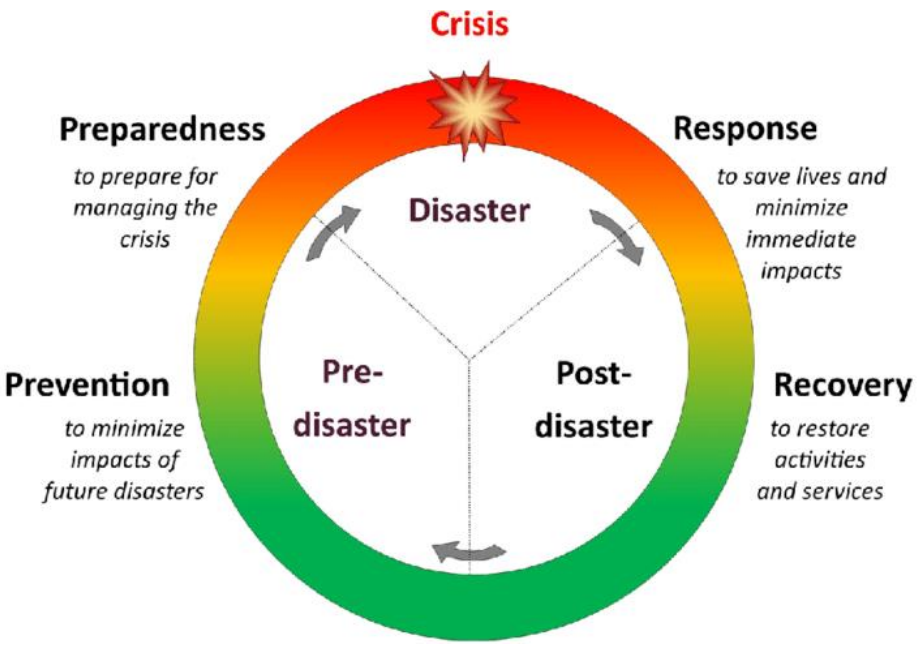


Figure 3: The disaster risk management cycle (Le Cozannet et al., 2020)

According to Comfort et al., (2004) coordination occurs across multiple levels within the disaster risk management cycle. For that purpose, coordination is an important asset that in my research was discussed especially during the investigation of the case study. I used the definition of Malone and Crowston, (1990) that described coordination as the management of dependencies between entities. During a crisis multi-organization coordination involves the synchronization of actions among various organizations. For that reason, as Bharosa et al., (2010) stressed in order to provide the whole spectrum of coordination the distinguished of three perspectives on coordination: the micro-level, focusing on coordination among individuals, the intermediate level, centering on coordination within organizations, and the macro-level, which considers coordination across organizations. Despite its clear importance, coordination in disaster response has received relatively limited focus in scientific research so far (Chen et al., 2008b). Starting from the micro-level, is important to arise some of the obstacles. Making decisions and taking actions during a disaster response is challenging for individuals due to severe time pressure and an overwhelming influx of information, which may be inaccurate or outdated by the time decisions are made. Based on that Lindblom (1968) and March (1988), noted that during a complex and intense environment a decision-maker's mental capacity is limited by the time available to focus and the vast number

of alternatives to consider. At the intermediate level, Bharosa et al., (2010), recognized that collaboration and transparency are two assets that organizations need, especially during disaster response because there may be variations in organizational cultures and structures across the different organizations. Therefore, collaboration works as the glue that fosters relationships among multiple and with diverse characteristics organizations. Thus, collaboration is crucial in disaster management because it addresses the limitations of individual organizations in handling complex and large-scale disasters by enabling efficient resource use, rapid response to uncertain demands, and effective integration of diverse capabilities (Woong, 2019). The organizational structure, as noted by Bharosa et al., (2010), can differ in style, as it can contain military-style, hierarchical commands and control structures. However, these variations in reality are not rigid, as Granot (1997) observed that some organizations operate with strict discipline and hierarchical control, while others are more informal, with varying decision-making styles from authoritarian to democratic.

To overcome these challenges that can potentially lead to conflict (O'Leary and Bingham 2009) cooperation between the organizations is crucial to be included in my research. Cooperation is a notion that in the field of disaster management is equally important as coordination and collaboration. While coordination focuses on organizing efforts and collaboration involves joint decision-making, cooperation is about the willingness to engage and contribute to a collective effort, while different organizations having different priorities, capabilities and responsibilities. In this research I discussed cooperation within the context of fire management within the national level without involving the external factors such as international cooperation.

2.4 Defining legitimacy

Corresponding to that an important element as many studies identified is the trust to establish collaboration which is also connected with the legitimacy of actors (Boin, 2018). Moreover, the concept of legitimacy is vital during the crisis response phase, as organizations risk negative consequences if their actions result in adverse outcomes, such as fatalities (Massey, 2001). The author also explored the concept of organizational legitimacy in the context of organizational behavior, distinguishing it into two primary types: strategic and institutional. The strategic approach highlights how organizations strategically employ communication strategies to manipulate symbols and gain legitimacy whereas the institutional approach focuses on the cultural environment in which the organization operates and is influenced while pressuring to conform to expected, normative behaviors. In the conceptualization of legitimacy, the author described it as a dynamic process including the interaction between organizational strategy and stakeholder expectations, instead of referring to a single activity. To properly manage legitimacy, both of the above must be consistent. Keohane and Nye, (2001) distinguish the previous concept of legitimacy as 'input' and 'output'. The 'input' is linked to the perception of the legitimacy by the stakeholders but also the degree that the organizations adhere to democratically established rule, standards, and laws. While the 'output' pertains to how the organization's performed during the crisis event and it will be thoroughly examined within the selected case study. To conclude, regarding the legitimacy in my research, following the institutional approach provides valuable insights into how the collaboration of the organizations is taking place. Therefore, according to Meyer and Scott, (1983) legitimacy defined as the degree of

cultural support for an organization, reflects the shared beliefs, values, and norms held by the member of the organization and the organization itself. These differences in beliefs and values regarding wildfire management and response to the fire can lead to conflicts and hinder effective collaboration among organizations. Moreover, organizations may perceive their approaches as legitimate based on their cultural environment and member beliefs, exacerbating collaboration challenges.

3. Methodology

In this section, I will describe the methodology I used to answer each of the specific research questions. Firstly, the preliminary review was essential in order to gain the proper knowledge about the fire sector. To do so, the separation of the methodology into four phases was a catalyst. Therefore, literature research, document analysis (official documents and grey literature), semi-structured interviews, and web-based surveys were conducted to shed light on the organization's collaboration and understand how members perceive the legitimacy of their actions within a specific wildfire incident. Furthermore, the survey method that I used to collect data contained different types of questions such as closed ended with predefined response options and multiple-choice or Likert scale. This quantitative research method helped me to analyze the different perceptions of each of the organizations regarding my topic and provide information that cannot be collected by systematic observation (Gürbüz, 2017). Despite that part of a qualitative research method by utilizing semi-structured interviews I aimed to offer a comprehensive understanding of the mentioned concept of legitimacy and cooperation and address my research questions (Jamshed, 2014). Qualitative research supports exploring experiences, perspectives, behaviors, and beliefs related to specific topics by seeking insights and viewpoints of the participants (Hammarberg et al., 2016). Employing various methodological approaches was essential to uphold the validity and reliability of the study (Bernard, 2006).

3.1 Data collection and analysis

3.1.1 Literature study

Firstly, for the literature review, I focused on the surrounding concepts related to the collaboration of organizations in wildfire management and the principles that I needed to include in my theoretical framework in order to boost my structure and provide the proper elements to delve into my research. Afterward, conducting the literature review as much as possible, and having established the foundation to understand and address the research questions as well as to construct the survey and interview structure. This first phase of the methodology was important in order to clarify the actual needs of the research questions provide additional meaning to them and place them in the wider context of fire management studies

3.1.2 Documents analysis

For the document analysis, I focused on relevant official documents, such as policies and laws for each involved organization, as well as grey literature, including reports and media articles. Given the recent nature of the case study, there was a scarcity of scientific literature, making grey literature particularly valuable. Staying updated with these documents was essential for gaining a comprehensive understanding of the wildfire incident's outcome and for shaping the questions used in my survey and interviews. This approach allowed me to explore the full spectrum of collaboration among the three organizations. Additionally, reviewing policy instruments, such as the independent committee’s report by Goldammer, helped me understand the formal

institutional factors influencing organizational behavior. I also examined the laws and regulations that govern each organization and based on my research questions, summarized the legal framework and representation of actors involved in the suppression phase of fire management in Greece (see Appendix I).

3.1.3 Semi-structured interviews

Another key aspect of my methodology involved conducting interviews with experts in the field and representatives from relevant organizations. These interviews provided crucial insights that helped me answer my research questions, particularly those related to the case study of a specific fire incident. My initial aim was to select interviewees who had participated in the Evros fires of August 2023, as this would enhance my understanding of perceived legitimacy and offer a comprehensive perspective on how individuals perceived collaboration among their organizations during the suppression stage. Appendix II includes a preliminary list of the organizations and members involved in the case study, with acronyms used to ensure their anonymity throughout the research. First, I contacted each participant by phone or email, providing all necessary information about the purpose of my thesis. Before the interviews, both the participants and I signed a consent form to ensure their rights and protect the study's validity. All interviews were conducted online via Zoom, lasting between 20 to 37 minutes. These interviews were fully recorded, translated, transcribed, and analyzed, as explained in the next section (3.2 Data Analysis). I chose semi-structured interviews because they provided the flexibility needed to address my research questions and gather insights into Greece's current state of fire management, with a specific focus on the operations during the suppression stage and the challenges faced in terms of inter-organizational collaboration. The selection process ensured representation from the mentioned organizations to prevent bias toward any specific aspect of the fire management mechanism. However, due to delays with bureaucratic procedures from the Fire service, I was unable to secure an interview with a representative who participated in the 2023 Evros fire. To ensure representation from the Fire service, I decided to interview a former member who, although not directly involved in the Evros fire of 2023, provided valuable insights relevant to my study. Despite this setback, the approach still enriched my research by capturing informal institutional factors such as norms, beliefs, and perceptions of those who participated in the case study.

3.1.4 Web- based survey

Regarding the web-based survey, was conducted in the spring season before the actually start of the fire season in order to ensure the participation of the organizations. In this quantitative survey was designed to examine the perceptions among Forest service, Fire service and Civil protection regarding the challenges that faced during the case study and affects collaboration. As a first step, a communication through phone or email with the organizations that involved in the specific wildfire incidents that happened in Greece took place to ensure the collaboration and establish the reasons of my research. The focus is specifically on identification of individuals associated with local and regional Fire service operations, local and regional Forest service operations, Civil protection and operated during the event. Surveys offer a platform for state actors to express their opinions freely, without fear of repercussions. Additionally, surveys

allowed me for the collection of quantitative data, facilitating the analysis of trends and patterns across a larger sample size. In a second step, and following the logic of the research question, I built the survey first in a Microsoft word using previous examples of online surveys that were conducted in the same field. Therefore, topics covered in the survey by using different types of questions such as 5-point Likert scale ("Strongly disagree" to "Strongly agree") or ranking order when I asked from the participants to order based on their beliefs challenges that may associated with interagency from "1" to "8" (see Appendix III). Following the above, the survey was constructed through Qualtrics, an online survey and feedback platform and it will consist of three parts with different types of questions as mentioned. The first part was personal questions about the responders such as status and expertise, the second part general questions regarding their beliefs and perception of collaboration and coordination during the event and lastly, questions about their challenges or obstacles regarding the current situation of fire management and the decision- making process in a National level. The survey URL was distributed by the researcher to the local departments of each organization via email. It was accessible to everyone for almost three months from 21st of March to 7th of June 2024. I received 30 completed surveys for 10 respondents per organization. The responses regarding the case study are relatively small. On such a large scale usually, the personnel that operate are from all over the country, with additional support from abroad and the European Union can reach thousands. Based on publicly available statistics from the Fire service, the personnel that responded to the Evros fire over the course of 15 days were 2015 individuals (firefighters, volunteers, foresters, etc.) (Πυροσβεστικό Σώμα Ελλάδας, 2023). In the survey, variables like age and years of serving are included to examine if the results reveal any trends about the experience and aging of the personnel. Previous research has already emphasized that there is a tendency for Forest services to have older staff members (Xanthopoulos et al., 2020). However, because of my limited sample size, this factor cannot be classified as important, and as a result, I am unable to provide more information or make generalizations about the Evros fire of 2023.

3.2 Data analysis

First, the interviews were transcribed using the Microsoft Word's transcription tool. Following extensive manual checking and correcting, I translated the transcript interviews from Greek to English. Once the documents were digitized, I moved them to Atlas.Ti program in order to start with coding. I began classifying the digitized documents using thematic analysis (Naeem et al., 2023). To extract relevant information that could help answer my research question, I developed a set of codes. Using a deductive approach, I built the codebook (Elliott, 2018). The codes were primarily based on the theoretical framework to guide data interpretation, but in some cases, they also emerged directly from the data itself. In a similar manner, I coded individual quotes and then grouped them into broad themes. My research questions served as the guidelines for the formulation of the four themes: formal institutions, informal institutions, challenges, and future recommendations. The interpretation of the data, including the beliefs and opinions of the interviewees, was treated with equal importance and respect when necessary. This process formed the core of my results. An example of this analysis is provided below (Table 3).

Moving to the quantitative survey, I developed it using the online platform Qualtrics. After collecting all participants' responses, I created a dataset by entering the responses into Excel. For the analysis, I utilized IBM SPSS Statistics software. Following Vaske's (2008) guidelines, I converted all variables (Likert scale items) into numeric values and then visualized the data through figures and tables. Due to the small sample size, I did not conduct any statistical analysis; instead, I used the software primarily to categorize and compare the data obtained from the online survey.

Table 1: Example of the data analysis in Atlas.Ti.

Quotation	**Code**	**Code Group**
"The president of each coordination body for the Regional Unit is the local deputy regional governor"	Bureaucratic procedures	Formal institutions
"Alright, there's a gap in our cooperation. There's no communication, no joint effort in the field, when a fire is occurring"	Cooperation	Informal Institutions
"There must be ground teams in forest firefighting, like the Special Forest Operations Units (E.MO.D.E.)"	Resource Allocation	Challenges and Obstacles
"We need to keep local forest workers in the mountains because the locals know the place well; they have much more reason to protect it because it's their home, their workplace, the place where they work and live"	Local knowledge	Future recommendations

4: Results

In this chapter, I will examine the roles, responsibilities, and current challenges of the main actors involved in Greek wildfire management. I will highlight their participation across all phases of the fire management cycle with a primary focus on fire suppression, introduce the relevant legal framework, and identify key challenges and obstacles faced by the respondents from the interviews and the online survey. The chapter is divided into two sub-chapters: the first part addresses research questions 1 and 2 through a case study and general findings from a specific fire incident; while the second part addresses research question 3, providing the general results for the future options based on the interviews.

4.1 Organizational Roles and Legal Framework in Fire Suppression

4.1.1 Fire service

Role and Responsibilities

The Fire services, as I have already mentioned, is the main actor that is responsible for wildfire management alongside the local firefighting departments across the state. Therefore, following the emergency management cycle in the response phase, the Fire service is the main actor which also has the responsibility to coordinate all the other actors that are involved in the fire regime. Similarly, law 2612/1998 (ΦΕΚ 112 A') provide to the Fire service the responsibility for the operation efforts during the fire suppression for the forest and agricultural land. Furthermore, law 3511/2006 (ΦΕΚ 258 A') established that the Fire service has *"The responsibility and operational planning for fire suppression and the provision of assistance for the rescue of individuals and material assets threatened by fires. "Operational planning for suppression" refers to the organization, management, and coordination of all involved firefighting and rescue forces, equipment, and other means. "Operational planning for suppression" includes actions that ensure timely detection, reporting, and intervention, in order to achieve the immediate and effective handling of fires and the dangers arising from them."*

Moreover, I will further explain the Fire service act according to law 4662/2020 (ΦΕΚ 27 A'), «National Crisis Management and Risk Response Mechanism, restructuring of the General Secretariat for Civil Protection, enhancement of the civil protection volunteer system, reorganization of the Fire service, and other provisions». Following that in order to ensure cooperation between the actors, a couple of established Common Ministerial Decision such as the 12030Φ.109.1/10-5-1999 "On the regulation of cooperation issues between the Fire service and the Armed Forces, the Hellenic Police, the Forest service, the Local Government Authorities, Health Services, and other agencies and individuals providing their services for the prevention and suppression of forest fires" (Government Gazette B' 713). The recent one was established in 2019 through the Common Ministerial Decision 18/1752/2052 "Regulation of cooperation issues between the Fire service and the Forest service at central and regional levels" (ΦΕΚ B' 1525) trying to resolve any issues regarding communication between the two organizations to ensure the cooperation during the fire operation efforts in the response phase. Another important note is that the organization which has a semi-military structure belongs to the Ministry of Climate Crisis and Civil Protection which also has the duties of the General Secretariat of Civil

Protection (GSCP). Until 2021, the Fire service fell under the Ministry of Citizen Protection. This separation made cooperation and resource coordination during field operations significantly more challenging due to bureaucratic delays and differences between the two Ministries.

Perceived Legitimacy

This subsection presents findings from interviews regarding the perceived legitimacy of the current legal framework and its impact on operations during the suppression phase. While the Fire service's role is clearly defined in the legal framework, the complexity of wildfire management necessitates multi-organizational participation, leading to operational inefficiencies and bureaucratic delays during fire regimes.

Respondent E from the Fire service acknowledged that the current legal framework could create delays during operations. Regarding that, they mentioned that because of the semi-military structure of the Fire service, their decision is based on the laws they followed quite faithfully. Therefore, the respondent said that we need to examine whether the current laws and decisions that are in force can achieve cooperation among the organizations or they just remain only in their formal expressions and actions without achieving substantial results.

They noted that under existing legislation, coordination during fire incidents is managed by the National Coordination Center for Operations and Crisis Management (ESKEDIC) from GSCP. This center operates under the Fire service's responsibility. It includes cross-sectoral participation from other actors such as the Armed Forces, Hellenic Police, and the Forest service. However, this body functions only at the central level, specifically in Athens. This creates a significant gap in the overall suppression efforts because, as I will discuss later, the absence of a coordination body at the local level was one of the main factor's respondents identified as hindering the flow of information among the involved actors. This was also pointed out during one of the interviews:

"Yes, for example, Law 4662/2020 provided for the establishment of 13 Regional Civil Protection Operational Centers, which would function like smaller versions of E.S.K.E.D.I.K. in each region and would operate similarly at the regional level. These have not yet been made operational." (Respondent E)

Furthermore, Respondent E underlined that although the state is making formal arrangements to resolve this issue, these efforts are *"not substantial enough to achieve truly good coordination and full cooperation of all relevant organizations during the response phase."* Past decisions regarding firefighting responsibilities between the two organizations continue to affect overall cooperation. Despite being retired, the respondent was hesitant to address critical questions regarding the Evros fire of 2023. However, they agreed with the other responders' remarks regarding the difficulties of the operation and its circumstances. Additionally, due to the semi-military structure and the challenges officers face in freely expressing their opinions, respondent E often politely deflected and changed the subject. Instead, we discussed the general situation, the challenges the Fire service is facing, and the state's approach to fire management.

4.1.2 Forest service

Role and Responsibilities

The Forest service is an important agency in the development, protection, and management of the country's public forests, as well as in forest policy matters, technical supervision, and monitoring of non-public forests (ΥΠΕΝ, 2023b). For the current situation of the actor is crucial to briefly depict how a series of laws and regulations change and reform the prestige of the organization. As already mentioned in the introduction before 1998, Forest services were the main actor that covered all the domains of the management of forest and agricultural fires in Greece. However, with the implementation of law 2612/1998 the responsibility for the response to forest fires transferred to the Fire services restricted in this way the Forest service to responsible for the prevention and partly for the restoration phase of wildfire management. The organization belongs to the Ministry of Environment and Energy while the Forest Services are the local bureaus of the directorate-general of forest and forest environment.

According to law 998/1979 (ΦΕΚ 289 Α'), the Ministry of Environment and Energy has the authority to declare an emergency in an area either before or after a wildfire regime. This allows for the direct implementation of construction and other projects needed for the phases of prevention or restoration. These actions bypass the standard procedures of other actors or institutions. At the regional level, there are 7 Forest Directorates and 7 Forest Coordination and Inspection Directorates in each of the 7 Decentralized Administrations of the country. Furthermore, since 1998, efforts have been made to ensure collaboration between the Fire Service and the Forest Service, as both organizations are involved in the prevention and suppression of forest fires. These efforts include the adoption of a joint decision on mutual assistance (see Decision No. 181752/2052/02.05.2019), which operates under the general framework established by Law 2612/1998 for the Forest Service. Since my focus is on the response phase of the wildfire management cycle, it was essential for this study to clarify the legal framework and the responsibilities of the Forest Service. Therefore, under the current laws and the lack of resources, the organization is only able to play a supporting role during the forest firefighting operations within its area of responsibility. Furthermore, the organization participates in the Coordinating meetings that GSCP establishes before the start of the fire season or when a fire occurs and plays an advisory role. It can also inform other organizations regarding the preventative measures the Forest service has implemented. However, with the new operational doctrine of Fire service the Forest service can be a support team in the field during the operations providing an advisory-informative role, but this is something that has not been implemented yet.

Perceived Legitimacy

One of the main challenges in wildfire management in Greece is the inconsistent implementation of current laws and regulations by state actors. According to respondents from the Local Forest Service of Alexandroupoli and the Forest Directorate of Evros, a key lesson from the Evros incident was the poor coordination and lack of cooperation with the Fire Service and other organizations once the fire escalated. While extreme weather conditions, challenging topography, and the area's ecology played a role in the situation, respondents highlighted systemic issues within the organizations that have persisted for decades. They emphasized that these issues need to be addressed by the state to protect the remaining forests effectively. Based on these conditions respondent A

portrays when asked, how the cooperation with the other organizations is regarding wildfire management:

"There's a gap in our cooperation. There's no communication, no joint effort in the field when a fire is occurring."

Furthermore, regarding the legal framework in Greece, respondents indicated that the existing laws and institutional framework are not inherently problematic. The chronic issue is the lack of implementation. It was not specified whether this is a Forest service-specific issue or more general. Respondent B highlighted that the state's decision in 1998 has led to prolonged communication and cooperation issues for a long time, despite attempts to reestablish this through protocols such as Ministerial Decisions (from the Ministry of Environment and Energy and the Ministry of Climate Crisis and Civil Protection). Respondent A mentioned that documents such as the "IOLAOS 2" General Emergency Response Plan for Forest Fires created by the GSCP are positive initiatives but unfortunately, these guidelines are not fully followed or implemented effectively, particularly due to the Forest service's degraded state over the years. However, as both of the interviews wanted to embrace the positive examples, respondent B stated:

"One significant event that took place in the middle of the fire's progression was when, on our initiative, we proposed creating an intervention zone in the northwestern part of our Forest Service's area of responsibility. The Fire Service supported this action with firefighting resources, and we collaborated closely, also involving and supporting the Forest Associations working in this area."

This example highlights that when both organizations are willing to contribute either with resources or assist each other within the legal framework effective cooperation is achieved. However, the respondents agreed that the lack of resources for Forest services in general impacts prevention efforts. This not only affects the perceived legitimacy of the Local Forest departments but also hinders cooperation and ultimately diminishes trust in the Forest service from other organizations, especially from the Fire service.

4.1.3 Civil protection

Role and Responsibilities

In light of the Climate change era in September of 2021, New Democracy's government decided to introduce a new ministry. The responsibility of the Ministry of Climate Crisis and Civil Protection is to connect citizens and the State through innovative approaches. It aims to integrate "traditional" approaches to how we manage natural disasters with the reality of the climate change that we as a society are facing. This new ministry facilitates GSCP which is the administrative branch of Fire service and has as a purpose a better coordination of the Civil protection. Civil protection works with the Disaster management cycle that contains the phases of prevention, preparedness, response, recovery, and lastly rehabilitation (Burdak, 2018) (Figure 5). The purpose of the new ministry is to enhance the country's resilience against current climatic conditions while contributing equally to all five phases of the disaster management cycle.

Figure 4: The Disaster Risk Reduction Cycle (Burdak, 2018).

The institutional framework for Civil protection was established in 1995 with the creation of GSCP under the Ministry of Interior with law 2344/1995 which concerned the Organization of Civil protection and other provisions regarding coordination and management of emergency situations (law 2344/1995 (ΦΕΚ 212/Α)). Before this, the administration's role in disaster response was tied to concepts like Civil Emergency Planning (CEP) and other related legislations on civil mobilization. These frameworks were designed to support the Armed Forces, which played the dominant role in disaster response due to their resources, or conversely to supplement the administration with materials it lacked.

Law 3013/2002

With the enactment of law 3013/2002, the country enhanced the GSCP and established a legislative framework linking Civil protection with emergency crisis management. Below, I outline some of the responsibilities of the GSCP, which remain in effect today and have been discussed with individuals from the Organization.

For the purpose of the study, I will outline only the responsibilities that refer to the suppression phase of fire management.

- The establishment of a Central Coordination Body for Civil Protection includes key responsibilities such as coordinating the deployment of the necessary human resources, equipment, and the overall effort to address major general, regional, or local disasters. Furthermore, this Central Coordination Body operates 24 hours a day during the progression of the disasters, while providing updates on the situation to the citizens with instructions and how to tackle the phenomenon during the progression (law 3013/2002, Article 5)
- The GSCP has as an objective the research, development, the organization, and the coordination of the policy of the country for the prevention, information and the response of natural and technological disaster or emergency situations. (law 3013/2002, Article 6)

- The GSCP, in collaboration with the relevant state agencies, prepares the annual procurement program for all mechanical equipment and other materials necessary for the country's civil protection, based on the National Civil Protection Plan. (law 3013/2002, Article 6)
- In the GSCP was assigned the management of emergency situations, which includes the declaration of an area as being in a state of emergency as described in Article 8 of Law 3013/2002, and specifically: "In the event of a civil protection mobilization, he decides on the immediate procurement and distribution of materials, supplies, and equipment, exceeding the budgeted amounts if deemed absolutely necessary."
- Responsible for the implementation of civil protection measures, in addition to the General Secretary for Civil protection, are the Regional Governors, Prefects, the Mayors and the Presidents of the communities. (law 3013/2002, Article 10)
- Another important element within the framework of civil protection, a Registry of volunteer organizations and volunteers was created, and their roles were institutionalized. (law 3013/2002, Article 14)

That law clearly defined Civil protection as encompassing all actions that, in times of peace, the state needs to deal with and remain alert for emergencies. It marked the beginning of citizens involvement as an important element in the planning phase of civil protection. This study will not focus on volunteerism and the crucial role volunteers play in the suppression phase, but it is a necessity to note that this law institutionalized their involvement. Additionally, Article 13 of the law institutionalized the Local Coordinating Body. Following the merging of Municipalities and Communities (Kapodistrias Plan), civil protection departments were established at the Local Government Organizations level. It mandated the presence of specialized civil protection personnel, who are required to have a specific level of university education. These personnel should have expertise in sciences that ensure an understanding of the environment and natural disaster phenomena (such as geologists, foresters, surveyors, and civil engineers), along with further training in various areas of civil protection and different categories of risks, encompassing all phases of the emergency crisis cycle.

Consequently, through this law, a network operates at four levels. It starts from the level of Central Administration with the Ministries and the GSCP, which are responsible for the administrative divisions of the country. The risk management, from either natural or human-made factors, is organized and assessed by relevant departments within each ministry (Health, Environment and Energy, Labor, etc.). These Ministries are responsible for implementing measures to prevent accidents related to disaster in their respective area of responsibility and developing and enacting laws and regulations of European directives to mitigate these risks. The Decentralized Administration and Local Government (both Regions and Municipalities), are responsible for implementing laws and regulations for risk management and are divided into three levels, as mentioned above in Article 10. This administrative structure, both institutionally and technically, is supported by the involvement of security forces such as the Hellenic Police, Fire service, Coast Guard, and the Armed Forces. Notably, the security forces act as first responders during emergencies resulting from disasters.

After the legislative enactment of the GSCP, following the Presidential Decree 151/2004 "Organization of the General Secretariat for Civil protection (Government Gazette A' 107)". This Presidential Decree had as result in assigned GSCP as highlighted below:

- Coordinate preventative actions and responses to natural or technological disasters while researching, organizing, and planning necessary actions and informing citizens about relevant risks.
- To prepare and mobilize the necessary human and material resources of Civil Protection across the country based on the needs and category of the emergency.
- To utilize scientific information and data to appropriately deploy human and material resources.
- Lastly, to coordinate the response efforts during a disaster and subsequently manage the restoration efforts required due to the disaster.

Law 4249/2014

In response to evolving risks and the need to enhance citizen security, Law 4249/2014 mandated the modernization of key organizations such as the GSCP, the Fire service, and the Hellenic Police. This law aimed to restructure these organizations to improve their efficiency and effectiveness in crises. One of the significant changes was the reorganization of the GSCP into a new, flexible structure, with the Fire service becoming an administrative branch at both the Central and Regional levels. This restructuring aimed to improve response efforts through better planning and strategic allocation of human, material, and financial resources (Article 63 of Law 4249/2014). As part of this adjustment, the Unified Coordinating Operations Centre (E.S.K.E.) was established under Article 68 of Law 4249/2014. The responsibilities of the Regional Operational Center (PE.K.E.) were integrated into this new Coordinating Body, which included personnel from Civil Protection, as well as from Regional and Decentralized Administration. Another crucial establishment was the National Early Warning System with the number «112» which is a European Emergency Number Unit that after someone calls immediately searches for the necessary information to locate the caller. Furthermore, a three-year "National Civil Protection Plan was also established, and a "National Hazard Mitigation Policy" will be updated every 5 years.

Law 4662/2020

In 2020, a new framework was voted for the reform of the Civil protection system of the country: "National Crisis Management and Risk Response Mechanism, restructuring of the General Secretariat for Civil Protection, enhancement of the civil protection volunteer system, reorganization of the Fire Service, and other provisions".

Following the increasing trend of natural and technological disasters in both intensity and extent, it became vital to reorganize both the Civil protection and the Fire service and to adopt a modern and flexible National Crisis Management and Risk Response Mechanism. Therefore, this law introduced the National Crisis and Hazard Management Mechanism (Nat-CHAMM) which came to cover the whole Disaster Management Cycle and constitutes the entirety of the concurrent and administrative structures and functions of Civil protection (law 4662/2020, Article 2). Furthermore, the introduction of the National Mechanism established a vertical organization addressing the insufficient structures and gaps that were in the previous law (4249/2014) regarding the Coordinating Bodies at the Central and Regional levels. The law established clear directions and responsibilities for each level of Administration (Central-Regional-Local) to contract the

bureaucratic procedures that may cause in times of emergency problems in the strategic and operational or tactical level of the efforts (law 4662/2020, Article 3).

The structure of the National Mechanism is depicted and described below. One of the additions is the Coordinating Bodies for Civil Protection distinguished in three categories as depicted in Figure 2. The first one is the main operational body for the coordination of all the actions, the scientific documentation, and implementation of civil protection planning at the national level for the adherence to necessary measures to address emergencies and other actions, such as collaboration with other public agencies on relevant issues, as stated in Article 12 of the law 4662/2020. Additionally, the Regional Coordinating Civil Protection Authorities (P.E.S.O.P.P.) constitute broad-based bodies involving all relevant stakeholders, such as those responsible for managing forest fires, in cooperation with Civil protection at the regional level. They are responsible for directing the work of the Local Coordinating Civil Protection Authorities (T.E.S.O.P.P.) in emergencies throughout the entire disaster management cycle. Their main tasks include coordinating responsibilities in the operational planning of Emergency Management Frameworks and monitoring the implementation phases. Additionally, they design, organize, and execute public awareness and alert actions. They also enter into cooperation agreements with other regional bodies for mutual assistance in human resources, materials, and civil protection means. (law 4662/2020, Article 13),(ΦΕΚ 27/Α`) (Figure 6).

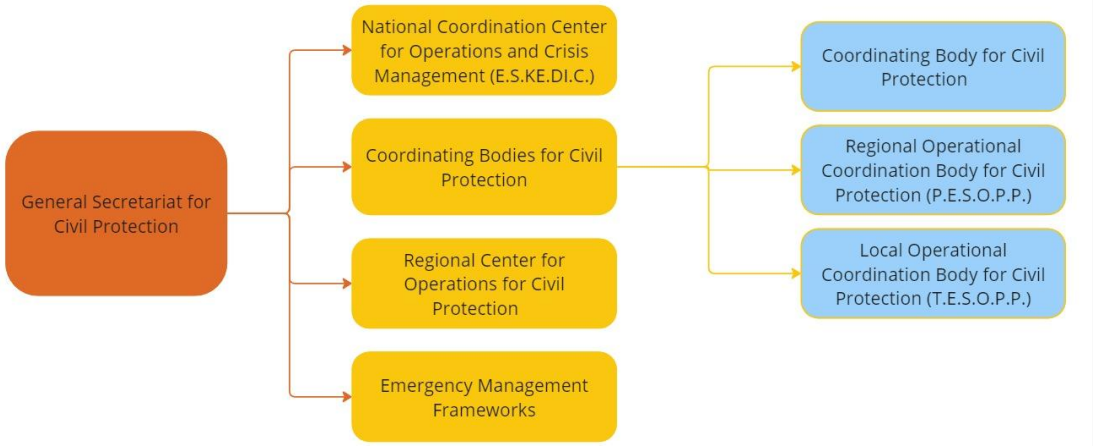


Figure 5: Structure of the National Mechanism based on the law 4662/2020

Perceived Legitimacy

After outlining the main points of the existing institutional framework, which establishes the legal boundaries of Civil protection, respondent C stated:

"The current institutional framework is ineffective in facilitating the interoperability of the organizations under the former regime because Law 4662/2020 had suspended its implementation. In the fire of Dadia, we didn't operate with P.E.S.O.P.P. and

T.E.S.O.P.P. because the Law had been suspended, but with the existing law now, all these coordination bodies do not interoperate with each other."

Respondent D from Alexandroupoli additionally highlighted that during the fire incident in 2023, the Civil Protection Coordinating Bodies of the Regional Unit of Evros (S.O.P.P.) and the Local Coordinating Bodies of Municipalities of Alexandroupoli and Soufli were activated twice. These bodies were institutionalized by law 3013/2002. Furthermore, they noted that before the fire season, they conducted preparatory coordination meetings where responsibilities and preparedness actions were discussed, but no decisions were made as these were coordinating meetings without decision-making authority. During the emergency in Evros, all involved organizations gathered to share their understanding of the disaster and to state how they could contribute with their resources. Respondent D emphasized that because the municipality of Soufliou is smaller than Alexandroupolis, additional resources are needed such as food and water for the citizens. Additionally, Alexandroupoli's Civil protection department assisted the Fire service in the Municipality of Soufli, when they requested machinery for the operations. Respondent D highlighted also that:

"The legislation in general for Civil protection in Greece does not provide clear responsibilities and a clear framework of action for the involved agencies, and this creates problems in cooperation and in the results."

This was evident in Evros, where Civil protection personnel, instead of staying in their supportive roles as legislation indicates, were involved in evacuating settlements operations (primary municipal responsibility). They were also present in the field during operations, taking pictures to show to the media that the organization was actively participating. Such actions can cause misunderstandings during emergencies and harm overall results. Additionally, respondent D mentioned that elected officials in essential Civil protection positions created issues due to their lack of understanding of current laws and responsibilities. Even though this was not the direct cause of the incident, it still contributed to the challenges faced. As respondents C and D mentioned, the lack of funds and resources such as machinery and the absence of drivers- who were not properly trained and terrified to use the machinery due to the risk to their lives- had led to challenges in Civil protection's legitimacy and trustworthiness in the eyes of other organizations in the area while this situation hinders the operational effectiveness of fire management during the response phase.

Table 2: Summary of the findings in Evros case

	Organizations involved	Challenge/issue
Cooperation	Local Fire service and Forest service	There was generally good cooperation between local departments, although there were some differences in the prioritization of settlements versus natural areas
Perceived legitimacy	Forest service	Implementation of prevention projects during the operation efforts. (e.g. creation of firebreaks etc.)
	Fire service	Lack of coordination because of the extreme weather conditions
	Civil protection	Bureaucratic delays in resources mainly for machinery from the municipalities
	GSCP and citizens	Absence of training and awareness for forest fires
"Olympus" involvement	GSCP and Fire service	Lack of information flow and coordination across the involved organizations

4.2 Challenges in inter organizational Collaboration

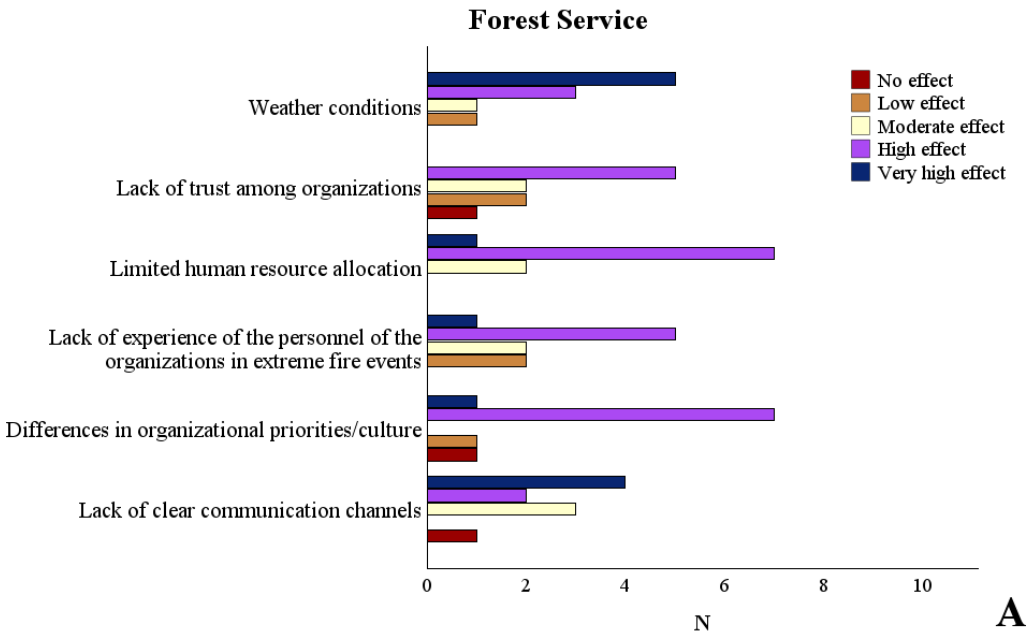
4.2.1 General perceptions of challenges

Respondents were asked to rate the extent to which various factors impeded effective cooperation among organizations involved in fire suppression. The responses were converted into the percentage of participants by using the first method to determine the range of the 5-point of the Likert scale. Therefore, each factor ranged as No effect (Range 1.00-1.80), Low effect (Range 1.81-2.60), Moderate effect (Range 2.61-3.40), High effect (Range 3.41-4.20), and Very high effect (Range 4.21-5.00). The rating was on a scale from "No effect" (1) to Very high effect (5). Afterward, using SPSS and the crosstabs tool, I compared two different variables: the results from the above question based on responses from the Forest service, Fire service, and Civil protection. Specifically, these results illustrate how the respondents among the organizations perceived the factors they were asked to rate (Figure 7).

Starting with the first factor, ***"Weather conditions"***, the majority of participants from the Forest service, Fire service, and Civil protection believed this factor played a significant role in inter-organizational cooperation. This is evidenced by over 20 respondents rating

it as having either a "High" effect or a "Very high" effect. Furthermore, factors such as the ***"Lack of trust among organizations"*** and ***"Lack of experience of the personnel of the organization in extreme fire events"*** are perceived also as important factors but without significant differences among the three organizations. In contrast, ***"Differences in organizational priorities/culture"*** respondents from the Civil protection perceived a "High" effect factor, with a 10 respondents rating, while the other two organizations, received a" High" effect from a substantial portion of respondents. ***"Limited human resource allocation"*** was a controversial factor among organizations. This is slightly depicted in the graphs with Fire service mostly rating it as a "Moderate" effect (Figure 7B), while the other two perceived it as a "High" to "Very high" effect (Figure 7A, C). Lastly, for the ***"Lack of clear communication channels"***, Forest service respondents rated variably, with a significant portion indicating a "Moderate" to "Very high" effect. Similarly, the Fire service perceived it as having a slightly higher "Moderate" effect but with also equal percentages for the "High" and "Low" effect, while the Civil protection, 7 out of 10 respondents rated it as a "High" effect.

These results highlight the varying perceptions of impediments to effective cooperation among the different organizations. While there are commonalities in the perceived impact of certain factors, such as ***"Weather conditions"*** and ***"Organizational differences"***, something that was also discussed during the interviews.



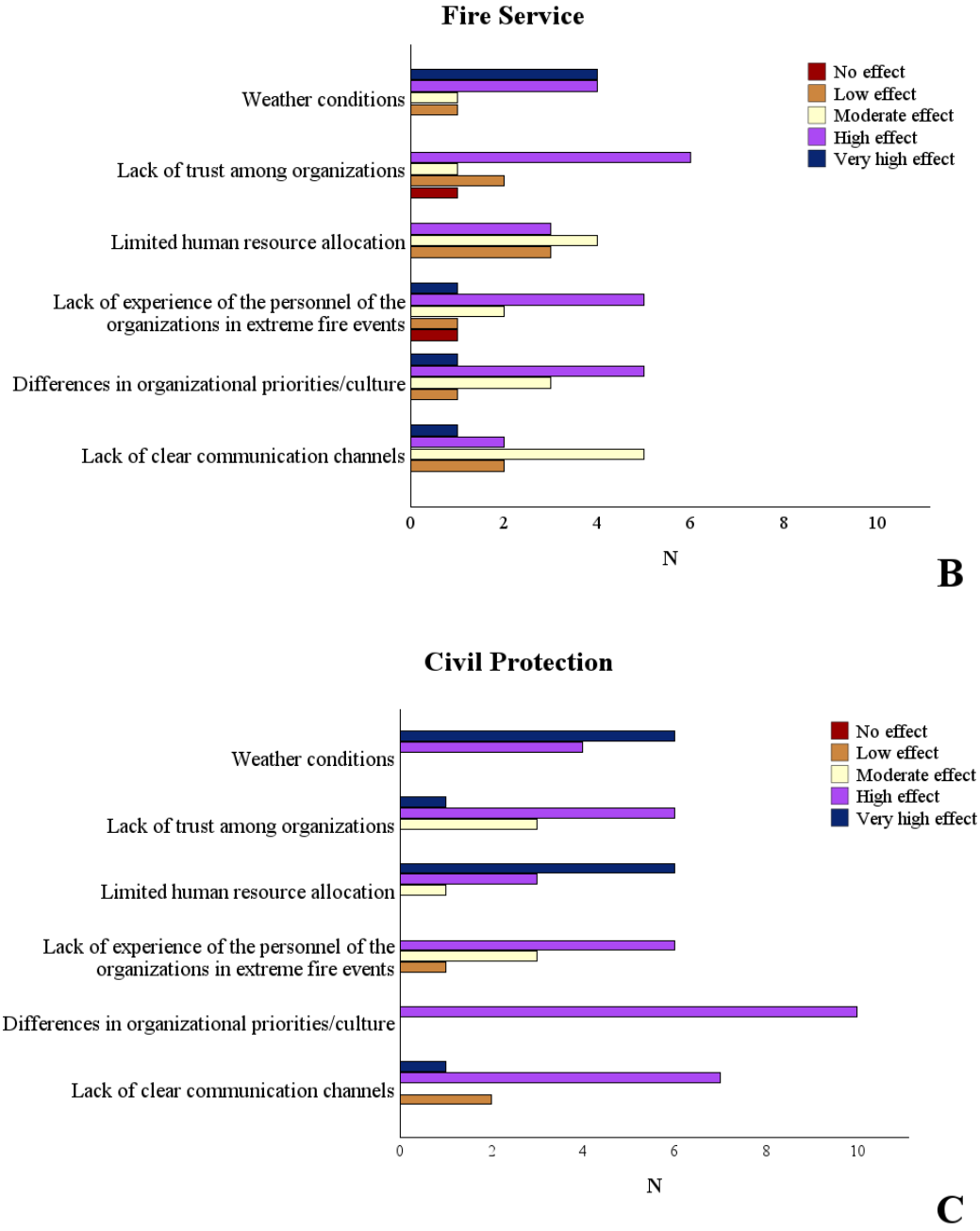


Figure 6: Linkert scale responses for one of the questions of the survey regarding the factors that impeded effective cooperation among organizations. (A) Forest service, (B) Fire service, and (C) Civil protection.

Following the previous question, I asked the respondents to rank eight factors, each describing a challenge associated with inter-organizational collaboration according to their perceptions (Figure 8). The responses were presented into the counts of participants that ranked each factor as Very high (Rank 1 or 2), High (Rank 3 or 4), Low (Rank 5 or 6), and Very low (Rank 7 or 8) based on a total of 30 answers. People perceived the ***"Extreme weather conditions"*** as a major factor that has a very high impact on inter-organization collaboration. Another important factor was the ***"Resource constraints"*** and the ***"Lack of communication"*** both ranked high indicating its critical impact on interorganizational collaboration. In contrast, ***"Trust issues"*** and ***"Organizational***

differences" had the least influence, while for the ***"Leadership conflicts"***, ***"Lack of preventative measures for fire mitigation (e.g. fuel management)"***, and the ***"Lack of experience or education in terms of forest fires"*** had equal percentages among the Very low/ Low and High/Very high response groups.

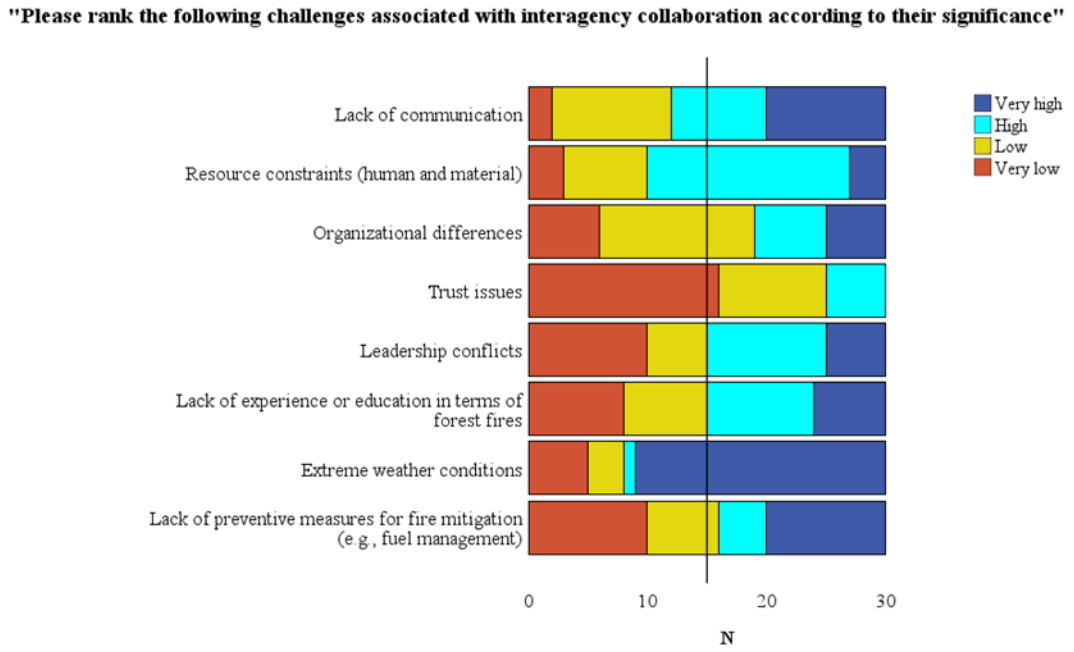


Figure 7: Linkert scale ranking of challenges that affect the interagency collaboration during wildfire suppression as counts of survey responses.

4.2.2 The wildfires of Evros

In this sub-section, I will present the findings related to the procedures, coordination among the three organizations, and the challenges identified by participants. The categorization of these findings aligns with the research questions, starting with the survey results on the Evros fires of 2023, followed by insights from the interviews regarding the notions of cooperation and perceived legitimacy.

According to the survey the respondents were asked to rank ten challenges faced by the organizations during the response phase in the Evros fires in August 2023 The results, presented as counts of participants who ranked each challenge, indicate that "Dealing with extreme fire type (crown fires)" was perceived as having the most significant impact during the case study. The challenge of ***"Insufficient number of forest personnel to operate with the Fire service"*** was rated quite high. Similarly, ***"Bureaucratic procedures that cause operational delays"*** was also identified as a major challenge. The ***"Lack of prevention actions in the wider area of the Evros region"*** was rated from moderate to very high, suggesting a need for improved preventative measures. On the other hand, ***"Insufficient knowledge of fire use during firefighting (backfires)"*** was perceived as a low influence challenge by most participants, receiving the highest counts among the organizations. Regarding the ***"Lack of expertise among personnel in environmental and forestry matters"*** the respondents from the survey perceived it as a

non-high-rated challenge regarding the case study. The ***"Challenges in coordinating the locals and the other stakeholders due to insufficient awareness and education about forest fires"*** and ***"Evacuation of settlements"*** were seen as low to moderate. Finally, the challenges such as ***"Limited availability of firefighting vehicles and aircraft"*** were also perceived variably, with some respondents rating very low and others as high. In the same logic also the ***"Lack of legislative framework for the coordination of forest fires"*** was perceived by the participants as a less influential challenge during the case study (Figure 9).

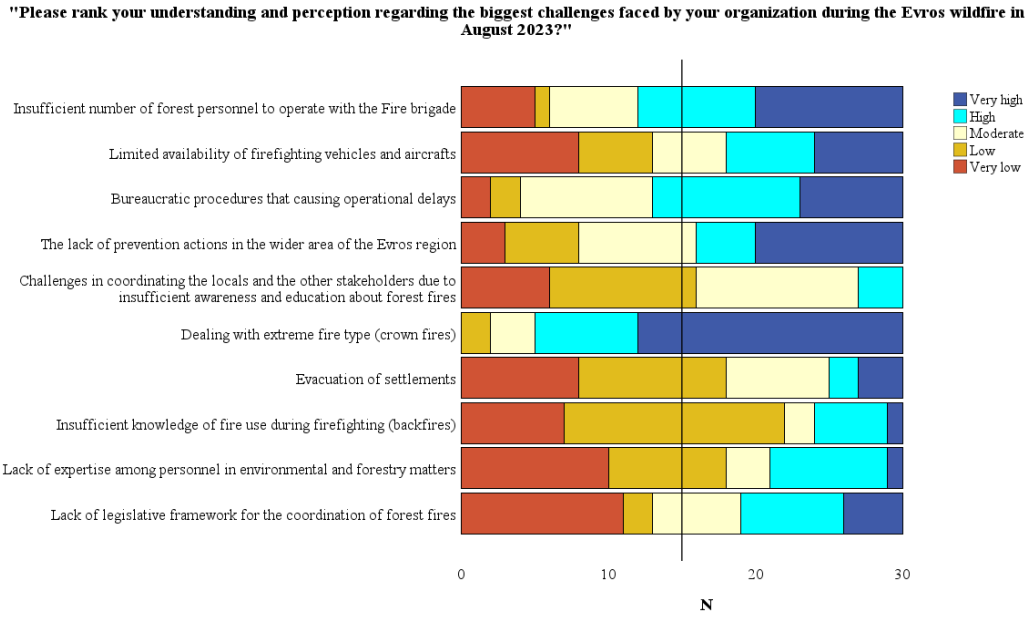


Figure 8: Linkert scale ranking of challenges that affect wildfire suppression efforts during the Evros wildfire in August 2023 as counts of survey responses.

Extreme weather conditions

Respondents from the Local Forest services highlighted the critical impact of weather conditions during the operations in Evros. Respondent A emphasized the difficulty in controlling the fire due to the combination of extreme weather and fire behavior:

"Due to various factors, the fire got out of control. There was minimal humidity, great force, and the fire was jumping 300 meters."

However, respondent E from the Fire service acknowledged that the weather was extreme as well due to climate change, but he didn't address or emphasize the case of Evros because he believed that other factors should be prioritized in order to mitigate the destructive impact of future fires:

"I believe that especially after the fire seasons of 2021 and 2023, which were among the three worst in the history of forest firefighting in our country and given the prospect of

climate change that seems to worsen conditions year by year, the majority of the Fire service staff believe that changes in the overall fire management plan are needed."

Respondent B also noted the importance of learning from the Evros incident, emphasizing the real and present impact of climate change:

"The example of Evros should serve as a lesson for the rest of Greece and Europe, that climate change is not theoretical; it is something we experience and significantly affects all our actions."

The above quote from the respondents depicts that in fact, extreme weather conditions are a major parameter in operations and can affect the cooperation of the involved organization. Prime Minister Kyriakos Mitsotakis also acknowledged the reality of climate change and its implications in his speech to Parliament on August 31, 2023, while the wildfire incident in Evros was still active:

"We must agree, however, on a common premise, a premise that arises from global experience. We need to realize something that is experienced not only in Greece but in many parts of the world: that climate threats – I am not only referring to fires but also to floods, and extreme weather phenomena – are often, not always but one step ahead of human defense."

"This is the reality of the new climate crisis which is already here. And for this very reason, in our country, although we prepared – I will insist on this and I am ready to respond to any well-intentioned criticism – we prepared, yes, better than any other year, we faced an unprecedented combination of events." (Στασινού, 2023)

Lack of forest personnel to support Fire service

Regarding the issue of the understaffed Forest Departments, which have been unable for years to properly support their duties and efforts. This controversial issue was also emphasized in the interviews with respondents from all the organizations providing evidence that strengthening the Forest service is more than a necessity to effectively support the Fire service. Respondent B described the challenges faced by his organization for more than two decades and explained why these conditions contribute negatively to the general suppression efforts:

"Since then, the Forest service has certainly been downgraded overall. For example, regarding the Forest Office of Alexandroupolis, we were 98 people back then—though I wasn't there, it was 98 people. Now we are 29 people. So, there has been a significant reduction in personnel, a significant reduction in resources, and a significant reduction in funding. Hence, our role has been limited only to prevention and support in forest fires, with the forest expertise we provide to the Fire service."

Respondent A also noted that the situation in Evros could get worse due to a lack of appropriate vehicles that the organization still uses for the response phase:

"We had one vehicle, 20 years old, which I don't know if would make it out of the fire. We went in and came out with the truck. We were lucky, I mean all these things need to be taken into account, and not talking about them only theoretically."

On the other side, Respondent B mentioned that recent funding from European programs like 'AIGIS' helped the Forest service to cover previous insufficiencies and fulfill their role. Similarly, respondents from Civil protection mentioned that this issue is a major barrier generally for management plans, particularly for Forest Departments that request funds to implement management plans for forests and research. Respondent D stated:

"These are the three main issues we state every year: we don't have enough personnel to do more, we don't have the resources to do more, and we don't have additional funding to do more. And not just to do more, but to do what we are supposed to do, which is within our responsibilities."

This phenomenon is frequently observed in all organizations involved in fire management, although it is primarily evident at the local level where the diminishment of these departments in a number of employees is depicted every year. From the side of the Fire service perspective, respondent E stressed that the lack of resources available to the Forest service can result as a hindered factor on the country's overall ability to tackle wildfires:

"What has been observed is that very large funds in recent years are directed towards suppression without corresponding funding for prevention."

Bureaucratic procedures causing operational delays

This challenge highlights the inefficiencies in the current legal framework that impede timely responses, which leads to ineffective cooperation between the involved organizations. In the previous chapter, I extensively reported on interviewees' opinions on the overall legal framework regarding the management of fires in Greece especially in the Evros case. Therefore, in this section, I am highlighting the issue of under-funding, because it has a significant effect on the organizations' bureaucratic internal structures. This issue affects their ability to coordinate projects effectively, whether related to prevention or restoration, as highlighted by Respondent C:

"Coordination with municipalities and regions for resources needs to happen fast, along with financial distribution in order for the Forest services can implement their duties."

Regarding the lack of preventative measures in the area, respondent A highlighted that the road network in the region exceeded the average by 35sq.m compared to the permitted 25sq.m., while he believes that this may further cause harm to the forest due to past management practices. This indicates that there was no lack of preventative action in the region. Additionally, Respondent A noted that during operations, the Forest Department with forest workers had to create new firebreaks or widen existing ones, implying that the existing firebreaks were either of poor quality or inadequate to manage the extreme fire. Respondent C mentioned that during coordination meetings, the Fire service often planned defensive lines and strategies for resource allocation such as machinery used to create firebreaks or evacuation of settlements. However, the fire's intensity often rendered these plans ineffective. Respondent E stated that only currently have we seen a change with actions that also provide support to other organizations:

"Only in the last two years, through European funds and the "ANTINERO" program, have some significant amounts been allocated to prevention works, but this is not a general situation."

When Respondent A asked about the use of modern methods, they emphasized that using methods like controlled fire requires well-trained personnel from the fire brigade to execute them safely and without causing harm to themselves or the environment. Consistent monitoring of the method is crucial due to its sensitivity to changes in wind direction and intensity. Despite these various processes that demand a certain experience, Respondent A acknowledged that controlled fires could provide an additional solution to suppression efforts. Furthermore, regarding the existing experience among the personnel respondent A provided a clear answer to the fact that after 26 years of the Fire service being the responsible organization for the response phase, they have either the appropriate personnel to tackle forest fires or the experience after so many years while the Forest service lacks to follow that simple because, for a couple of years, the state excluded it from the active participation when a fire event occurred.

During the interviews, respondents emphasized the importance of integrating local knowledge and expertise into wildfire management efforts. Respondent A described a positive example of cooperative action in Evros emphasizing the importance of strengthening Forestry Associations and the valuable support they provide during suppression efforts:

"In the area of Northern Evros, where Forestry Associations guided by the Forestry Office and in cooperation with the local Fire service Commander who provided a fire truck to support the people, we created firebreaks together, cut trees, went into the forest, and this fire truck that was there supported us and saved quite a few hectares, about 100-150 thousand, which could have burned. That was very positive, but again, with the local (Fire Chief)."

Respondent B further highlighted the need for support for the Forestry Associations, emphasizing their crucial knowledge of the area. He noted that leveraging this local expertise can enhance preventative actions and ultimately reduce the overall suppression costs the country spends annually. Additionally, the respondent highlighted some issues of malfunction and poor coordination but noted that the large-scale mobilization and involvement of forces with hundreds of personnel from across the country, the EU, or internationally seems to operate well. However, he admitted that the Evros fire was a very challenging situation without official reports or complaints about the failure of the forces to protect the critical infrastructure of the area. Respondent A on the other hand, stressed that the lack of awareness and training of local communities influenced the overall outcome in Evros fire:

"If as a State, we had ensured there were 20-30 men and women trained in case of fire. In terms of actions and remaining there to help, we didn't need to have 30 fire trucks in every settlement, we would need 10 and 20 of these people (firefighters), so the rest of the fire trucks that would be left would go somewhere else."

4.2.2.1 Impact of Organizational Culture on Collaboration

Figure 10 depicts respondents' perceptions of a controversial topic in fire management, specifically addressing how differences in organizational culture impacted collaboration during the Evros fires in August 2023. The responses indicate a varied degree of agreement on whether or not these "***cultural differences"*** impeded interorganizational collaboration. I compare the counts of responses within rankings received for this question between the organizations to determine whether respondents from each organization rated specifically and reveal any visible difference. While responses from Civil protection were more evenly distributed between Strongly agree to Neither agree nor disagree, those from Forest service and Fire service were considered to Somewhat agree or strongly agree that cultural differences were a hindrance.

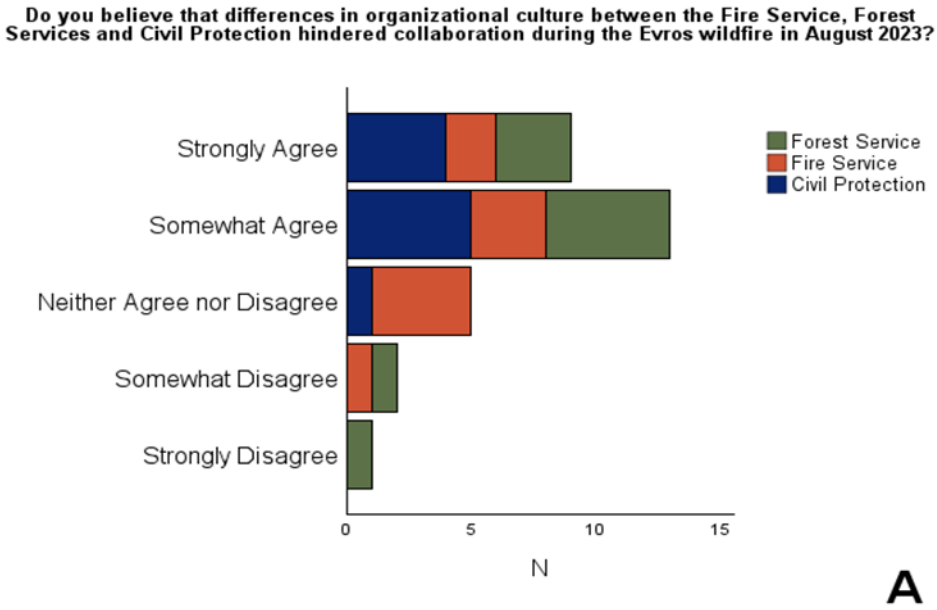


Figure 9: Linkert scale responses from the survey question. Do you believe that differences in organizational culture between the Fire service, Forest service, and Civil protection hindered collaboration during the Evros wildfire in August 2023? (A) Categorized by organizational affiliation (Forest service, Fire service, and Civil protection.

Respondents from the Forest service predominantly indicated that "***cultural differences***" significantly impacted collaboration. Respondent A stated:

"Look, if you have a conversation with firefighters, those who have a personal relationship with the forest and not a professional one, they care and understand and agree with what we're saying. On a professional level, you understand it's challenging for them to express these views openly and to convey them in practice. They have a semi-military structure."

Respondent A gave a specific example of the ***"cultural difference"*** that they experienced during Evros fire suppression operations efforts.

"So, when you see a creeping fire, you enter and gradually put it out, so it doesn't escalate. We were trying from the road, where it would definitely get out of control. In the first days of the fire in Dadia, the fire was moving retrogressively, the wind was from the north, so the fire was spreading backward. There was no intervention there; 4-5 fire trucks were sent. We proposed the need to reinforce our resources and stop it there, but it wasn't implemented. If there had been 5, 10, or 100 people and intervened, we wouldn't have had what happened, which spread back to the small core (forest of Dadia) and the rest, burning another 50,000 acres. We might have avoided these things."

Overall, the interviews with respondents from the Forest service revealed that, while differences in culture remain, they are not as pronounced as they were in the early 2000s when there was open conflict between the Forest service and the Fire service. Respondents stressed that both sides now recognize the need for change to achieve effective cooperation during operations.

Respondent E for Fire service also highlighted the difference in organizational culture, but with a slightly different emphasis.

"I've encountered colleagues who believed that they had nothing to gain from cooperating with the Forest service, perhaps keeping in mind some old situations."

This statement suggests that individual opinions, reflecting the ***"cultural differences"*** within organizations, can influence operational outcomes, though not significantly. When Respondent E was asked about the political decision made in 1998, they responded that it still affects collaboration but does not have a major impact on the management of fire incidents.

Respondents from Civil Protection also believed that nowadays, especially with the legislation, the gap seems to be bridged between the two organizations. However, Respondent D had a different approach and provided an opinion that personal beliefs and attitudes can play a role in collaboration and later on in the response to the fire regime.

"Elected officials, such as the local Deputy Regional Governor and the Regional Governor, often believe that fire response is their responsibility. They visit the field and take photos, which is appreciated by the Fire service as it seems to share the responsibilities. However, this creates confusion because we don't have the authority for such actions."

4.2.2.2 Communication Challenges and Coordination during the Evros Wildfire

Figure 11 illustrates the issue of communication channels between organizations and how this impacted coordination on the Evros wildfire in August 2023. Following the logic of the previous figure, I compared the counts of responses within each of the three organizations. Starting from the Forest service most of the respondents rated communication channels as Ineffective to Neutral. The same pattern was followed also by the Fire service while Civil protection responses were evenly distributed between Neutral, Ineffective, and Very ineffective.

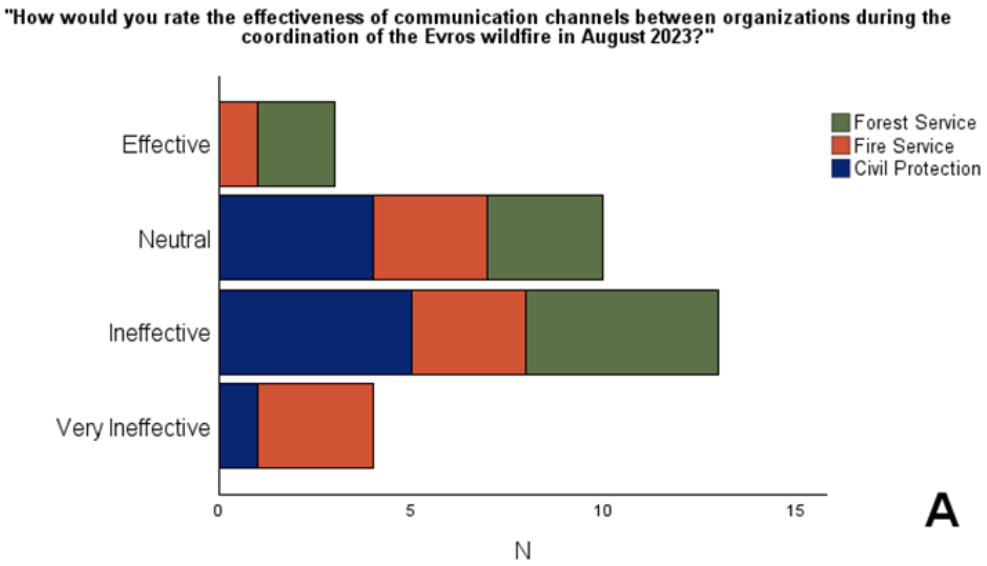


Figure 10: Linkert scale responses regarding the survey question, how would you rate the effectiveness of communication channels between organizations during the coordination of the Evros wildfire in August 2023? (A) Categorized by organizational affiliation (Forest Service, Fire Service, and Civil Protection).

Corresponding to the results of the online survey, the interviews with the respondents from the Forest service revealed that communication channels significantly impacted their ability to collaborate effectively with other organizations. However, interviewees also reported their thoughts and concerns about the complexity of this specific incident regarding the huge human operation that also put extra weight on the general management of the fire.

Respondent A stated: "*Of course, as a Forestry service, cannot communicate either with the Fire service or with anyone else. The Fire service has some radios; We don't have such capability. Meetings are held once a day. They give some directions on what will happen and what has happened so far. I think this is insufficient; the flow of information needs to be continuous so that we can address the cases.*"

This statement underscores the lack of real-time professional communication tools, such as radios, available to the Forest service compared to the Fire service. It is important to note the role of the organization in the response phase is advisory. Hence, the absence of communication tools hinders the flow of information. The respondent further elaborated on the issue of being excluded from critical communication loops: "*This is a big issue that we faced, namely that the local agents were not taken into account, I mean, they said that the head of the Fire service would communicate with the Forest Director to inform us, but no one ever communicated.*"

The interviewee was critical about this statement, noting that this mainly appeared after the fire escalated and higher hierarchy representatives from the Central State Administration involved. Despite this, the interviewee emphasized that the relationship between their team and the Local Fire Service chief was strong, even though the initial response to the fire did not achieve the desired results. Respondent A stated:

"*I spoke with the Fire Chief because we are friends and know each other. We've had many discussions, and they have supported us, such as sending a fire truck to northern Evros. While they might have bypassed some orders, they understood the situation. However, personal relationships alone do not address the underlying issues. We are dealing with institutional factors that need to be resolved. Additionally, communication is crucial; simply gathering for media appearances during the day is not sufficient or effective."*

Corresponding to the aforementioned respondents from Civil protection also emphasized the same issue in terms of communication channels that there is not a unified frequency for all the involved agencies to communicate and provide with all the necessary information about the operations and the general situations. The respondent C notably mentioned that:

"*The big problem with this fire regime was that all agencies did not have a common understanding of what was happening.*"

Both interviewees from Civil protection highlighted that when the fire escalated to a large-scale crisis, the National Coordination Center for Civil protection in Athens took the main responsibility for the operations. This shift marked the beginning of significant information flow issues, especially after the arrival of the "Olympus" mobile operation center on August 21st.

Respondent C specifically stated: "*Of course, they had asked us to take specific hours for briefing; otherwise, they would have to communicate with those who were at the fronts lines to provide an update. However, the main issue was that the fire had moved from Evros into Rhodope and again the "Olympus" was in charge of that fire, providing information and coordination, while PE.K.E. was in charge of the other two fires in Rhodope. As a result, PE.K.E. essentially did not know what was happening in Evros."*

At this point, respondent C didn't want to share and discuss more regarding why the "Olympus" had that impact on the communications in the whole operation. However, they made it clear that there were two different coordinating bodies involved: PE.K.E., the regional coordinating body responsible for another fire regime next to the Evros one, and "Olympus," which coordinated the operations for the Evros fire. Respondent D further elaborates on their criticism of the situation by pointing out that at some point the Fire service stopped providing information about the fire regime. After the regional civil protection and other involved agencies (which they didn't specify) complained about the lack of information, the Fire service provided a daily overview of the situation at the airport of Alexandroupoli where the operation center was stationed.

Respondent E acknowledged that the relationship between the two organizations (Forest service-Fire service) has improved since 1998 when then was a complete lack of communication, but they now face more technical challenges, such as the lack of proper communication tools. They mentioned that during the operation of Evros fire, they still used analog communication channels (radios), which can be problematic. The respondent pointed out that if someone makes a mistake, it can essentially block all the others that are connected. Respondent E expressed the need for a change to a digital communication system like TETRA (Terrestrial Trunked Radio).

4.3 General results for the future options based on the interviews

In order to adjust the last part of the result chapter and provide "recommendations" based on the respondent perceptions during the interviews, it's important to distinguish that the structure of the sub-chapter will follow the same structure as the previous sections, with a focus on the general themes of cooperation and perceived legitimacy.

Cooperation

Multidisciplinary Approach and Coordination

Enhancing cooperation during wildfire response requires a multidisciplinary approach where state and non-state actors work together effectively. Respondent A emphasized the need for an open-minded coordinator from the fire services who can listen to experts like foresters and meteorologists. This approach, however, can be challenging during large-scale events, as noted by respondent E while the coordinator which is the fire chief is the responsible person that needs to decide about the actions of the operations. To overcome such a challenge, a well-structured and clear legal framework is essential, ensuring all actors understand their roles without overlap or confusion.

Strengthening forest service

The diminished role of forest services is a chronic issue that hampers effective fire management. Scientists and people of the field acknowledged the need for funding for the organization and balanced actions focusing also on prevention except suppression. As highlighted by the Goldammer report (2019), prevention efforts should be prioritized to limit the occurrence and spread of fires. Respondent E noted that prevention actions can contribute to the overall suppression efforts helping the fire services during fire regimes to be more effective.

Institutional and Structural Enhancements

Respondent E also highlighted the necessity for Forest services to have a more active role in response phase, with trained personnel responding first to fire outbreaks before the fire escalates. This requires serious changes and proper funding while modernization of the organization is crucial. Respondent B pointed out the success of strengthening the Forestry Association, which facilitated effective cooperation and intervention during the case study under the supervision of fire services. The forest workers, as he noted, are crucial for the suppression efforts because their knowledge about the area can be helpful during the operations. Corresponding to that, something that has already started being discussed in public is the creation of a new agency. Introducing a specialized agency for forest fighting under the Fire service supervision, as agreed by Respondent E and A, could be beneficial. However, respondent B cautioned that creating a new agency requires thorough research. Furthermore, the agency needs to consider the existing actors while they are the ones that have the experience and the resources.

Perceived legitimacy

Interoperability and Common Vision

To enhance legitimacy, interoperability among all actors is essential. Interoperability regarding the common vision for implementation of the same objective which is the equal contribution for protecting the forests. Respondent C emphasized the importance of exercises and training campaigns to build trust and familiarity with roles while can promote effective cooperation during real crises. This was visible throughout the case study that people they didn't have the same image about the event responding differently in some cases. Respondent E noted that cross- agency exercises should be realistic, lasting 48-72 hours, to test procedures under extreme scenarios and not with the current form that the personnel training under a specific scenario for a few hours. A robust communication system is also crucial. Creating a unified information system to electronically provide instructions and information can prevent misinterpretation and improve coordination, as seen during the case study where actors used different communication channels while the responsible agency relied on a very old system of communication channel during the operations. Under this recommendation respondent C suggested that establishing a unified communication system involving all actors may help.

Implementing Common Standards

A key issue affecting perceived legitimacy is the absence of common standards in decision- making and actions among involved actors. Establishing a central coordinating body, as mentioned above, can create a scientifically robust national strategy. This strategy should include risk culture training, simplification of the legal framework. Respondent D highlighted that the need for a clear framework with feasible roles and responsibilities, especially for Civil protection can contribute to ensure a robust and effective mechanism for national fire management. Greater involvement of all actors in decision-making processes can boost perceived legitimacy. Citizens' awareness and training are critical for that while promoting actions for fire prevention and have a long-term impact. Specifically, for the case study respondent E noted:

"These changes should primarily concern prevention works, so that we can prevent the occurrence but especially the rapid spread of fires in recent years. Another issue is the protective measures for settlements and infrastructures in general, to limit or eliminate the possibility of human casualties and to reduce destruction. Moreover, not engaging a large number of firefighting resources in protecting infrastructures would allow for more effective forest firefighting."

This is important because is something that also the respondents for the forest service's experienced during the case study. Engaging citizens while you proper created a trained teams in villages can be crucial except for self-protection and preparation for wildfire incidents can also be important as an "extra hand" that in moments of crises can help Fire services with operations.

5: Discussion

This research aimed to investigate how formal and informal institutions impact the coordination and the collaboration between the Fire service, Forest service, and Civil protection in Greece during the suppression phase of wildfires. By investigating the August 2023 Evros wildfire, I examined how the current legal framework through the existing laws influences collaboration and coordination in fire management efforts. This discussion contextualizes these findings within Greek wildfire management, highlighting specific insights from the Evros case study. I aimed to describe how the member's perceptions were shaped through the lens of perceived legitimacy, regarding the challenges by investigating this particular case study. Finally, I will conclude the chapter with recommendations for improving coordination and collaboration among organizations.

5.1 Influence of Formal Institutions

Legal Framework and Coordination Mechanisms

The analysis of the current legal framework followed by the three main organizations involved in wildfire management, particularly during the suppression phase, reveals significant insights. These institutions play a crucial role in defining responsibilities and coordination mechanisms among organizations, providing legitimacy for their decisions and actions during the response to a fire regime. Throughout the interviews and examination of the current legal framework, I identified the main factors that influence the effectiveness of collaboration during the fire suppression phase.

The Fire service, as the primary organization responsible for fire suppression, operates under laws 2612/1998, 3013/2002, and 4662/2020. This involves ensuring timely detection, reporting, and intervention, centralized through the National Coordination Center for Operations and Crisis Management (ESKEDIC) in Athens. However, the inactivation of law 4662/2020 has created operational gaps at regional and local levels, impacting the effectiveness of cooperation. While the laws clearly define the Fire service's role, the complexity of coordinating multiple organizations is not well-addressed, sometimes causing delays. Bureaucratic issues, such as the absence of 13 Regional Civil Protection Operational Centers, hinder local coordination and how the local fire departments cooperate with other organizations, impacting the Fire service's legitimacy. Especially in large-scale fires like the Evros case, it was crucial for organizations to operate together quickly and effectively during emergency operations to avoid any disconnections or fragmentation among them (Wolbers et al., 2018).

Civil protection's role is similarly hampered by a lack of clear operational guidelines and insufficient planning. Although laws aim to enhance coordination, they fall short in practice, leading to bureaucratic inefficiencies that were evident during the Evros fire. For instance, during the Evros fire, personnel from local departments were excluded from the meetings of the Coordination Center due to space constraints or misunderstanding, illustrating the framework's failure to fully support interoperability among organizations. Protocols like IOLAOS 2, despite robust guidelines, are often not fully implemented locally, resulting in operational inefficiencies and diminished trust

among organizations. This issue is also exacerbated by resource shortages, particularly in a region like Evros which the economy is not that developed as other regions in Greece (Population and Social Conditions - ELSTAT, n.d.). Both the local departments of Forest service and Civil protection struggle with resource allocation, affecting their operational readiness and ability to support suppression efforts as they mentioned during the interviews. Respondent D highlighted the lack of funding for machinery, which causes the loss of critical operating time for the Fire services, and the delays in allocation of the resources in the fields. Additionally, the shortage of well-trained personnel to operate these machines further worsens the situation, as noted by respondent C during the Evros fire. The absence of funding can contribute negatively to support the efforts of collective actions resulting in the local organizations searching for external support (Edgeley et al., 2020). A similar situation arose between the two municipalities in the Evros region when the Municipality of Soufli, due to its limited economic resources, was unable to meet the Fire service's demands for adequate machinery and other necessary resources. The challenges faced by Civil protection, particularly the non-operational coordination bodies and overstepping of roles in the local scale, are consistent with findings by Radović, (2020), who identified similar issues in disaster management frameworks that lack proper implementation and clear role definitions.

Regarding the Forest service, the current legal framework clearly defines its responsibilities, limiting its involvement in active suppression since the implementation of law 2612/1998. The Forest service plays a supportive role during the suppression phase, but chronic underfunding and understaffing hinder its effectiveness in other phases of the disaster management cycle (prevention, restoration). Although preventative measures like firebreaks were in place during the Evros fire, the Spanish report suggests a redesign, as the existing ones cannot contain high-intensity fires (FAST, 2023). Respondents from the Local Forest Department expressed that their capacity to contribute to their tasks during a fire regime was restricted by the current legal framework in combination with a shortage in personnel and equipment. For instance, the personnel in the Forest Department of Alexandroupoli have decreased from 98 at the start of the century to just 29, while covering a vast agricultural and forested area making its work almost impossible. These chronic issues, combined with an anachronistic framework for the suppression phase, result in extreme measures, such as prohibitions on cutting pine trees to create or maintain fire-break zones. This outdated philosophy leads to excessive fuel buildup, ultimately harming the forest during operations when over-cutting is necessary to maintain firebreaks. Gill et al., (2013) discussed how resource constraints and shifting roles can undermine the effectiveness of forest management organizations in wildfire suppression. Particularly in forested areas, reducing fuel before the fire regime is a crucial asset that can influence the outcome of fire suppression efforts. (Gill et al., 2013). In the instance of Evros, this resulted in an incomplete project regarding fuel reduction from the local forest service prior to the start of the 2023 fire season, as pointed out by respondent from Civil protection. However, as I will discuss further, fuel management plays a crucial role in fire management especially for the prevention phase where the Forest service is the responsible organization. The main point here is that under the current legal framework, the Forest service's role is limited. These policies, which the country has relied on for decades to address fire management, have as shown later in my case study, directly impacted the overall collaboration efforts among organizations during the response phase.

5.2 Case study findings: Evros wildfire

Regarding the Evros wildfire in August 2023, the findings revealed that indeed the collaboration between the organizations and the coordination during the suppression efforts faced challenges that influenced the outcome of the incident. The examination focused on the perception of legitimacy among the members of the three organizations showed that the organizational culture, when influenced by politicization of fire regimes, can cause polarization among the involved organizations. During the interviews, the respondents from the three organizations mentioned that the decision of 1998 to transfer the responsibility of fire suppression from the Forest service to the Fire service still manifests the collaboration between the organizations. This is also backed by literature with Morehouse et al., (2011) highlighting that the state's capacity to effectively manage wildfires was significantly weakened following this political decision.

As noted by Tsatsanis et al., (2020), the Greek political landscape is marked by intense polarization, which extends into public institutions. This political environment affects how members of different organizations perceive each other, particularly when leadership roles are politically appointed. Such perceptions of politicization in disaster management can undermine trust, complicate coordination, and play a critical role in electoral outcomes (Mylonas, 2019; Tsatsanis et al., 2020). Moreover, the way the government is portrayed by the media, often influenced by political biases, can distract from the responsibility of political leaders to address long-term rural economic and social trends that have greatly increased fire risks. Similar to the situation during 2007 wildfires in Peloponnese, this focus on political agendas hinders effective collaboration, as attention is diverted from the root causes of wildfire hazards (Hovardas, 2014). The media's depiction acts as a barrier to policy changes, missing opportunities for reform that often arise after wildfires (Farley et al., 2007). The politicization of wildfire management affects the perception of the members on how they are perceived by other organizations. However, all of the interviewees acknowledged that past behaviors cannot be part of the decision-making and affect the collaboration during the suppression phase. In general, they recognized that the focus needs to be on the enhancement of the legal framework to support and improve the National mechanism.

In addition, the results from the online survey and the interviews revealed that members of the Forest service, Fire service and Civil protection identified several key factors that impeded effective collaboration during the Evros wildfire in August 2023. These factors were predominantly categorized into organizational, operational and environmental challenges.

Organizational challenges

Starting from the organizational challenges, the members from all three organizations highlighted the lack of trust among organizations as a significant barrier. As Boin (2018) points out, trust is an important element in establishing cooperation between organizations. Particularly, in disaster management, such as fire incidents, this trust deficit can often lead to miscommunication during suppression efforts. It's crucial to note that trust can be visualized also as organizational trust and describes how the actors feel about the organization that is in charge of the fire management (Earle, 2010). This organizational trust can also affect the legitimacy of the organization since it depends

on how the decision-making is effectively implemented during the suppression efforts. Furthermore, as Smith et al., (2013) acknowledged, when the outcome of an event leads to negative results, people tend to blame the leaders rather than the personnel involved in local management. This tendency highlights how trust is often directed toward leadership in general, rather than the individuals on the ground. This also, depicted in my findings, where respondents from Civil protection expressed frustration about the "Olympus" the coordinating center that took over the operations. They stress that local leaders were excluded from some meetings, and the Fire service hesitated to share critical information about the fire conditions and suppression efforts.

Another challenge that arose was in regard to the organizational culture and priorities. Respondents, especially from the Forest service, emphasized that differing organizational cultures and priorities created friction during the response phase. This is depicted in the results where decisions were made based on the priorities of each organization. For instance, the Forest service prioritizes ecological conservation by working to save each individual tree in the area. In contrast, the Fire service, guided by its semi-military organizational structure, prioritizes immediate firefighting tactics, emphasizing human and settlement safety. This often led to conflict between the organizations and since the responsibility for the forest fires was on the Fire service the final decisions were made by them. Berlin and Carlström (2011) suggested that such a differentiation in the priorities of the organizations regarding the crisis can affect the inter-organizational coordination. Furthermore, an organization's structure that lacks flexibility in its routines and procedures might also contribute to the making of incorrect decisions, particularly when unanticipated problems arise. According to respondents from Civil protection and the Forest service, this is one of the limitations of the Fire service's semi-structured approach, which can lead to inefficiencies and poor decisions during operations. Weick et al., (1999) argued that organizations need a balance of flexibility and orderliness in their structure to effectively handle crises. However, as a respondent from the Fire service indicated for the Evros case, organizations often rely on hierarchical ranks for quick responses during emergencies. Thus, this approach can limit effective decision-making, especially under the existing conditions. Lekka, (2011) suggests that effective organizations blur the lines of who is responsible for decision-making, enabling decisions to shift in response to emerging issues. According to respondents from the Forest service, this philosophical divergence in the organizational culture didn't hinder cooperative actions at the local level of decision-making. Despite this success, respondents stress that the moment the fire escalated and the decision-making passed to the higher hierarchy they experienced organizational constraints. This has been already discussed in the literature mentioning that the larger and more complex an event is the less trained the involved parties to facilitate collaboration (Berlin and Carlström, 2011). Lastly, the understaffing and resource constraints, as I have already mentioned particularly for the Forest service, were obstacles that hindered the collaboration among the organizations. The significant reduction in personnel and resources over the years limited their ability to contribute effectively, also in the case of Evros. This is something that previous researchers such as Xanthopoulos et al., (2020) acknowledged for previous fire incidents that occurred in Greece. This was also echoed by Civil protection members, who during the interviews pointed out the insufficient resources for preventative measures and local management that impacted the fire suppression efforts during the fires of Evros.

Operational challenges

One significant operational challenge identified was the lack of adequate human resources, which directly impacted the effectiveness of operational efforts. According to Granot, (1997), this issue can influence collaboration. Furthermore, the lack of trained local people regarding forest fires in the area is perceived as a factor that affected the allocation of the existing personnel that participated in the Evros fire while the focus of the units was to save the villages and the residential areas. This corresponds to the crucial need and the active involvement of the local communities in the suppression efforts and the general fire management plan. However, one factor that was consensus across all organizations both the online survey and the interviews was the lack of clear communication channels. The Evros wildfire revealed significant communication and coordination challenges among different organizations involved in the response. The lack of real-time, professional communication tools and unified communication channels hindered effective collaboration during the operations (Bharosa et al., 2010). In risk and crisis, communication is an important factor that can determine whether the decision-making of a certain action is successfully implemented by the personnel or not (Comfort, 2007). Respondents from the Forest service noted the importance of distinguishing personal relationships during operations from the need for institutionalized communication channels, as experienced during the Evros fire. The transition to advanced digital communication systems and the establishment of unified communication protocols are essential for improving coordination in future large-scale emergencies. Particularly information technology is crucial for the flow of information enhancement among organizations and emergency responders while it can also transform the way organizations interact (Bharosa et al., 2010). Especially during large-scale operations, when the environment is dynamically combined with high levels of uncertainty and unpredictability, it demands simultaneous actions with well-established information systems (Comfort et al. 2001, Weick, 1988).

Environmental challenges

The environmental challenges such as the extreme weather conditions limited the coordination actions. The rise in average temperatures caused by climate change (Agoston, 2018) has led to more frequent severe weather events, which ultimately impact the interventions of firefighters. This has resulted in major problems in terms of fire suppression efforts, prompting the CTIF International Association of Fire and Rescue Services to call for global recognition of the practical implications of climate change (CTIF, 2023). The President of CTIF acknowledges that the Fire services are currently navigating an exceptional time with operational challenges, where firefighters frequently face emergencies that far exceed what was once considered “normal” or “expected”. Particularly, when considering larger temporal and spatial scales, fire regimes seem to be more influenced by climatic variability. Hence short periods of high fire risk tied to specific weather conditions are responsible for the majority of fire incidents. However, this ongoing debate about the relative impact of fuel load and vegetation composition at the landscape level compared to climate factors and the distribution of fire ignitions, appears to vary depending on the specific context, even within the same region. During the Evros fire, respondents noted that the severity of weather conditions such as the strong winds and low humidity, affected the strategies and the plan that the Fire service implemented day by day. The Spanish technical report from the Forest Fires Assessment and Advisory Team (FAST) confirms this

information. The report highlights the fire behavior observed in Dadia-Soufli on the 21st of August that produced average flame lengths over 40 meters with an intensity of 90,000 kW/m. As noted by FAST, this level of intensity was beyond the suppression capabilities of any firefighting or emergency service (FAST, 2023). Additionally, fires in future climate conditions may push firefighting efforts beyond their existing capabilities to control them (Podur and Wotton, 2010). Agoston, (2018) highlighted that climate change adds complexity to firefighting efforts, increasing the physical and mental demands on firefighters during interventions. Similarly, Raftoyannis et al., (2014) emphasized the perception of foresters and forest scientists regarding the issues of climate change and the need for adaptive measures for fire management particularly in Mediterranean countries like Greece. Brotons et al., (2013) indicated that fire suppression alone has limited effectiveness in counterbalancing the increased impacts of climate change on fire regimes. While fire suppression may temporarily mitigate the effects of climate change, it cannot fully compensate for the growing intensity and frequency of large fires driven by changing climate conditions (Piñol et al., 1998). However, it's important to note that the weather conditions indeed influence the fire behavior in the case of Evros but parameters such as the one that I already discussed are essential to address before blaming nature. During the Evros fire, preventive actions by organizations like the Forest service and Civil protection with the support of the Fire service were not enough to contain the fire. Respondents from the Forest service mentioned that efforts were made to create or widen firebreaks and reduce fuels, but according to the Spanish technical report, these measures proved inadequate (FAST, 2023). As San-Miguel-Ayanz et al., (2013) pointed out, in many Mediterranean countries despite upgrades in resources, Fire services still face severe impacts from increasingly intense fires. This highlights the inadequacy of current fire suppression methods to manage extreme fire seasons like the summer of 2023 in Greece. As mentioned, while fuel reduction can influence suppression efforts, extreme weather can still lead to uncontrollable fire behavior (Gill et al., 2013). Hence, the perceptions of expert scientists regarding climate change and its impact on firefighting efforts should be considered, with further investigations and experience-sharing needed to develop new fire management methods (Raftoyannis et al., 2014). The Evros case results showed that respondents from the three organizations framed climate change not as an excuse for inaction in fire management, but as a clear reminder that Greece must adapt its approach to handling fires under these extreme weather conditions.

Differences in challenges identified by each organization

The Evros fire highlighted various challenges as perceived by members from different organizations. Participants from the Forest service emphasized severe understaffing and a lack of proper resources, such as machinery and communication tools, as primary issues. This is supported by previous studies that have highlighted inadequate funding and the aging workforce as constraints on the operational capabilities of the Forest service (Xanthopoulos, 2007, Kalogiannidis et al., 2023; Goldammer et al., 2019). Organizational priorities also influenced the outcome of the Evros fire. Despite these variations, both the Fire service and Forest service expressed respect for each other during interviews and acknowledged the need to focus on their positive examples of cooperation efforts that took place during the event. While leaving outside individuals' perceptions or beliefs during a response to a fire trying to build trust again between the two organizations. This organizational priority is logical to impact the efforts since the challenges that the organizations face are different and can translate into different

priorities during the response to a fire. Therefore, the Fire service perceived the communication issues and the weather conditions as the factors that significantly influenced their operations during firefighting in the Evros fire. Regarding the weather conditions, the interviews indicated that the efficiency of the current methods used by the Fire service during operations may need improvement. This can be seen as an opportunity since the increase of mega-fires due to climate change cannot be successfully tackled by traditional firefighting methods (Torre, 2009). Moreover, the improvements in the current communication tools are highlighted specifically by the Fire service.

Finally, Civil protection respondents pointed out issues with role clarification within the current legal framework, which complicates the implementation of fire management in Greece. In the case of an emergency, the designed policies need to foster a common interest and a sense of commitment to establish coordination among organizations (Peters and Pierre, 2003). This hindered collaboration among organizations, with inactive laws and bureaucratic complexities impacting the outcome in the case of the Evros fire. On the other hand, the low local awareness and management that was discussed during the interviews also affects the operations. In an environment such as the Mediterranean region where most of the fires involve humans either due to negligence or deliberate lighting, it is necessary to consider the enhancement of the citizens in the fire management. Previous studies pointed out that working in a diverse environment and encouraging communities with fire management will lead to their sensitization to risk while educating them to follow less dangerous practices (Moreno, 2005). Moreover, integrating local knowledge as pointed out by the experts during the interviews can contribute to reducing wildfire suppression costs (Kalabokidis et al., 2008). This could be done by strengthening the local Forest Associations that operate in the forest all year. Their knowledge and expertise could support local firefighters in responding to fires. Considering the socio-economic conditions of the area the development of modern policies is now visible for the empowering of locals specifically for Greece, a country that year after year experiences more pressure in land development due to tourism and the expansion of residential areas (Raftoyannis, et al., 2014).

Perceived Legitimacy and Its Impact on Collaboration

The Evros wildfires of August 2023 serve as a critical case study for understanding the role of perceived legitimacy in inter-organizational collaboration during wildfire response in Greece. Perceived legitimacy, defined from the participants as the recognition and acceptance of each organization's role, expertise, and decision-making authority, significantly influenced the effectiveness of the collaboration among the Fire service, Forest service, and Civil protection. As highlighted in the literature, legitimacy management is an ongoing process that requires organizations to gain, maintain and at times, regain legitimacy (Suchman, 1995). The complexity of this interactive process, especially in the response to a crisis, can be challenging for organizations. Particularly as Suchman (1995) mentioned about the maintenance of legitimacy the "structural inertia" which indicates that the organizations follow stable structures and processes may result in being less able to adapt to the new environmental demands and respond effectively. As depicted from the findings of the Evros fires, Fire services with the semi-military structure and command hierarchy while ensuring clear command and control, often overlook local expertise, leading to operational disconnects and strained relations

with the other organizations. Previous studies have stated that organizations with this type of dominant leadership may encounter downward inaction within the organization, affecting collaboration with others (Rockett, 1994). The importance of a common operating picture as Comfort (2007) mentioned can lead to clear communication and coordination actions among organizations while utilizing all the levels of hierarchy. On the other hand, for the Forest service, the resource constraints and their diminished role since 1998 have significantly harmed the image of the organization and influenced its legitimacy. This was highlighted also through the formal institutions and the legal framework that restrict the role and responsibilities of the organization during the response of a fire regime to an advisory organization. For respondent C bureaucratic political influences lead to bureaucratic delays due to inactive laws influencing the legitimacy of the involved organizations. This can lead to significant coordination issues and affect the operational efforts during the crisis. Overall, the findings emphasize the critical importance of perceived legitimacy in crisis management in fostering effective inter-organizational collaboration. The Evros wildfires demonstrated that legitimacy, influenced by resource availability, organizational structure, and political dynamics, plays a pivotal role in shaping the collaborative landscape. The lack of the organizations to trust and implement the laws and regulations during the response affects the common vision and the collaborative efforts among the involved organizations.

5.3 Recommendations for improved collaboration

Lastly, the final part of the chapter is dedicated to future recommendations. It focuses on enhancing collaboration among organizations. It also emphasizes the response phase of the fire management cycle. However, the options can be applied also in other phases such as the prevention and the preparedness phase, important for anticipating future fire regimes. First, for the problem of cooperation, many of the respondents and the literature suggested that addressing the discrepancies in resource allocation among organizations is crucial. Specifically, the strength of the Forest service with adequate personnel and equipment can mitigate the impact of resource constraints. Similarly, by addressing that, the bureaucratic delays that appeared to be a big barrier in the case of Evros should be reduced. Organizations will carry out the obligations derived from the legal framework, while further streamlining the procedures will facilitate better decision-making and can enhance operational efficiency in the event of an emergency (Sylves, 2019).

Furthermore, another issue that was identified during the investigation of the Evros case was the differences in organizational cultures and priorities. This can be addressed with joint training and strategic planning. Additionally, it would foster organizational integration while helping bridge philosophical divides and improve overall cooperation (Radović, 2020, Comfort, 2007). Simultaneously, by joint training, the organizations can help interoperability and the common vision which are essential assets for efficient coordination of operation efforts. A key factor that depends on that is effective communication (Comfort, 2007). Something that in the case of Evros influenced the operations since the absence of proper communication infrastructure hindered the flow of information among the organizations. The thesis suggested that the establishment of a unified communication channel for real-time information sharing can improve coordination during operations.

Another issue that can be addressed is the inclusion of local actors in the region such as Municipalities and the citizens. As depicted through the interviews, many of them feel side-lined at some point during the operations and do not cooperate as they expected. Leveraging local expertise and involving locals in wildfire management can enhance both prevention and response efforts (Bradshaw, 2019). Furthermore, bridging practice and science can significantly improve our understanding of fire science (Stoof and Kettridge, 2022). Locally, this can be implemented by strengthening the Forest Associations of the areas. According to the literature and based on my findings, creating job opportunities for locals can be beneficial both for the forest itself and also for the fire suppression efforts (Corona et al., 2015). This, if combined with the guidance of the scientific community can create opportunities to integrate fire management practices that reflect the local experience. Hence, the exchange of ideas and knowledge, especially in the era of climate change, can lead to a solid understanding of fire behavior. According to the literature and based on the thesis findings it is essential to create a central body dedicated to forest fires (Goldammer et al., 2019). This doesn't mean creating new organizations or rebuilding the legal framework. The existing experience of organizations such as the Fire services are capable of addressing the issue but lack clear direction and support from other organizations that can contribute to the other phases of the fire management cycle. According to Pandey et al., (2023), this involves a robust enforcement mechanism, ensuring a balanced distribution of resources across prevention, suppression, and mitigation. By establishing a dedicated body responsible for forest fires, including experts and scientists, and creating a national statistical database of wildfires, we can ensure that and further enhance cooperation and trust among the organizations.

5.4 Strengths and limitations

It is important to address the strengths and the limitations of the thesis. This study aims to investigate a complex and dynamic situation and consists of factors such as informal institutions which are difficult to capture and explain simply because of unwritten rules and individuals' perceptions, and beliefs. Therefore, the chosen theoretical framework, which combines different concepts, aims to offer a comprehensive lens through which to explore interorganizational collaboration and coordination dynamics by recognizing the influence of institutions on organizations' behavior. The framework primarily focuses on internal institutional dynamics and interactions and may ignore external pressures and influences that shape wildfire management such as pressure from public opinion, or international obligations (e.g., reskEU mechanism), which could impact the organizational behavior of the decision-making.

In terms of methodology, the use of multiple research methods, including literature review, document analysis, semi-structured interviews, and a web-based survey, strengthens the study's validity and reliability. The preliminary review phase ensures a solid understanding of the wildfire management landscape, while the document analysis provides insights from official reports, news articles, and scientific literature. Additionally, the semi-structured interviews and the web-based survey offer an opportunity to capture the perspectives of participants directly involved in wildfire incidents, thus enhancing the depth of understanding regarding collaboration, and coordination of the organizations in the wildfire response. However, despite these

strengths, there are potential limitations and blind spots to consider. One of the challenges that I faced was the equal representation of the participants for the organizations. During the collection of my data, I attempted to contact representatives of the Local Fire services for a possible interview. While they initially expressed a willingness to collaborate, the central Fire service in Athens declined my requests, due to an ongoing judicial investigation regarding the Evros fire in August 2023. This lack of representation from a key organization introduces a significant limitation to the study. Another challenge arises from the reliance on self-reported data in the survey, which could introduce biases or inaccuracies based on respondents' perceptions and interpretations. Furthermore, the study's focus on three organizations, excluding other important entities such as the Greek Army, Hellenic Police, volunteer rescue teams, and local communities, may limit the diversity of perspectives and outcomes. Additionally, the focus on a specific wildfire incident in Greece may limit the generalizability of findings to other contexts or regions. Given the large scale of the response to this particular fire incident, which involved thousands of people both nationally and internationally, the limited number of semi-structured interviews and survey responses (30 participants) cannot fully capture the general situation or produce general conclusions about fire management in Greece. Another limitation could be the potential impact of external factors such as political or economic influences on wildfire management policies and practices which go beyond the scope of the theoretical framework and the interest of the study. Moreover, the dynamic nature of crisis management and the evolving landscape of wildfire management may pose challenges in capturing the full spectrum of factors influencing organizational behavior.

Regarding the analysis of the data, I made an effort to interpret the data and the results in a responsible and ethical manner. I was aware that the case study contained sensitive information. I was also known, that failing to pay the proper attention, could result in the exposure of the Organizations and potentially damage their reputation. Therefore, the analysis involved the security of all the collected data while ensuring the anonymity for representatives. Since the Organizations are state agencies with strict procedures, I followed all legal requirements regarding obtaining permissions to engage them legally and conduct the interviews. Overall, I enjoyed this intense period, yet it was a very thoughtful process and a lot to remember. I hope to deliver a respectable thesis while as a professional and putting aside my feelings about the Greek fire management and, most importantly, without letting this catastrophic fire incident to influence my work.

6. Conclusion

The present study aims to underscore the importance of understanding the complex dynamics of inter-organizational cooperation and coordination regarding fire management in Greece. By investigating the response phase, particularly for the large-scale incidents of the Evros fire of August 2023, the study findings highlight the critical need for a holistic and integrated approach to wildfire management. Through the lens of institutional theory and the notion of legitimacy, the study has attempted to explain the complexities involved in managing such disasters.

The study's findings showed the critical role that both formal and informal institutions play in shaping the behavior and decision-making processes of organizations involved in wildfire management. Formal institutions, such as laws, regulations, and official protocols, provide the structural framework within which organizations operate. For many interviewees the current legal framework hinders interoperability, leading to ineffective cooperation among the organizations during the response phase. In practice, outdated or inactive laws cause bureaucratic delays, preventing key organizations from fulfilling their responsibilities. Moreover, the case study shows that the existing legal framework is not suited to modern fire management, especially in the context of climate change. The outdated approaches limit the potential for organizations like the Forest service to contribute alongside the Fire service during the response phase. Particularly, the underdevelopment of the Forest service and the lack of attention to the prevention and restoration phases due to anachronistic laws led to the absence of prevention measures in some areas while burdening wildfire management and especially the operation efforts during the response phase. Additionally, Civil protection struggles to function as the central body that should unite and direct all organizations under a common vision. The ambiguous role definitions further complicated the coordination process during the response to a fire.

However, the influence of informal institutions, shaped by individual perceptions regarding the challenges, also contributes to the overall collaboration and coordination among organizations. These perceptions affect decision-making during operations, influencing the interactions between the Fire service, Forest service, and Civil protection during the Evros fire in August 2023. The organizational challenges were particularly evident in the lack of trust and differing priorities among the involved entities. This has also to do with past political decisions, such as the implementation of the law 2612/1998, which created a gap between the two main organizations. However, both representatives indicated that while past conflicts stemming from these perceptions may have strained cooperation, they are no longer the primary cause of operational difficulties in the field. On the other hand, the Fire service's hierarchical structure and semi-military approach sometimes led to operational disconnects, while the Forest service faced constraints due to limited resources and a reduced role in fire management. Despite these issues, there were notable examples of cooperation at the local level, suggesting that mutual respect and acknowledgment of each organization's contributions can foster effective collaboration, even when priorities and constraints differ.

The findings also reveal that indeed the challenges that the organizations faced during the Evros fires are different for each organization and depend on priorities. However, there is a challenge that all the three organizations agree on. The need to strengthen the

Forest service and especially revise its role. The need for balance between the phases highlighted refers mostly to the lack of proper preventative measures, especially in the area of the fire incident. Moreover, the communication issues that they faced during the operations make it clear that there is a need for an upgrade in communication channels, with unified systems that keep all participants updated and synchronized during the operations. Additionally, the insufficient involvement of local communities and the lack of integration of local knowledge were identified as issues that impacted the effectiveness of fire management efforts. Engaging local expertise and fostering community awareness could enhance both preventative and responsive measures in future wildfire events. The environmental challenges, particularly those related to climate change, were also prominent. The extreme weather conditions, driven by climate change, significantly exacerbated the severity of the Evros fire incident. This highlighted the limitations of traditional firefighting methods and the pressing need to adapt fire management practices to address the increasing frequency and intensity of fires.

Perceived legitimacy was affected due to the aforementioned challenges posed by the findings of the case with a major impact on interorganizational collaboration. The recognition and acceptance of each organization's role, expertise, and decision-making authority were vital for effective coordination. The Fire service's rigid structure and the Forest service's diminished role, coupled with Civil protection's bureaucratic hurdles, all impacted the perceived legitimacy and, consequently, the collaborative efforts during the response.

In light of these findings, several recommendations for improving future wildfire management efforts can be made. Ensuring equitable resource allocation and streamlining legal and administrative processes can address disparities and enhance operational efficiency. Joint training and strategic planning can bridge organizational cultures and align priorities, fostering better cooperation. Implementing a unified communication system will improve real-time information sharing and coordination. Furthermore, increasing local engagement and integrating local knowledge into fire management strategies can enhance both prevention and response efforts. Finally, establishing a centralized fire management body that oversees and coordinates efforts, including managing resources and maintaining a national wildfire database, can significantly improve collaboration and effectiveness. Overall, the Evros wildfire case underscores the need for a comprehensive and integrated approach to wildfire management. By addressing these recommendations, Greece can enhance its preparedness and response capabilities, better adapt to the challenges posed by increasingly extreme fire behaviors and foster a more collaborative and effective wildfire management framework.

7. Bibliography

Abode Stock. Images of "Forest Fire Icon" - Browse stock photos, vectors, and videos, 12 in total. (n.d.). Adobe Stock. https://stock.adobe.com/nl/search?k=%22forest+fire+icon%22&token_type=bearer&expires_in=86399&asset_id=688901744.https://stock.adobe.com/nl/search?k=%22forest+fire+icon%22&token_type=bearer&expires_in=86399&asset_id=688901744

Agoston, R. (2018). The effects of global climate change on fire service Human resource view. Procedia Engineering, 211, 1–7. https://doi.org/10.1016/j.proeng.2017.12.001

Bharosa, N., Lee, J., & Janssen, M. (2010). Challenges and obstacles in sharing and coordinating information during multi-agency disaster response: Propositions from field exercises. Information Systems Frontiers, 12(1), 49–65. https://doi.org/10.1007/s10796-009-9174-z

Berlin, J. M., and Carlström, E. D. (2011). Why is collaboration minimized at the accident scene? A critical study of a hidden phenomenon. Disaster Prevention and Management: An International Journal, 20(2), 159–171. https://doi.org/10.1108/09653561111126094

Bernard, H.R. (2006) Research Methods in Anthropology. Qualitative and Quantitative Approaches. Altamira Press, Lanham.

Boin A. (2018). The Transboundary Crisis: Why we are unprepared and the road ahead. DOI:10.1111/1468-5973.12241

Bradshaw, K. (2019). Agency engagement with stakeholder collaborations, in wildfire policy and beyond. Arizona State Law Journal, 51(2), 437-504.

Brotons, L., Aquilué, N., De Cáceres, M., Fortin, M.-J., & Fall, A. (2013). How Fire History, Fire Suppression Practices and Climate Change Affect Wildfire Regimes in Mediterranean Landscapes. PLoS ONE, 8(5), e62392. https://doi.org/10.1371/journal.pone.0062392

Burdak, M. (2018). Disaster management response cycle in context of structural system and elements. International Journal of Science and Research, 7(9). https://doi.org/10.21275/ART20191438

Chen, R., Sharman, R., Chakravarti, N., Rao, H.R., & Upadhyaya, S.J. (2008a). Emergency Response Information System Interoperability: Development of Chemical Incident Response Data Model. *J. Assoc. Inf. Syst., 9*, 7.

Chen, R., Sharman, R., Rao, H. R., & Upadhyaya, S. J. (2008b). Coordination in emergency response management. Communications of the ACM, 51(5), 66–73. https://doi.org/10.1145/1342327.1342340

Comfort, L., Sungu, Y., Johnson, D., & Dunn, M. (2001). Complex systems in crisis: Anticipation and resilience in dynamic environments. Journal of Contingencies and Crisis Management, 9(3), 144–159. doi:10.1111/1468-5973.00164.

Comfort, L. K., Dunn, M., Johnson, D., Skertich, R., & Zagorecki, A. (2004). Coordination in complex systems: Increasing efficiency in disaster mitigation and response. International Journal of Emergency Management, 2(1/2), 62. https://doi.org/10.1504/IJEM.2004.005314

Comfort, L. K. (2007). Crisis Management in Hindsight: Cognition, Communication, Coordination, and Control. Public Administration Review, 67(s1), 189–197. https://doi.org/10.1111/j.1540-6210.2007.00827.x

Corona, P., Ascoli, D., Barbati, A., Bovio, G., Colangelo, G., Elia, M., Garfì, V., Iovino, F., Lafortezza, R., Leone, V., Lovreglio, R., Marchetti, M., Marchi, E., Menguzzato, G., Nocentini, S., Picchio, R., Portoghesi, L., Puletti, N., Sanesi, G., & Chianucci, F.

(2015). Integrated forest management to prevent wildfires under Mediterranean environments. Annals of Silvicultural Research, 39(1). https://doi.org/10.12899/asr-946
Cronstedt, M. (2002). Prevention, Preparedness, Response, Recovery - an Outdated Concept? The Australian Journal of Emergency Management, 17(2), 10–13. https://search.informit.org/doi/10.3316/ielapa.370106115314792
CTIF Addressing the Climate Crisis: A call to action for fire and rescue services worldwide. (2023). CTIF Addressing the Climate Crisis: A Call to Action for Fire and Rescue Services Worldwide | CTIF - International Association of Fire Services for Safer Citizens Through Skilled Firefighters. https://www.ctif.org/news/ctif-addressing-climate-crisis-call-action-fire-and-rescue-services-worldwide
Earle, T. C. (2010). Trust in Risk Management: A Model-Based Review of Empirical Research. Risk Analysis, 30(4), 541–574. https://doi.org/10.1111/j.1539-6924.2010.01398.x
Edgeley, C. M., Paveglio, T. B., & Williams, D. R. (2020). Support for regulatory and voluntary approaches to wildfire adaptation among unincorporated wildland-urban interface communities. Land Use Policy, 91, 104394. https://doi.org/10.1016/j.landusepol.2019.104394
EFFIS - Statistics Portal. (n.d.-a). https://effis.jrc.ec.europa.eu/apps/effis.statistics/estimates/GRC
Elliott, V. (2018). Thinking about the Coding Process in Qualitative Data Analysis. The Qualitative Report. https://doi.org/10.46743/2160-3715/2018.3560
European Commission (2023). Proposal for a regulation of the European Parliament and of the Council on a monitoring framework for resilient European forests. Retrieved from: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023PC0728&qid=1707389673733
FAO, 2010. FAO Term Portal: Collection: Fire Management (A10.6)/CSCM. Food and Agriculture Organization of the United Nations (FAO).
Farley, J., Baker, D., Batker, D., Koliba, C., Matteson, R., Mills, R., & Pittman, J. (2007). Opening the policy window for ecological economics: Katrina as a focusing event. Ecological Economics, 63(2–3), 344–354. https://doi.org/10.1016/j.ecolecon.2006.07.029
FAST Team Greece. (2023). Technical Report: Forest Fires in Alexandroupolis and Dadia-Soufli (Greece 2023). FAST Team Greece.
Fountain, J. E. (2001). Building the Virtual State: Information Technology and Institutional Change. Brookings Institution Press. http://www.jstor.org/stable/10.7864/j.ctvcb59n3
Geoland. (2023, December 2). NATURA 2000 Site Burnt in Greece. https://www.geolandproject.eu/2023/12/02/natura-2000-site-burnt-in-greece/
GFMC, UNECE / FAO INTERNATIONAL FOREST FIRE NEWS (IFFN) Edited and published by GFMC (1989-2015) – Global Fire Monitoring Center (GFMC) / Fire Ecology Research Group. (2017, November 24). https://gfmc.online/iffn/iffn.html
Gill, A. M., Stephens, S. L., & Cary, G. J. (2013). The worldwide “wildfire” problem. Ecological Applications, 23(2), 438–454. https://doi.org/10.1890/10-2213.1
González-Cabán, A. (2008). Proceedings of the second international symposium on fire economics, planning, and policy: A global view (PSW-GTR-208; p. PSW-GTR-208). U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. https://doi.org/10.2737/PSW-GTR-208
Goldammer J., Xanthopoulos G., Eftichidis G., Mallinis G., Mitsopoulos I., Dimitrakopoulos A.A., Report of the Independent Committee Tasked to Analyze the

Underlying Causes and Explore the Perspectives for the Future Management of Landscape Fires in Greece, 2019
Goyal, A. (2023). Greece wildfires: a horrible sense of déjà vu. www.linkedin.com. https://www.linkedin.com/pulse/2023-greece-wildfires-horrible-sense-d%C3%A9j%C3%A0-vu-ajay-goyal/
Granot, H. (1997). Emergency inter-organizational relationships. Disaster Prevention and Management, 6(5), 305–310. doi:10.1108/09653569710193736.
Gürbüz, S. (2017). Survey as a quantitative research method. Research Methods and Techniques in Public Relations and Advertising, 2017, 141–162.
Hammarberg, K., Kirkman, M., and De Lacey, S. (2016). Qualitative research methods: When to use them and how to judge them. Human Reproduction, 31(3), 498–501. https://doi.org/10.1093/humrep/dev334
Helmke, G., and S. Levitsky. 2004. Informal institutions and comparative politics: a research agenda. Perspectives on Politics 2(4):725 https://doi.org/10.1017/S1537592704040472
Hovardas, T. (2014). "Playing With Fire" in a Pre-Election Period: Newspaper Coverage of 2007 Wildfires in Greece. Society and Natural Resources, 27(7), 689–705. https://doi.org/10.1080/08941920.2014.901462
IPCC. (2021). Climate change 2021: The physical science basis. Contribution of working group I to the sixth assessment report of the intergovernmental panel on climate change. Cambridge University Press. In Press.
Jamshed, S. (2014). Qualitative research method-interviewing and observation. Journal of Basic and Clinical Pharmacy, 5(4), 87. https://doi.org/10.4103/0976-0105.141942
Keohane R.O. and Nye, Jr J.S. (2001). Between Centralization and Fragmentation: The Club Model of Multilateral Cooperation and Problems of Democratic Legitimacy. [KSG Working Paper No. 01-004.] John F. Kennedy School of Government Harvard University
Le Cozannet, G., Kervyn, M., Russo, S., Ifejika Speranza, C., Ferrier, P., Foumelis, M., Lopez, T., & Modaressi, H. (2020). Space-Based Earth Observations for Disaster Risk Management. Surveys in Geophysics, 41(6), 1209–1235. https://doi.org/10.1007/s10712-020-09586-5
Lekka, C. (2011). High reliability organizations: A review of the literature. Research Report RR899. Health and Safety Executive. Retrievable from: http://www.hse.gov.uk/research/rrpdf/rr899.pdf.
Lindblom, C. E. (1968). The Policy-Making Process. New Jersey: Prentice-Hall, Englewood Cliffs.
Liu, J., Dietz, T., Carpenter, S. R., Folke, C., Alberti, M., Redman, C. L., Schneider, S. H., Ostrom, E., Pell, A. N., Lubchenco, J., Taylor, W. W., Ouyang, Z., Deadman, P., Kratz, T., & Provencher, W. (2007). Coupled Human and Natural Systems. Ambio, 36(8), 639–649. http://www.jstor.org/stable/25547831
Malone, T. W., and Crowston, K. (1990). What is coordination theory and how can it help design cooperative work systems? New York, NY, USA: ACM
Management Unit of Evros Delta and Dadia National Parks - N.E.C.C.A. (2023, July 4). N.E.C.C.A. - Natural Environment Climate and Change Agency. Retrieved March 11, 2024, from https://necca.gov.gr/en/mdpp/management-unit-of-evros-delta-and-dadia-national-parks-and-protected-areas-of-eastern-thrace/.
March, J. G. (1988). Decisions and Organizations. Oxford: Blackwell
Massey, J. E. (2001). Managing Organizational Legitimacy: Communication Strategies for Organizations in Crisis. Journal of Business Communication, 38(2), 153–182. https://doi.org/10.1177/002194360103800202

Meyer, J. W., and Scott, W. R. 1983. Centralization and the legitimacy problems of local government. In J. W. Meyer & W. R. Scott (Eds.), Organizational environments: Ritual and rationality: 199-215. Beverly Hills, CA: Sage.
Morehouse, B. J., Henderson, M., Kalabokidis, K., and Iosifides, T. (2011). Wildland Fire Governance: Perspectives from Greece. Journal of Environmental Policy & Planning, 13(4), 349–371. https://doi.org/10.1080/1523908X.2011.611678
Moreno JM (2005). A preliminary assessment of the impacts in Spain due to the effects of climate change. Spanish Ministry of Environment, Madrid, Spain
Mylonas, H. (2019). Greece: Political Developments and Data in 2018. European Journal of Political Research Political Data Yearbook, 58(1), 113–122. https://doi.org/10.1111/2047-8852.12241
Naeem, M., Ozuem, W., Howell, K., and Ranfagni, S. (2023). A Step-by-Step Process of Thematic Analysis to Develop a Conceptual Model in Qualitative Research. International Journal of Qualitative Methods, 22, 16094069231205789. https://doi.org/10.1177/16094069231205789
North, D. C. (1991). Institutions. The Journal of Economic Perspectives, 5(1), 97–112. http://www.jstor.org/stable/1942704
OECD (2023), Taming Wildfires in the Context of Climate Change, OECD Publishing, Paris, https://doi.org/10.1787/dd00c367-en.
O'Leary, R., and Bingham, L. B. (Eds.). (2009). The Collaborative Public Manager: New Ideas for the Twenty-first Century. Georgetown University Press. http://www.jstor.org/stable/j.ctt2tt4xg
Pandey, P., Huidobro, G., Lopes, L. F., Ganteaume, A., Ascoli, D., Colaco, C., Xanthopoulos, G., Giannaros, T. M., Gazzard, R., Boustras, G., Steelman, T., Charlton, V., Ferguson, E., Kirschner, J., Little, K., Stoof, C., Nikolakis, W., Fernández-Blanco, C. R., Ribotta, C., … Dossi, S. (2023). A global outlook on increasing wildfire risk: Current policy situation and future pathways. Trees, Forests and People, 14, 100431. https://doi.org/10.1016/j.tfp.2023.100431
Palaiologou, P., Kalabokidis, K., Troumbis, A., Day, M. A., Nielsen-Pincus, M., & Ager, A. A. (2021). Socio-Ecological Perceptions of Wildfire Management and Effects in Greece. Fire, 4(2), 18. https://doi.org/10.3390/fire4020018
Peters, B., and Pierre, J. (2003). Handbook of Public Administration. SAGE Publications Ltd. https://doi.org/10.4135/9781848608214
Piñol J, Terradas J, Lloret F (1998) Climate warming, wildfire hazard, and wildfire occurrence in coastal eastern Spain. Climatic Change: 345–357.
Podur, J., and Wotton, M. (2010). Will climate change overwhelm fire management capacity? Ecological Modelling, 221(9), 1301–1309. https://doi.org/10.1016/j.ecolmodel.2010.01.013
Population and Social Conditions - ELSTAT. (n.d.). https://www.statistics.gr/en/statistics/pop
Puffer, S. M., McCarthy, D. J., & Boisot, M. (2010). Entrepreneurship in Russia and China: The impact of formal institutional voids. Entrepreneurship: Theory and Practice, 34(3), 441–467. https://doi.org/10.1111/j.1540-6520.2009.00353.x
Radović, V. (2020). Emergency Management/Response. In: Leal Filho, W., Azul, A.M., Brandli, L., Özuyar, P.G., Wall, T. (eds) Climate Action. Encyclopedia of the UN Sustainable Development Goals. Springer, Cham. https://doi.org/10.1007/978-3-319-95885-9_66
Raftoyannis, Y., Nocentini, S., Marchi, E., Calama Sainz, R., Garcia Guemes, C., Pilas, I., Peric, S., Amaral Paulo, J., Moreira-Marcelino Ana, C., Costa-Ferreira, M., Kakouris, E., & Lindner, M. (2014). Perceptions of forest experts on climate change and fire

management in European Mediterranean forests. iForest - Biogeosciences and Forestry, 7(1), 33–41. https://doi.org/10.3832/ifor0817-006
Rockett, J.P. (1994), "A constructive critique of United Kingdom emergency planning", Disaster Prevention & Management, Vol. 3 No. 1, pp. 47-60.
San-Miguel-Ayanz, J., Moreno, J. M., & Camia, A. (2013). Analysis of large fires in European Mediterranean landscapes: Lessons learned and perspectives. Forest Ecology and Management, 294, 11–22. https://doi.org/10.1016/j.foreco.2012.10.050
Smith, J. W., Leahy, J. E., Anderson, D. H., & Davenport, M. A. (2013). Community/Agency Trust and Public Involvement in Resource Planning. Society & Natural Resources, 26(4), 452–471. https://doi.org/10.1080/08941920.2012.678465
Snider, G., Daugherty, P. J., & Wood, D. (2006). The Irrationality of Continued Fire Suppression: An Avoided Cost Analysis of Fire Hazard Reduction Treatments Versus No Treatment. Journal of Forestry, 104(8), 431–437. https://doi.org/10.1093/jof/104.8.431
Steen-Adams, M. M., Charnley, S., & Adams, M. D. (2017). Historical perspective on the influence of wildfire policy, law, and informal institutions on management and forest resilience in multiownership, frequent fire, coupled human and natural system in Oregon, USA. Ecology and Society, 22(3), art23. https://doi.org/10.5751/ES-09399-220323
Stoof, C. R., Kettridge, N. (2022). Living With Fire and the Need for Diversity. Earth's Future, 10(4), Article e2021EF002528. https://doi.org/10.1029/2021EF002528
Suchman, M. C. (1995). Managing Legitimacy: Strategic and Institutional Approaches. The Academy of Management Review, 20(3), 571. https://doi.org/10.2307/258788
Sylves, R. T. (2019). Disaster policy and politics: Emergency management and homeland security. CQ press.
Tedim, F., Leone, V., Amraoui, M., Bouillon, C., Coughlan, M., Delogu, G., Fernandes, P., Ferreira, C., McCaffrey, S., McGee, T., Parente, J., Paton, D., Pereira, M., Ribeiro, L., Viegas, D., & Xanthopoulos, G. (2018). Defining extreme wildfire events: Difficulties, challenges, and impacts. Fire, 1, 9. https://doi.org/10.3390/fire1010009.
Tedim, F., S. McCaffrey, V. Leone, G. M. Delogu, M. Castelnou, T. K. McGee, and J. Aranha. 2020. What can we do differently about the extreme wildfire problem: an overview. Pages 233-263 in F. Tedim, V. Leone, and T. K. McGee, editors. Extreme wildfire events and disasters: root causes and new management strategies. Elsevier, Cambridge, Massachusetts, USA.https://doi.org/10.1016/B978-0-12-815721-3.00013-8
Torre M (2009). La situación actual del problema de los incendios forestales en España. Cuadernos SECF 31: 179-195. [in Spanish]
Thornes, J. E. (2002). IPCC, 2001: Climate change 2001: impacts, adaptation and vulnerability, Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change, edited by J. J. McCarthy, O. F. Canziani, N. A. Leary, D. J. Dokken and K. S. White (eds). Cambridge University Press, Cambridge, UK, and New York, USA, 2001. No. of pages: 1032. Price: £34.95, ISBN 0-521-01500-6 (paperback), ISBN 0-521-80768-9 (hardback). International Journal of Climatology, 22(10), 1285–1286. https://doi.org/10.1002/joc.775
Tsatsanis, E., Teperoglou, E., & Seriatos, A. (2020). Two-partyism Reloaded: Polarisation, Negative Partisanship, and the Return of the Left-right Divide in the Greek Elections of 2019. South European Society and Politics, 25(3–4), 503–532. https://doi.org/10.1080/13608746.2020.1855798
Tyukavina, A., Potapov, P., Hansen, M.C., Pickens, A., Stehman, S., Turubanova, S., Parker, D., Zalles, A., Lima, A., Kommareddy, I., Song, X-P., Wang, L., & Harris, N.

(2022). Global trends of forest loss due to fire, 2001-2019. Frontiers in Remote Sensing. https://doi.org/10.3389/frsen.2022.825190
Vaske, J. (2008) Survey Research and Analysis: Applications in Parks, Recreation, and Human Dimensions. Venture Publishing, Inc., State College.
Weick, K. E. (1988). Enacted sensemaking in crisis situations. Journal of Management Studies, 25, 305–317. doi:10.1111/j.1467- 64861988.tb00039.x
Weick, K. E., Sutcliffe, K. M., & Obstfeld, D. (1999). Organizing for high reliability: Processes of collective mindfulness. In R. I. Sutton & B. M. Staw (Eds.), Research in organizational behavior: 21 (pp. 81–123). Elsevier Science/JAI Press
Wildfires continue to rage in Greece. (n.d.). https://www.esa.int/ESA_Multimedia/Images/2023/08/Wildfires_continue_to_rage_in_Greece
Wolbers, J., Boersma, K., & Groenewegen, P. (2018). Introducing a Fragmentation Perspective on Coordination in Crisis Management. Organization Studies, 39(11), 1521–1546. https://doi.org/10.1177/0170840617717095
Woong, L. D. (2019). Collaboration and performance in disaster and emergency management: Focusing on South Korea. International Journal of Disaster Risk Reduction, 35, 101116. https://doi.org/10.1016/j.ijdrr.2019.101116
Xanthopoulos, G. (2004). Who should be responsible for forest fires? Lessons from the Greek experience. In Book of Abstracts of the II International Symposium on Fire Economics, Planning and Policy: A Global View (p. 128). April 19-22, 2004, Cordoba, Spain. University of Cordoba and USDA Forest Service, Pacific Southwest Research Station. (Full paper on CD accompanying the Book of Abstracts).
Xanthopoulos, Gavriil. (2007). Forest fire policy scenarios as a key element affecting the occurrence and characteristics of fire disasters.
Xanthopoulos, G., and Athanasiou, M. (2019). Fire Globe: Attica Region, Greece (July 2018). In Wildfire Mag, International Association of Wildland Fire (pp. 18-21). Retrieved from https://digitalis.uc.pt./handle/10316.2/44582
Xanthopoulos, Gavriil, Nikolov, Nikola. (2019). Wildfires and fire management in the eastern Mediterranean, southeastern Europe, and Middle East regions. Fire Management Today 77(1):29-38.
Xanthopoulos, G., Dimitrakopoulos, A., Mallinis, G., Eftichidis, G., Mitsopoulos, I., & Goldammer, J. G. (2019). A year after Greece's wildfire disaster. Crisis Response Journal, 14(4). Retrieved from www.crisis-response.com.
Xanthopoulos, G., Delogu, G. M., Leone, V., Correia, F. J. M., Magalhães, C. G., Tedim, F., Leone, V., & McGee, T. K. (2020). Firefighting approaches and extreme wildfires. In F. Tedim, V. Leone, & T. K. McGee (Eds.), Extreme Wildfire Events and Disasters (pp. 117-132). Elsevier. https://doi.org/10.1016/B978-0-12-815721-3.00006-0
Xanthopoulos, G., Athanasiou, M., & Kaoukis, K. (2022). Suppression versus prevention. The disastrous forest fire season of 2021 in Greece. Wildfire, QUARTER 2, 2022, 18-24.
Xanthopoulos, Gavriil, Zevgoli, Emmanouela, Καούκης, Κωνσταντίνος, and Athanasiou, Miltiadis. (2023). Lessons not learned. Wildfire, QUARTER 4, 2023: 36-40.

Greek Literature

Avramidis, A. (Photographer). (2023, August 23). Scorched land and charred trees are seen following a wildfire, near the village of Avantas in the region of Evros, Greece [Photograph]. Reuters. https://www.reuters.com/pictures/europes-largest-fire-years-

leaves-scorched-path-across-greece-2023-08-29/7NBZSGGUVVPXDBVB2XBAJUZV6U
Γκουρμπάτση, Α. (2023, September 3). Απολογισμός πυρκαγιών 2023. Dasarxeio. Retrieved September 1, 2024, from https://dasarxeio.com/2023/09/03/128685/
Dasarxeio. (2023, December 13). Πυρκαγιές Έβρου: Κατατέθηκε το Πόρισμα της Επιτροπής του ΓΕΩΤΕΕ. dasarxeio.com. https://dasarxeio.com/2023/12/13/131537/
Kalogiannidis, S., Chatzitheodoridis, F., Kalfas, D., Patitsa, C., & Papagrigoriou, A. (2023). Socio-Psychological, Economic and Environmental Effects of Forest Fires. Fire, 6(7), 280. https://doi.org/10.3390/fire6070280
Kathimerini.gr. (2023, September 1). Migrants rescued in Dadia forest. kathimerini.gr. https://www.ekathimerini.com/news/1218984/migrants-rescued-in-dadia-forest/
Kavalapoint. (2023, December 13). Το πόρισμα της επιτροπής του ΓΕΩΤΕΕ για τις δασικές πυρκαγιές στη Δαδιά. Kavalapoint.gr. https://www.kavalapoint.gr/to-porisma-tis-epitropis-toy-geotee-gia-tis-dasikes-pyrkagies-sti-dadia/
Παπαδόπουλος, Γ. (2023, September 1). Γιατί δεν σβήνει η φωτιά στον Εβρο. Η ΚΑΘΗΜΕΡΙΝΗ. https://www.kathimerini.gr/society/562592548/giati-den-svinei-i-fotia-ston-evro/
Πυροσβεστικό Σώμα Ελλάδας. (2023). Σύνολα δεδομένων Δασικές Πυρκαγιές 2023. Ανοιχτά δεδομένα. Retrieved August 29, 2023, from https://www.fireservice.gr/el_GR/synola-dedomenon
Στασινού, Ν. (2023, August 31). Κ. Μητσοτάκης: Οι χειρισμοί δεν αποδείχθηκαν αντίστοιχοι των συνθηκών. Η ΝΑΥΤΕΜΠΟΡΙΚΗ. https://www.naftemporiki.gr/politics/1508638/live-i-omilia-toy-k-mitsotaki-sti-voyli-gia-tis-pyrkagies/
ΦΕΚ 27 Α΄ (07-02-2020) ΝΟΜΟΣ ΥΠ’ ΑΡΙΘΜ. 4662.2020. Εθνικός Μηχανισμός Διαχείρισης Κρίσεων και Αντιμετώπισης Κινδύνων, αναδιάρθρωση της Γενικής Γραμματείας Πολιτικής Προστασίας, αναβάθμιση συστήματος εθελοντισμού πολιτικής προστασίας, αναδιοργάνωση του Πυροσβεστικού και άλλες διατάξεις.
ΦΕΚ 212 Α (11-10-1995). ΝΟΜΟΣ ΥΠ’ ΑΡΙΘΜ. 2344/1995. Οργάνωση πολιτικής προστασίας και άλλες διατάξεις.
ΦΕΚ 112/Α΄(25-5-1998) ΝΟΜΟΣ ΥΠ’ ΑΡΙΘΜ. 2612/1998. Ανάθεση της δασοπυρόσβεσης στο Πυροσβεστικό Σώμα και άλλες διατάξεις.
ΦΕΚ 102 Α’ (1-5-2002). ΝΟΜΟΣ ΥΠ’ ΑΡΙΘΜ. 3013/2002. Αναβάθμιση της πολιτικής προστασίας και λοιπές διατάξεις.
ΦΕΚ 161 Α’ (9-9-2021). ΠΡΟΕΔΡΙΚΟ ΔΙΑΤΑΓΜΑ ΥΠ' ΑΡΙΘΜ. 70/2021. Σύσταση Υπουργείου Κλιματικής Κρίσης και Πολιτικής Προστασίας, μεταφορά υπηρεσιών και αρμοδιοτήτων μεταξύ Υπουργείων.

8. Appendices

Appendix I

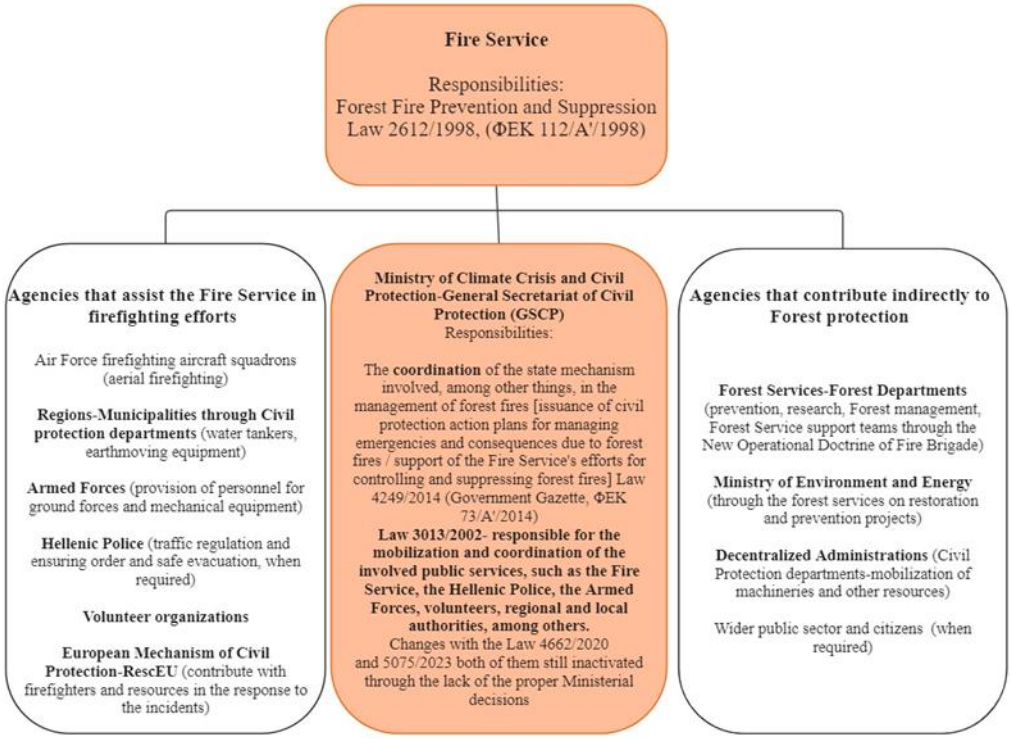


Figure 11: A brief representation of the actors involved in the response phase, along with the laws they are bound by, is as follows.

Appendix II

Table 3: Preliminary Contacts Table

Organization	Acronym	Date of the interview	Contact	Duration
Forest Directorate of Evros	Respondent A	24/04/2024	Online meeting-Zoom	32 minutes
Forest service	Respondent B	23/04/2024	Online meeting-Zoom	29 minutes
Independent Directorate of Civil Protection of Eastern Macedonia and Thrace region	Respondent C	01/05/2024	Online meeting-Zoom	30 minutes
Civil protection	Respondent D	20/05/2024	Online meeting-Zoom	22 minutes
Fire service	Respondent E	05/06/2024	Online meeting-Zoom	37 minutes

Appendix III

Table 4: Survey questions, each assigned to the three blocks. The letter in parentheses at the end of each question describes the type and the available range of options referenced in the bottom row of the table.

Personal Questions	**General Questions on Fire response**	**Ranking or rating factors and challenges regarding the case study and effects collaboration**
Q1.1 In which Organization do you work? **(A)**	Q1.5 Please rate the extent to which the following factors impeded effective cooperation among the organizations **(C)**	Q1.4 How would you rate the collaboration among the three organizations during the Evros case? **(B)**
Q1.2 What is your age? **(A)**	Q1.6 Please rank the following challenges associated with interagency collaboration according to their significance. **(D)**	Q1.7 How would you rate the effectiveness of communication channels between organizations during the coordination of the Evros wildfire in August 2023? **(E)**
Q1.3 How many years have you been serving in this Organization? **(A)**		Q.1.8 Do you believe that differences in organizational culture between the Fire service, Forest service and Civil protection hindered collaboration during the Evros wildfire in August 2023? **(F)**
		Q1.9 Please rank your understanding and perception regarding the biggest challenges faced by your organization during the Evros wildfire in August 2023? **(D)**

A: Multiple Choice: one answer	**B: Matrix: Very poor to Very good**	**C: Matrix: No effect to Very high effect**	**D: Ranking Order**	**E: Matrix: Very ineffective to Very effective**	**F: Multiple Choice: Strongly disagree to Strongly agree**

Appendix IV

Interview Consent Form

Research Project Title: "Greek Wildfire Management: A case study on collaboration during wildfires of 2023 in Evros region."

Researcher:

Research Participant's name: _____

The interview will take on_____. We don't anticipate that there are any risks associated with your participation, but you have the right to stop the interview or withdraw from the research at any time.

Thank you for agreeing to be interviewed as part of the above research project. Ethical procedures for academic research undertaken from institutions to require that interviewees explicitly agree to being interviewed and how the information contained in their interview will be used. This consent form is necessary for us to ensure that you understand the purpose of your involvement and that you agree to the conditions of your participation. Would you therefore read the accompanying **information sheet** and then sign this form to certify that you approve the following:

Purpose of the research
The purpose of this study is to explain the current challenges facing wildfire management in Greece, with a primary focus on the collaboration among agencies during the response phase. Specifically, the study will investigate key agencies involved in the suppression stage, such as the Fire service, Forest service and Civil protection. This investigation will involve examining the perceptions of individuals who are working within these agencies and operated during the Wildfires of Evros in 2023. By examining the perspectives of these individuals regarding the challenges that hindered collaboration with other agencies during this specific wildfire incident, the research aims to understand the general wildfire management towards mitigating the significant problems posed by wildfires in our country.

Use and storage of your data.
For this research, the information that you will provide through the interview will be recorded via a platform like Skype, Zoom, MS Teams etc. All data collection and storage will occur on a secure network with centralized backup services (OneDrive WUR). As an additional precaution, I will also store the data on my personal external hard disk. The data will be related to the Evros wildfire incident of 2023 and the collaborative efforts between the agencies, as experienced by the participant. No personal data such as names, addresses, or specific department name will be included. Upon completion of the thesis, all information including interview transcripts and recordings will be deleted from my personal hard disk. However, as the Forest and Nature Conservation Policy Group (FNP) holds the copyrights of the data, primary data

such as the transcribed interviews will be stored digitally with the FNP secretariat. Therefore, the MSc thesis will be entered in the E-articles depot of Wageningen University and will be publically available as an open access publication.

Confidentiality and Anonymity of your data

The interview will be conducted online through a platform that the investigator and the interviewee commonly decide beforehand. Furthermore, the interview will be recorded through the social platform. This recording will be used by the investigator during the data analysis process. The transcript will be translated into English since the interview will take place in Greek. The transcribed interview will be fully anonymized and will only be read by the investigator and his supervisor. To ensure the anonymity the use of made-up name (pseudonym) will be used in the report of the research.

- the interview will be recorded, and a transcript will be produced.
- the transcript will be translated from Greek to English language for the purpose of the research.
- the transcript of the interview will be analysed by the researcher.
- access to the interview transcript will be limited to the participating researcher and the academic supervisor.
- the primary data (transcribed interviews) will be kept from the FNP group and will be stored digitally with the FNP secretariat.
- any variation of the conditions above will only occur with your further explicit approval.

Quotation Agreement

I also understand that my words may be quoted directly. With regards to being quoted, please sign next to any of the statements that you agree with:

	I agree to be quoted directly.
	I agree to be quoted directly if my name is not published and a made-up name (pseudonym) is used.
	I agree that the researchers may publish documents that contain quotations by me.

All or part of the content of your interview may be used.

•In academic papers, policy papers or news articles
•On media that I may produce such as spoken presentation for my thesis study
•In an archive of the project as noted above

By signing this form, I agree that:

1. I am voluntarily taking part in this project. I understand that I don't have to take part, and I can stop the interview at any time.
2. The transcribed interview or extracts from it may be used as described above.

3. I have read the Information sheet.
4. I don't expect to receive any benefit or payment for my participation.
5. I understand that the anonymized transcript will be read by the researcher and his supervisor.
6. I have been able to ask any questions I might have, and I understand that I am free to contact the researcher with any questions I may have in the future.

_____

Participant's Name

_____ _____

Participants Signature **Date**

_____ _____

Researcher's Signature **Date**

Contact Information

This research has been reviewed and approved by the Wageningen University and Research of the Netherlands. If you have any further questions or concerns about this study, please contact:

Name: Nikolaos Mantzaridis
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E-mail: nicholaos.mantzaridis@wur.nl; mantzaridisnicholaos@gmail.com

Appendix V

Interview questions for the Forest services and the Civil protection.

General wildfire management

1. What would you describe as effective cooperation?

2. What will you describe as legitimacy of procedures, decisions, and actions?

3. How do members within your organization view their proposed actions according to the fire management planning?

4. How do you access the decisions and actions made by your organization and how does this impact the relationship with other organizations during the response to a fire?

5. Are there any specific strategies or initiatives you believe could enhance collaboration and coordination between organizations in wildfire management efforts?

6. In your opinion, how have legislation and policies influenced collaboration with other agencies in response to wildfire incidents?

Evros case

1. Please give a short overview of your role and define your involvement in the fire suppression stage.

2. Could you please provide both a positive and a negative example of collaboration between organizations during the Evros wildfire incident, and explain the factors that contributed to each outcome?

3. How do you believe the personal perceptions/beliefs of your organization's member influenced collaboration with other agencies during the firefighting efforts?

4. In the response phase according to your opinion what went well significantly well and what wrong in the Evros wildfire incident.

5. What do you believe are the most important lessons learned from the Evros wildfire incident that can be used to enhance effective collaboration for the future?

6. Do you believe that the philosophy of your organization regarding the response of fires has changed over time and adapted to the new realities of the era?

7. What are the most significant changes that need to be made for the future in your opinion in order to enhance effectively collaboration in the response of fires?

Interview Questions for the Fire Service:

1. What was the role of the Unit in extinguishing the firefighting operation in Evros in August 2023?
   - In which area of Evros did you operate?

2. What procedures did you follow as Unit during the firefighting operation in Evros in August 2023?

3. What is the legislative framework that defines and guides the operations of the Unit that you belong to?

4. What protocol was implemented to ensure coordination of the unit with other units?

5. What communication channels did you utilize during the firefighting operation in Evros in August 2023?

6. What procedure is followed regarding the mobilization of other agencies during the suppression phase?
   - In cases requiring the participation of multiple agencies, how are collective decisions made to determine priorities and required actions (collaboration and communication)?

7. What is the role of the unit in the new operational doctrine of the Fire Service?

8. What is the role of the Commander in the process of briefing and debriefing?