



(Paulo Cunha/EPA)

SEEKING RESILIENCE IN A FOREST FIRE PRONE COUNTRY: THE JUNE 2017 FOREST FIRE IN CENTRAL PORTUGAL

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Summary

On June 17, 2017, a forest fire erupted in central Portugal that would bring severe consequences and greatly challenge the country's crisis management system. In order to understand why the crisis happened and how it unfolded, this thesis set out to study the transboundary nature of the crisis and the resilience of its crisis management. Based on this, the following research problem was established: *“To what extent was the June 2017 forest fire in Portugal a transboundary crisis and to what extent was resilient crisis management achieved?”*

To find possible answers and formulate conclusions, research has been carried out using an explorative case-study approach. Seeing that collecting primary data was not an option, a choice was made to utilize qualitative document studies. Because of the inherent bias towards applying a single-method for collecting data, it was of great importance to ensure the data's reliability and validity through careful selection. Empirical data has been retrieved from various documents and reports, including the official independent investigation report requested by the Portuguese government, as well as reports from the EU.

The theoretical parameters which gave focus to the research has been described and outlined in chapter 2. The theoretical framework presented in this chapter aimed to enhance the understanding of how different aspects pertaining to the crisis itself could influence the degree to which resilient crisis management is achieved. These aspects include crisis typologies, crisis phases, crisis management and crisis 'transboundedness'. Thereafter the challenges of transboundary crisis management were presented, with an emphasis on communication and coordination. Lastly, the theme of resilience is visited, with the theoretical framework accounting for both proactive and reactive resilience, as well as offering a set of factors which may influence the degree to which resilient crisis management can be achieved.

Key findings from the study suggests that the June 2017 forest fire in central Portugal was very much so a transboundary crisis. This conclusion was reached by assessing the transboundary dimensions which were crossed during the crisis. Although the fire started in one municipality in central Portugal, by the time it was put out four days later it had affected seven municipalities, damaged dozens of buildings, and taken 65 lives in the process. The crisis called for coordination and cooperation across various response entities, both on local, regional, national and international levels, thereby also adding transboundary elements to the crisis management. In assessing the proactive and reactive resilience measures, key findings show a crisis management system which had the right intentions but lacked the political

power to ensure that the crisis management system was prepared, thereby hampering response efforts once the crisis had manifested.

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1. Introduction

The theme of the study is transboundary crises and resilient crisis management, using the June 2017 forest fire in central Portugal as the case to study these themes. In this chapter, firstly, the background and motivation behind the choice of study will be presented, followed by a summarization of the limitations of the study. Thereafter, a short overview of previous research is offered. Lastly, an overview presenting how the thesis is organized is presented.

1.1 Background and motivation

Coping with crises is, above all, a government responsibility that has proved increasingly difficult to meet. Crises and disasters pose enormous challenges to the political-administrative elites called upon to deal with them (Boin, t'Hart, Stern and Sundelius 2016). As our world continually evolves becoming increasingly complex, so do the crises we experience. As a result, the complexity of crisis management also increases, constantly crossing new boundaries, including new actors and involving new sectors of our society. This is a subject which I think is in need for greater exploration and the field of crisis management needs constant revising to keep the research relevant to its context.

In June 2017, Portugal experienced first-hand the challenges of keeping crisis management structures up to par with the present adherent risk when a forest fire in the district of Leiria, situated in Central Portugal, evolved from a local firefight to a full-blown international response operation. It was not the first time, and, likely will not be the last time this happens. Due to the country's localization in the dry and hot southern Europe, it is normal for the country to experience long periods of drought, making the country's forests very vulnerable to fires. At the same time, Portugal, like other southern European countries, must also prepare for the global challenges of climate change and how this will affect adherent risks, such as forest fires. The climate changes are constantly monitored and comprehensive assessments regarding the future impacts and vulnerabilities associated with climate changes in Portugal have been performed (European Climate Adaptation Platform 2018).

However, the June 2017 fire in Leira, which mainly affected the municipality of Pedrógão Grande (in addition to Góis), was unlike most other fires because it led to such tragic consequences as 65 people lost their lives, most of whom were trapped in flames on a 300 meter stretch of a road while trying to flee the flames (Relatorio 2017). Following these events, the Portuguese government was heavily scrutinized by foreign and domestic media questioning whether they had done enough, both regarding prevention and response. The government

answered by ordering an independent investigation of the event, which was summarized into a report released in October 2017.

This thesis is an explorative study into the Portuguese crisis management system, and how resilience was sought after in the crisis management of the forest fire in Pedrógão Grande (and Góis). The main goal is to explore the presence of proactive and reactive resilience measures through which resilient crisis management is achieved.

1.2 Research problem and questions

Although the academic field of crisis management is growing, there is still room for reflections and critical thinking. Thus, I am interested in seeing the intricacies in the field of crisis management, showing that the tasks of crisis management are complex and dependent on context. It is in terms of context that the term ‘transboundary’ is introduced. This is a relatively new term which is getting a lot of traction in the academic world of crisis management (Ansell, Boin and Keller 2010). Resilience is also a recurrent theme in the thesis. However, applying the term is not an easy task because the term has been used in so many different settings that there is no clear-cut way to interpret it. Large scale response operations, such as the one in Portugal, see us having to re-imagine our comprehension of crisis dimensions, thereby constantly forcing us to rethink our understanding of crisis management. There is therefore ample reason to explore how the terms transboundary and resilience apply to crisis management, and how resilience can be achieved. Based on these assertions, the study aspires to address the following research problem:

To what extent was the June 2017 forest fire in Portugal a transboundary crisis and to what extent was resilient crisis management achieved?

Having decided that the 2017 forest fires in Portugal would be the case used to study this; a set of research questions were established to create a structure which would allow a more in-depth understanding of the relevant issues conducive in generating conclusions:

- 1. To what extent was the June 2017 forest fire a transboundary crisis, and what were the challenges in the crisis response?*
- 2. To what extent were proactive resilience measures taken, and what factors influenced them?*

3. *To what extent were reactive resilience measures taken, and what factors influenced them?*

As a means to find possible answers to research problem and adjoining research questions, the study has applied a single-case study approach to the explorative design. Research was carried out using qualitative research methods.

1.3 Limitations of the study

The scope of the thesis made it necessary to make limitations to the research inquiry. Because the research had an inductive approach, the empirical elements set forth certain boundaries affecting both the theoretical chapter, as seen in chapter 2, as well as the subsequent discussion of the empirical findings in chapter 5. For instance, there are many more theoretical elements that apply to crisis management, however, considering the empirical case these were excluded based on non-applicability. Limitations were also made regarding the choice of the case to study. Although the research problem could have been applied to any forest fire, a choice was made to focus specifically on the fire of June 2017 in Portugal. Other forest fires could also have been of interest, particularly a second forest fire in Portugal which occurred in October 2017. However, because the official independent report investigating the October fire was not published until March of this year and considering the amount of time it took to translate the first report, I decided against it.

The study was also limited in studying the events on a general and comprehensive level instead of going in-depth in one area, meaning that it considers all aspects related to the research problem (e.g. 'transboundedness', communication, coordination, preparedness activities and response measures pertaining to the crisis etc.). The study does not go in-depth in any of the areas but seeks to explore how the intrinsic relationship between them affected the resilience of the crisis management.

1.4 Previous research

As a research field, crisis management is constantly expanding to adjust to the changes and to complexities of our societies and the crises which affect them. Research on transboundary crises is an example of how the field is expanding, with EU funding research projects such as TransCrisis, where well-known researchers such as Boin, Cadar and Donnelley seek to advance our understanding of crisis management in transboundary settings.

Over the years of crisis management research, we have seen forest fires being utilized as case studies. Kruke and Morsut (2015) for instance, used the 2014 forest fire in Sweden to study

how multilevel response contributes to resilient crisis management. However, there seems to be a gap in research, in the sense that I did not manage to find studies addressing both transboundary crises and resilient crisis management aspects in relation to each other and applied to cases such as forest fires. This lays the premise for the explorative design of the thesis. Applying theoretical and analytical frameworks addressing transboundary crises and resilient crisis management to a forest fire case study may serve to enrich and shed new light on the field of forest fires, while simultaneously providing a basis for further research.

1.5 Outline

This thesis is organized as it follows:

Chapter 1: Introduction presenting the study's theme, relevance and research problem. It also offers an overview of the limitations of the study, as well as a very brief summarization of previous research.

Chapter 2: Presents the theoretical framework applied to the analysis and discussion of empirical data. The framework is divided into five sections, where there is a natural progression of theoretical elements which are summarized in section 2.5.

Chapter 3: Accounts for the research design and methodology, which have guided the research process.

Chapter 4: Presents the empirical data collected from various reports regarding the 2017 June forest fire in central Portugal.

Chapter 5: Comprises a discussion based on the three established research questions, in which empirical findings are analyzed using the theoretical approach presented in chapter 2.

Chapter 6: Provides a summary of the main findings of the study and concludes with remarks on the relationship between transboundary crises and resilient crisis management.

The thesis provides an Appendix, as well, which offers further insight into forest fire terminology as well as provides a map explaining the geographical area where the fire spread.

2. Theoretical framework

This chapter accounts for the encompassing theoretical framework which the transboundary nature and crisis management of the 2017 forest fire in Portugal have been analytically interpreted in order to address the following research problem: “*To what extent was the June 2017 forest fire in Portugal a transboundary crisis and to what extent was resilient crisis management achieved?*”. The theoretical framework applied to the analysis and discussion of empirical data comprises a variety of different aspects, accounting for central themes and concepts which together provides a solid basis to address the research problem. Although these theoretical aspects, are presented in separate sections, at the end of the chapter I will show the intrinsic and complimentary relationship between them.

Section 2.1 commences with a presentation of crisis management and an examination into the terminology of crises, how to classify them, and how they are divided into phases. Section 2.2 focuses on crises of transboundary nature. Section 2.3 follows with an exploration into the challenges of transboundary crisis management. Section 2.4 presents factors which may influence resilient crisis management. Lastly, chapter 2.5 offers reflections on how these theoretical elements influence the concept of resilient crisis management.

2.1 Crisis management – crisis as central concept

Crises are ingrained features of our societies. No country, big or small, is free from hazards, risks, accidents, natural disasters, conflict and turmoil. Depending on its nature, a crisis presents an abundant amount of challenges for any public administration or organization.

The task of crisis management is becoming progressively complex, constantly including new actors and new sectors of our society. As a result, crisis management is becoming just as much a task of governance as a task of government. It is under the stressors of a crisis that governance, both on local, national and international levels, is tested on its effectiveness, competency and maturity (Kruke and Morsut 2015).

Unless managed properly, crises may escalate, get out of hand and lead to grave consequences, therefore accentuating the need for governments and organizations alike to be prepared and equipped to deal with them. In order to do so, a well-functioning crisis management system needs to be in place. However, knowing what and who such a system comprises of may be a challenge in itself. Some scholars emphasize that the most decisive factor is the context in which the system is supposed to work in, thus there is no single organizational solution that is considered optimal in all solutions (Christensen, Lægheid and Rykkja 2014). This argument

accentuates the importance of understanding how the context of the crisis may influence our ability to cope with it and what factors may be of greater importance to do so: “a sound governance should guarantee resilient crisis management through coordination among several intervening actors” (Kruke and Morsut 2015:187).

Although frequently used, the term *crisis management* is always in need of further clarification. If its purpose is to represent the management of the crisis itself, an exploration into the terminology, development and classification of *crisis* ought to be introduced and analyzed, followed by the phases in which crisis management may pertain to.

2.1.1 Crisis terminology and development

According to Rosenthal et al. (2001:6), crises are defined as “*periods of upheaval and collective stress, disturbing everyday patterns and threatening values and structures of a social system in unexpected and often inconceivable ways*”. As suggested by this definition, there are three fundamental elements of crisis: threat, urgency and uncertainty. Looking at these elements separately aids us in grasping the diverse nature of differing crises and how variations in these elements create distinct challenges for crisis leaders (Boin et al. 2016). When we focus on the *threat*, a distinction can be made regarding the locus or the sector of a crisis. While some crises may threaten critical infrastructure, the health and safety of the population, and our economic stability, other crises pertain to the ways communities and organizations are run (ibid.). When the performance, competency and integrity of key officeholders threaten the legitimacy of an organizations of public institution we speak of an institutional crisis (ibid.). A distinction based on locus or sector is becoming increasingly challenging due to the rise of a ‘new’ type of crises characterized by their ‘transboundedness’. Crises are regarded as transboundary when they threaten multiple geographical or policy domains or sectors. Because of their complexity, transboundary crises are typically harder to manage because of the absence of man-made borders which are put in place to make organizing response capacities an easier task (ibid.). The concept of ‘transboundedness’ will be revisited later in chapter.

A distinction should also be made based on the *urgency* of the crisis. The clearer the need for an immediate resolution, the higher the crisis level is (ibid.). When the crisis is pressing, decision makers typically have more authority to impose changes because they can’t ‘afford’ to wait. On the other hand, when a crisis is slow in its development, they have plenty of time in developing solutions. This lack of urgency may make it harder to force people work together and bring the crisis management to a halt (ibid.).

Lastly, we can distinguish crisis based on the *level of uncertainty*. It is of course easier to plan for a crisis we see coming than for one that takes us completely by surprise. In this sense, crisis management is not an easy task. Planning and preparing for the unexpected and unknown, dealing with uncertainty and ambiguity, while responding with as much urgency as possible, tests the capacity of any organization or government (Christensen et al. 2014). Local governments are typically relatively well prepared to handle threats that periodically recur and are fairly familiar, such as hurricanes and floods. Existing contingency plans, drills and rehearsed escalation scenarios provide the involved actors with standard operating procedures making the dealing with the crisis manageable (Boin et al. 2016). Although dangerous, these types of crises can ordinarily be dealt with through planning, training, exercising and sufficient availability of resources (ibid.). More challenging crises are those that arise in a complete surprise. Those marked by “unknown unknowns” (Boin et al. 2016:8). They are fundamentally ambiguous, making problems appear concurrently or in rapid succession so that a generalized sense of uncertainty emerges (ibid.). In many ways, crises are disturbances in regularities, rendering “normal” proceedings and rule of thumbs relatively useless, if not counterproductive (Rosenthal, Boin and Comfort 2001:7). However, although the outbreak of a crisis, such as an earthquake or tsunami, may come as a surprise, the consequences of poor planning such as inadequate construction of infrastructure should not raise surprise, but rather a reflection on to what extent bad planning or lack of preparation may influence the gravity of a crisis (Kruke and Olsen 2005).

For a long time, crises were viewed in functional terms as facilitators of long-awaited change (Rosenthal et al. 2001: 5). Once viewed as ‘acts of God’ (Quarantelli 1998; 1997; 1995), our understanding of crises has developed junction with the evolution of our society. Crises are no longer viewed exclusively as incidents that cause great damage, but as “results of long-lasting processes calling for new perspectives on emergency planning and management” (Kruke and Olsen 2005:277). In today’s ever-changing society, characterized by extraordinary technological advancements, crisis management has become a much more complex activity than ever before. To cope with this complexity, researchers have found it helpful to classify crises: differentiating among crisis types makes it easier to study and understand them and shape crisis management accordingly.

2.1.2 Crisis typology

Crisis is a word used to describe all sorts of challenging events. A crisis can be man-made or natural, local or international, economic or cultural, or maybe a little bit of everything. Consequently, substantial efforts have been put towards developing typologies that can be used to outline approaches to managing various types of crises. As the field of crisis management has expanded, researchers have developed typologies as tools to better understand and study crises. One of the most recognized is t'Hart and Boin's crisis typology (2001), which aims to offer a better understanding of a given crisis by classifying it according to its speed of development and termination.

While some crises may be characterized by a surprising brutal force that immediately catches everybody's attention, other crises can have a slow build-up, slowly creeping in and manifesting. According to t'Hart and Boin, analyzing crisis development and termination in a processual manner opens possibilities for discerning forms of crisis trajectories.

		Speed of development	
		Fast: Instant	Slow: Creeping
Speed of termination	Fast: Abrupt	Fast burning crisis	Cathartic crisis
	Slow: Gradual	Long-shadow crisis	Slow burning crisis

Figure 1: Crisis typology (t'Hart and Boin 2001:32)

The fast-burning crisis ends as it starts: fast and decisive (e.g. hijacks, hostage situations). The challenge with fast-burning crises is that they may reveal latent conditions and vulnerability which led to the crisis, as well as lead to long-lasting political consequences, thus making it hard to classify them as fast-burning (t'Hart and Boin 2001).

The cathartic crisis is characterized by a sudden termination following a long and gradual onset. Crises like these tend to be led on by a slow build-up of tension and vulnerability until reached a critical point at which something snaps (ibid.). These characteristics are often seen in political conflicts between authorities and extremist groups, or international confrontations between

major and minor powers. In both cases, the crisis termination happens when the major power has had enough and intervenes by imposing a decisive, often military, resolution to the conflict (ibid.).

As put by t'Hart and Boin (2001:33), *the slow-burning crises* “creeps up rather than bursts out and fades away rather than being resolved”. In other words, they are crises which have developed slowly and that will likely take a long time to terminate. A classic example of such a crisis is climate change, which for a long time struggled to reach a crisis status, despite its already dire consequences. Although often regarded as a generation-defining crisis, it took years before it was presented as a political problem in need of political solutions. Success in politicizing these issues tends to be determined by the winners of public debate and sheer exhaustion of mass media (ibid.). Although politicians may choose to neglect them, they tend to prove themselves remarkably resilient and continue to reemerge (ibid.).

The long shadow crisis are incidents that occur suddenly, raising critical issues of a much wider scope and significance and inadvertently triggering a political or institutional crisis (ibid.). According to t'Hart and Boin (2001), there are several prototypes in this category, one of them being “incomprehensible” incidents such as a major outbreak of discontent. The 2014 Ferguson riots following the fatal shooting of black teenager Michael Brown is an incident that fits this pattern. Another prototype is the “mismanaged” incident (ibid.). In the aftermath of a crisis it is sometimes argued that the insufficient level of preparedness and poor quality of response were contributing factors to the gravity of the crisis (ibid.). Lastly, the “agenda-setting” incident describes incidents that become symbols so powerful that they influence public agenda. These incidents typically provide opportunities for advocates to shape the issue for years to come. The Three Mile Island accident in 1979 is a good example considering the politicization of nuclear energy despite the accident claiming no lives and causing no real damage (ibid.).

2.1.3 Crisis phases in relation to crisis management

Having defined what crises are and how they may be classified, this section will present the different phases of a crisis, the principal crisis management activities pertaining to each phase, and how the phases and corresponding activities may influence each other. According to Kruke, there are three crisis phases: pre-crisis, acute- and post-crisis (Kruke 2012). Although they are presented separately, Kruke argues that the acute incident must be seen in light of what happened both before the crisis manifested as well as what happened afterwards, understanding the crisis as a circulatory process in which all phases affect each other, as shown in figure 2 (Kruke 2012).

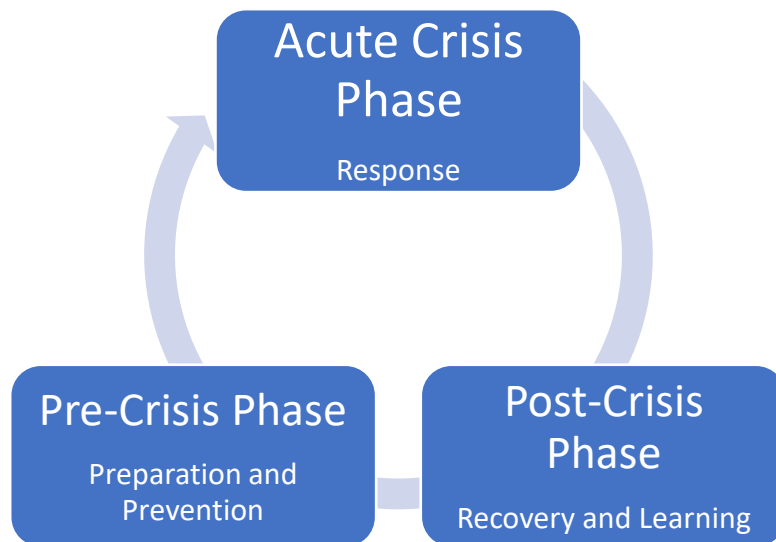


Figure 2: Crisis phases (Kruke 2012)

When understood as a circulatory process, there is a clear connection between the quality of the pre-crisis activities (preparation, prevention, planning) and the possibility and ability to effectively manage the crisis once it develops. The intent behind this circulatory process is that we “progress from the post-crisis phase into a ‘new’ pre-crisis phase more prepared for the next crisis” (Engen, Kruke, Lindøe, Olsen, Olsen and Pettersen 2016:265). In other words, crisis management does not only revolve around responding to a crisis once it hits, but it just as much relies on a working co-dependency between preparedness, response and learning and coordination among the intervening actors. This allows us to describe the process as resilient crisis management (Kruke and Morsut 2015), which will be further discussed later in the chapter.

2.2 Transboundary Crises – the ‘new normal’?

As previously mentioned, a transboundary crisis is a crisis that transcends boundaries. A crisis becomes transboundary when its potential effects and impact affect multiple sectors, groups or countries (Boin, Cadar and Donnelley 2015). A transboundary crisis may cross several forms of barriers (geographic, cultural, political, legal, linguistic), making the crisis more complex and harder to manage the more boundaries are involved (Boin et al. 2015). Crises are becoming gradually more transboundary in nature. Due to the increasing complexity and interconnectedness of our societies, it seems that transboundary crises will become ‘the new normal’.

2.2.1 Characteristics and trends of transboundary crises

The transboundary nature of any crises can be described in terms on three dimensions in which higher scores on each dimension refer to the ‘transbandedness’ of the crisis (Ansell et al. 2010:196). The first dimension concerns political and geographical boundaries. Although several crises fall within a geographically bounded political jurisdiction (such as a city or country), some crises cross these territorial boundaries and threaten multiple cities, regions, countries or even continents (Ansell et al. 2010:196). The financial fall of the American market in 2008, and the spreading of the Ebola virus outbreak of 2017 are two examples of crises which did not respect the national borders of their origin country and caused havoc across the world. A crisis can cross these borders both vertically and horizontally. For instance, when lower levels of government (cities, counties, provinces) are overwhelmed by a crisis, they may require assistance from higher levels of government (national, regional, international) to cope with the crisis (ibid.). This represents the vertical dimension of a transboundary activity. However, a crisis can also spread horizontally, across boundaries between different political jurisdictions operating at the same level of government – like two countries (ibid.). The difficulty of transboundary crisis management is greater when both vertical and horizontal coordination is required, which often it is (ibid.).

The second dimension refers to the functional aspect of a crisis. A crisis may jump functional boundaries, threatening critical infrastructure, functions and life-sustaining systems (ibid.). For instance, crises may cross from private to public systems (see Deepwater Horizon oil spill in 2010), from financial to industrial systems, or from one industrial sector to another. Crises that cross functional borders are challenging to manage, mostly because they typically involve systems that operate differently and function independently. As a result, these types of crises often surprise their operators and constituents, making cooperation a difficult task (ibid.).

The third dimension is time. Whereas some crises have a clear beginning and ending, others transcend such time boundaries. They may have roots that run deep and ramifications which are felt years down the road (the global climate change and the Paris terrorist attacks are two examples) (ibid.). This may be due to the crisis being a chain of related events rather than one single event, or that the crisis has multiple effects that emerge on different time scales (ibid.). A flood, for example, may have immediate effects on transportation and infrastructures while effects on agriculture may appear later if the water moved toxic waste past agricultural land. These types of crises may be hard to manage because there is great uncertainty pertaining to what type of response the crisis requires and when to stand it down (ibid.).

According to Ansell et al. (2010), a crisis that scores high on all three dimensions is our ideal-typical transboundary crisis. Thus, transboundary crises are expected to be more challenging to respond to than a crisis that has low scores on the three dimensions: “Because crises that produce extensive or complex interdependence across jurisdictions, sectors or time create greater demands for joint cooperation and coordination, we expect them to be more difficult to manage” (Ansell et al. 2010:197).

During the last twenty years, we have seen more and more crises having certain characteristics which confront national governments around the globe with new challenges. Whether we are talking about the 9/11 attacks, Zika and Ebola viruses, or large-scale natural disasters such as Hurricane Katrina or earthquake in Haiti, these all share similar characteristics: they affect multiple jurisdictions, undermine the functioning of policy sectors and critical infrastructures, escalate rapidly and alter and change along the way (Ansell et al. 2010: 195).

Boin et al. (2015) argued that more of these crises with transboundary nature will happen in Europe as well, as a result of an increasingly complex and interconnected European economy and the surge of new transboundary threats such as technological advancements, terrorism, migration, climate change etc., as it has happened in Europe recently (the economic crisis and the recent migration crisis are two examples).

In general, most crises require a rapid response which must come to fruition under stressful and uncertain conditions. These challenges become increasingly more difficult to manage when a crisis spreads across geographical borders and policy boundaries (Ansell et al. 2010:195). As a direct consequence of the crisis spreading more actors become involved, complicating crisis management through differing agendas and lack of acquaintance (ibid.).

2.3 Challenges of transboundary crisis management

With crises increasingly transcending borders, the tasks of crisis management are conjointly becoming more complicated. Crisis management structures are typically founded on the idea of national sovereignty, but as mentioned, a transboundary crisis does not respect national borders and specific policy domains or sectors, thereby making managing it much more challenging. Some argue that because governments typically organize their crisis management capacity in accordance with geographic and policy borders, an absence of such borders may cause a mismatch between the effects of a crisis and the capacities to deal with these effects (Boin et al. 2015).

As a result, many of the challenges that come with transboundary crises revolve around coordination and management, such as information sharing, cooperation and coordination across the boundaries of organizations, professions and political jurisdictions (Ansell et al. 2010:195). There is a need for knowledge pertaining to which kinds of organizational factors produce reliable performance across a network of actors, a field which is still relatively unexplored, according to Ansell et al. (2010:195): “Although the literature tells us a good deal about how to foster reliable performance in single organizations, we know much less about how to do this when organizations are uncertain about who their partners in a crisis might be”.

2.3.1 The importance of cooperation and coordination

As implied above, cooperation and coordination are crucial elements in a working crisis management system, thus making their corresponding challenges of great importance to solve. This section delves into the importance of coordination and present key coordination challenges. Typically, coordination is often talked about in relation to crisis management in humanitarian operations. This separation in the crisis management literature may be useful in terms of research, but it does, however, not necessarily apply to reality. As a result, this section is based on the notion that coordination challenges found in humanitarian operations response systems are just as applicable in studying any other multilevel response system.

Coordination can be understood as “the integration of organizational work under conditions of task interdependence and uncertainty” (Okhuysen and Bechky 2009: 469), and typically refers to activities which ensure communication about what to do and who should do it. Coordination is mainly a political activity. To enable interaction within and between organizations, delicate decisions about power, responsibility, rules of conduct, and division of labor must be made (Boin et al. 2016). Crisis management demands a timely and typically rapid coordination. The more dynamic and complex the nature of the crisis is, as in the case of transboundary crises, the harder it may be to coordinate the response. Still, “the threat of a fragmented or inefficient response can be countered by the presence of coordination capacity, that is, the capacity to identify key partners, monitor and assess emerging forms of vertical and horizontal cooperation, and to facilitate effective cooperation and intervene where cooperation is lacking or dysfunctional” (Boin et al. 2015:10).

For coordination to be effective, one must know who to coordinate with and the power balance between the involved actors. Therefore, the need for swift coordination exists not only horizontally within a team or organization, but also vertically between members of different organizations. According to Christensen et al. (2014: 1), a distinction can be made between the

external-internal dimension of coordination and the vertical-horizontal dimension (see table 1 below). The first differentiates between coordination within central government and coordination between bodies within and outside central government, while the second dimension recognizes the differences between vertical coordination between vertical coordination of central government with international organizations (upward coordination) and local/regional government (downward) and lastly, the horizontal coordination between organizations at the same level (Christensen and Lægheid 2008:17).

Table 1: Explaining internal, external, horizontal and vertical coordination (Christensen and Lægheid 2008:17)

	Horizontal Coordination	Vertical coordination
Internal Coordination	Between various ministries, agencies or policy sectors	Between parent ministry and subordinate agencies/bodies in the same sector
External Coordination	With civil society organizations/private-sector interest groups	Upwards to international organizations and downwards to local government

How crisis management is run depends on where the authority in charge to command is placed, the localization of knowledge of the situation, the dynamics of the situation, as well as the belief in local capacities and availability of resources (Engen et al. 2016). In responding to a crisis, the understanding of the hierarchy of the crisis response is crucial.

In general, there are three hierarchical levels of crisis response; the strategic (HQ), the operational (ops), and the tactical (ground level) (ibid.). The headquarter is often referred to as the strategic level of the organization because this is usually where the people with the authority to make decisions are situated. This is also typically where politics come into play, often complicating decision making by making the issue at hand more complex. On the far side of the spectrum, there is the tactical level. This is where you find the people on the ground who are working against the clock to save as many lives as possible (ibid.).

2.3.2 Coordination challenges

The fundamental challenge of coordination is maneuvering the complexities and intricacy of governance. Public institutions are not necessary well-oiled machines, in which all employees know what is expected of them and what to do (Boin et al. 2016). Coordination is about cooperation and to enable it the involved parties must allow themselves to be coordinated. This

may give rise to problems if public institutions are not inclined to fall in line with the presumably superordinate goal of achieving a coordinated crisis response (ibid.). In fact, some actors (public or private) may view crises as opportunities to act in accordance with their own interests. This is the political dimension of crisis coordination, where bureaucracy and speedy response may be on polar sides of the spectrum of effective crisis coordination. Crisis management happens in situations where much is at stake politically, creating tensions between executive politics and collaborative governance (ibid.). On the one hand, there is pressure from both the public and the media on public institutions to provide a quick and effective response to a crisis. On the other hand, the public and the media will also hold these institutions accountable if the response is inadequate. This, of course, is a dilemma for political leaders: failing to live up to public expectations may have detrimental political consequences (ibid.).

The larger the scope of the crisis, the more actors are involved. These actors can vary from public administration and emergency services to public and private organizations and NGOs. Although they may all wish to help and share the same 'end goal', they may have different ways of accomplishing it. This is often seen in humanitarian crises, where bureaucracy and politics often play a crucial role in complicating the coordination and cooperation between different actors.

When facing emergency response, interorganizational cooperation is a requisite. Another necessity in effective operations is adequate power of command (Kruke and Olsen 2005). In other words, when a crisis calls for a multilevel response where several actors are involved, three things need to be clear: who is involved, who is responsible, and who is in charge. Kruke and Olsen (2005) indicate that effective power of command might be difficult to achieve inside the different organizations forming the response, let alone among them. NGOs, for instance, are often formally structured and may possess organizational cultures that hamper such cooperation (ibid.). This plays into the classic discussion of centralization vs. decentralization, where researchers have different views on the necessity for power of command. For example, Scott-Flynn (1999) and Quarantelli (1997) present a contrasting view, focusing on coordination of resources and information sharing rather than exercising control and command as Kruke and Olsen call for.

Another coordination challenge focuses on how having many involved actors hampers coordination and joint efforts (Kruke and Olsen 2005). Although crises typically are a government responsibility, more often than before we see situations where outside help from other countries and NGOs is needed.

In order to enhance crisis management to cope with the complexity of crises, Kruke and Morsut (2015) call for the promotion of resilient crisis management.

2.4 The road to resilience: what is resilient crisis management and how do we achieve it?

Resilience is a word which has been extensively used in the last decade or so. One of the most classical understandings of resilience is “the capacity to cope with unanticipated dangers after they have become manifest” (Wildavsky 1991:77). The concept of resilience is applied in various contexts, making it challenging to say exactly what it is and how it is achieved. In this section, I offer one theoretic approach to the term, and explain the importance of incorporating resilience in crisis management. Thereafter, a set of factors which affect resilient crisis management is presented.

2.4.1 The importance of resilience in crisis management

Resilience is a concept in which has been interpreted and reinterpreted over the years. A definition neatly serving as a summarization of prior definitions is offered by the UNISDR, which states that resilience is “the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions” (UNISDR 2018:np). This definition is rather including, both considering systemic and societal aspects and the capacity of systems, communities and societies to bounce back.

In the theoretical discourse, resilience is often considered an ‘emerging property’ of a ‘healthy’ system (Longstaff 2005). Boin and McConnel, however, consider this theoretical approach to be ‘too optimistic’ proposing that we rather focus on “what political leaders can and cannot do to create the conditions under which resilience is likely to emerge” (Boin and McConnell 2007: 54). Previously in this chapter, crisis management has been presented as activities in which pertain to all phases of a crisis. Resilience is also one of those terms which must be seen in context, meaning that achieving it may depend on when during a crisis we look for a ‘road to resilience’. However, this implies that the management of the crisis is resilient when coordination among the actors works horizontally and vertically, internally and externally (Kruke and Morsut 2015) and guarantees a swift response to a crisis. One may therefore say that resilient crisis management can be achieved both before and after a crisis occurs, through either proactive or reactive resilience activities, as illustrated in figure 3 below.

The first form of resilience is proactive and pertains to adjustments which are made prior to a crisis. This is also sometimes referred to as *precursor resilience* (Engen et al. 2016), which can be defined as the “ability to accommodate change without catastrophic failure, or a capacity to absorb shocks gracefully” (Foster 1993:36). Hollnagel, Woods and Leveson (2006) add that proactive resilience pertains to all coordination strategies and means in which the goal it is to stop the crisis in its tracks and keeping it from reaching its crisis potential. Both definitions focus on preventing potential problems from escalating into a full-scale crisis.

Failing to do so will bring on a reactive mode of coordination, a condition of constant ‘fire-fighting’ – giving maximum effort to ‘bounce back’ (Hollnagel et al. 2006). This second type of resilience is also referred to as *recovery resilience* and may be defined as “the ability to respond to singular or unique events, bouncing back to a state of normalcy (Kendra and Wachtendorf 2003:42).

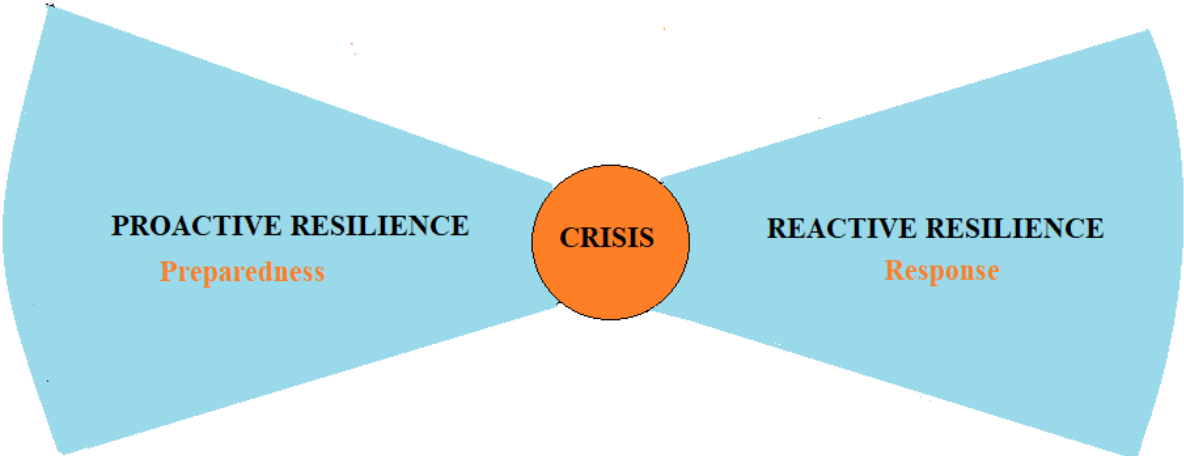


Figure 3: Showing relationship between proactive and reactive resilience, by Author

The figure above seeks to show my comprehension of the relationship between proactive and reactive resilience. As shown above, proactive resilience speaks to the preparedness measures implemented to keep a crisis from happening. Examples of such preparedness measures are for instance *risk and vulnerability assessment*, and *planning* (Engen et al. 2016). The first step of becoming prepared to cope with a crisis is evaluating the probability of the threat and our vulnerability to them. There are many ways of assessing risk and vulnerability, but these will not be further discussed in this thesis. Once the risk has been assessed, the most important task of proactive resilience is planning. Planning may pertain both to activities that are planned to prevent a crisis, but also what involved actors should do if the crisis occurs. Reactive resilience measures are, in this case, understood as efforts which are mobilized in order to respond to a

crisis once it has manifested. The predominant task here is the *mobilization of resources* to put together an adequate *crisis response* (ibid.). Which resources must be mobilized heavily depends on the context of the crisis. Two tasks, or factors, that affecting both proactive and reactive resilience is communication and coordination. These are imperative in ensuring the quality of both preparedness and response activities, and thus resilient crisis management.

2.4.2 Factors that influence resilient crisis management

In this section, I offer an overview of different factors which affect to what extent resilient crisis management is achieved and how these factors, first presented in a 2015 article by Kruke and Morsut, influence crisis response.

Factor 1: Speed of crisis development and of crisis termination

The first factor mirrors t'Hart and Boin's typology (see figure 1).

The speed at which a crisis develops (and ends) greatly impacts the response capabilities of the involved actors. In a fast-burning crisis, the crisis response must be put in effect immediately, giving little to no time for planning. The response to such a crisis therefore depends in large degree on reliable local preparedness activities (Kruke and Morsut 2015). The necessary equipment and personnel should be as close as possible to the crisis area to limit further damages which may have long-lasting consequences for the community and its inhabitants (ibid.).

Factor 2: Scope/size of the crisis

The greater the scope and size of the crisis, the larger is the demand for resources. In turn, a greater demand for resources typically require added involvement from actors on different levels. The 2004 Indian Ocean tsunami was a fast-burning crisis involving 11 coastline countries and causing massive injuries, fatalities and substantial damage to infrastructure. The crisis called for a multilevel crisis governance involving actors from the respective countries, the UN, the EU, the International Red Cross and so on (Kruke and Morsut 2015).

At this point, it is important to mention that the scope and size help separating a crisis from accidents and catastrophes, as Quarantelli (2000) shows and as Engen et al. underline when they consider the effect the accidents/crises/catastrophes have on individuals, organizations, and communities (Engen et al. 2016: 262).

Table 2: Explaining escalation from emergency to crisis to catastrophe and concurrent need for mobilization (Engen et al. 2016:262)

	Scope	Resource demand	Mobilization
Emergency/accident	X	X	Local
Crisis	XXX	XXX	Local Regional
Catastrophe	XXXXX	XXXXX	Local Regional National International

An emergency is an unwanted incident of a smaller scope that can typically be handled by local response structures. A crisis is an unwanted incident of a greater scale which requires a more comprehensive response by mobilizing local and sometimes regional response structures. A catastrophe is an incident in which causes great damage to infrastructure, and that requires the a much greater mobilization of response capacities from the local to potentially international response structures (Engen et al. 2016: 262). By this definition, the Indian Ocean tsunami ticks all the boxes for being a catastrophe.

The size and resource demand of larges ‘unwanted’ incidents may cause local actors to have difficulties upholding its function when faced with the incident. In some cases, the response structure itself may be impacted by the incident, leaving them unable to operate. The larger the incident, the more likely it may be that other response structures close by may also be impacted, making it a necessity to go further up the multilevel response structure ladder (local, regional, national, international) to get assistance (ibid.).

Factor 3: Availability of resources

The availability of resources does to a large degree depend on the relevance and reliability of the emergency preparedness process (Kruke and Morsut). Resources can pertain to tools and equipment, to vehicles, as well as personnel. Typically, the larger the scope of the crisis, the further out (either horizontally or vertically) crisis managers have to venture to locate the necessary resources. However, the more time crisis managers spend locating these resources, the more damaging the consequences may have become. This reiterates the importance of cooperation and coordination between resource structures, both vertically and horizontally within and between them. To cope with this, risk and emergency preparedness assessments

should be carried out to provide the foundation preparedness planning, training and resource allocation (Morsut and Kruke 2014 unpubl.).

Factor 4: Preparedness

To what degree the crisis is met and handled is in direct correlation with the level of preparation of response structures on various hierarchical levels: the actors need to know what to do, where to find the resources, how to use them, and who oversees what. In addition, they need to feel confident in their ability to fulfill their tasks and overcome potential challenges (Kruke and Morsut 2015).

Factor 5: Local knowledge and capacity

Typically, in large-scale crises the localization of the authority to command rarely lies with a local actor. However, it may be a large mistake not including local capacities, considering how the crisis always hits locally. It is therefore imperative to reflect on the local community's knowledge and experience pertaining to local vulnerabilities, resources and crisis response capacities. Further, an emphasis should also be on ad-hoc volunteers and the effected local community present at the scene as they represent a significant immediate crisis response resource (Kruke and Morsut 2015).

2.5 Reflection on resilient crisis management

So far in this chapter, I have discussed crisis management, crisis types, crisis phases, transboundary crises and its challenges, and the importance of resilience in crisis management. Here I show their intrinsic relationship – how they influence each other.

How a crisis should be coped with is dependent on many factors. This theoretical framework has offered an account of various factors which will have direct influence on how resilient crisis management is achieved. This theoretical approach aims to show that resilient crisis management is more than the traditional notion of coping with the crisis when it has become manifested, but that resilience is something in which crisis managers should strive to achieve in all phases of a crisis. Depending on the context of the crisis, one may choose a different 'road to resilience'. In an ideal situation, crisis managers would seek to prevent all crises from happening, thereby constantly remaining in the pre-crisis phase. However, as we know, no matter how much effort goes into preventing crises, there will always be a residual risk. We must therefore anticipate the next crisis, which is why Kruke states that the pre-crisis phase is not only about *prevention* but also about *preparedness*.

Kruke and Olsen (2005) explain that *anticipation* is about future scenarios forming the basis for emergency planning, stating that resilience (reactive) may only exist if planned for. This understanding of anticipation goes hand in hand with the presented approach to proactive resilience. In summary, proactive resilience is about preventing the crisis to the best of our ability, while simultaneously preparing and anticipating for unexpected events. If an unexpected event turns into a crisis we move from a state of prevention and preparedness in the pre-crisis phase, into a state of response in the acute crisis phase. Concurrently, the resilience activities shift from being proactive to reactive. With this in mind, in the remaining part of the thesis, I will use expressions such as preparedness activities and proactive resilience measures, and response activities and reactive resilience measures interchangeably.

3. Research design and methodology

This chapter accounts for the comprehensive research design developed to guide the research process. It provides a summary of the methodological choices made throughout this process and relates these decisions to the nature of the research question and the theoretical framework through which the research is based upon. It also presents an overview of the data collected by means of document studies and, in turn, how the data were interpreted and analyzed. Challenges related primarily to language barriers are also discussed. Reflections regarding reliability and validity are also offered. Lastly, the chapter accounts for the research process in which an overview of central activities throughout the research process are presented in a table.

3.1 Research design

A research design is a process which logically binds together the research questions with the empirical findings and the conclusions at which can be drawn from the analysis of the collected data (Yin 2014). In other words, “a research design is a logic plan for getting from here to there” (Yin 2014:26). Regardless of the methodological direction taken, a crucial condition for achieving the goal is that the research process matches the requirements of the posed research question (Blaike 2010). With this in mind, the aim is to develop a research design which demonstrates *what* to be studied, *how* it will be studied, and *why* it is to be studied (Blaike 2010), concurrently ensuring the connection between methodology, theory and empirical findings. In this thesis, such a connection has been sought through the establishment of a single-case *explorative* research design, which seeks to generate insights into the studied phenomena in order to increase our understanding of it.

According to Yin (2014:16) “a case study is an empirical inquiry that investigates a contemporary phenomenon”. In other words, our decision is doing case studies is based upon a desire to understand a real-world case. When focusing on one single case, Yin calls for a single-case research design. A single-case study is appropriate under several circumstances, and five single-case rationales – which are, having a critical, unusual, common, revelatory or longitudinal case. In relation to my study, the choice of applying a single-case study was based on the rationale of the crisis representing an *extreme* and *unusual* case, which by deviating from everyday occurrences establishes a precedent for studying the case in order to evaluate whether the findings may reveal insights about normal processes (ibid.).

3.1.1 Research strategy

When researchers set out in seeking answers to their research questions, they are faced with electing the best research strategy to answer them. Therefore, making the selection of a research strategy is the most important choice following the establishment of the research objective and research problem (Blaike 2010). The research problem and adjoining questions create the premise for choosing which research strategy is best suited. There are four main forms of research strategies: inductive strategy, deductive strategy, retroductive strategy and abductive strategy (Blaike 2010). The aim is to elect the research strategy which is best suited for a conducive research process which may yield quality results.

To seek answers to these questions, I decided to apply an inductive research design after Blaike's (2010) understanding of the term. Blaike (2010) explains inductive reasoning as the process of "establishing limited generalizations about the distribution of, and patterns of association amongst, observed or measured characteristics of social phenomena" (Blaike 2010:83). This research strategy has been chosen on the premises that the observations of the phenomenon have laid the foundation for the research questions, not the other way around.

When applying an inductive strategy, the researcher will seek answers to questions by choosing a set of characteristics, collect data related to them, draw generalizations from the data, and infer a theory or explanation. These characteristics should be decided in advance to avoid the data collection getting too unspecific (Blaike 2010). This is typically done by formulating research questions that can guide us by limiting what social phenomena will be studied. In order for this limitation to be clear and precise, the researcher must specify the objectives of the research, thereby clarifying what type of information to be collected (Grønmo 2004).

I knew, going into the research process, that I was interested in the case of the 2017 forest fires in Portugal. However, I did not have a set of research problems or objectives, rather I sought to gain new knowledge throughout the process of studying the case. After a while, however, it became clear that a methodological 'plan of attack' was needed to give direction to the research process. In this thesis, the objective was to analyze the 'transboundedness' of and resilience achieved in the crisis management of the June 2017 forest fires in Portugal, thereby clarifying the need for detailed documentation specifying the characteristics of the crisis as well as its crisis management.

3.2 Document Studies – a qualitative research method for data collection

Once a decision has been made regarding the research design and strategy, the next step is to elect a method for data collection which is best suited to acquire the desired information (Jacobsen 2010). Document analysis is a systematic procedure for reviewing or evaluating documents, which is specifically suitable in situations where (1) collecting primary data is not an option, (2) when we want to study how others have interpreted a situation or event, and (3) when we aspire to study what the involved actors have said and done (ibid.). These are all factors which happen to be true in regard to this study. A decision was made quite early in the research process that collecting and translating primary data within the time frame would be too challenging. Instead, I shifted my focus to rely solely on documents (secondary data). In one of the most influential texts on social scientific research methods produced during the second half of the twentieth century, Glaser and Strauss (1967) argued that, in matters of sociological investigation, documents ought to be regarded as akin to an anthropologist's informant or a sociologist's interviewee.

As with other methods in qualitative research, document analysis requires that the data are examined and interpreted in order to elicit meaning, gain understanding, and develop empirical knowledge (Corbin and Strauss 2008). Although some say that the method ideally should be used in combination with other qualitative research methods (for example, interviews) to seek convergence and corroboration (Bowen 2009), it is particularly applicable as a single-method in qualitative case studies (Yin 1994). In the case of my study, reports are the main source of empirical data, and since I was interested in description of events rather than motivation behind them, they gave me the insight I needed in order to develop the necessary understanding and insights relevant to the research problem. However, when using document studies as a single-method, it is important to note that this form of research requires robust data collection techniques and documentation of the research procedure (Bowen 2009). Thereby, the next sections will explain how the study was designed and conducted.

3.2.1 Selection of data

All social research involves decisions regarding how to select data from whatever the sources may be (Blaike 2010). When the data are obtained from different sources, the researcher has a choice of either including the whole *population* or selecting a *sample* from the population (ibid). Studies with an explorative design is typically based on a qualitative approach, where the aim is that the population reflects the comprehensiveness of the system being studied (Grønmo 2004). Regarding this study, the population is comprised of all information from and about

actors within and who evaluate the Portuguese crisis management system as it pertains to forest fires in 2017. However, because the population is so vast, I decided to use a sample to make statements about the whole population (Blaike 2010). A *strategic selection* was thereby made based on an evaluation of which components would be the most relevant to the theoretical approach and in terms of analytical intent (Grønmo 2004).

3.2.1 Content Analysis and Thematic Analysis

Analyzing documents involves skimming (superficial examination), reading (thorough examination) and interpretation (Bowen 2009). When collecting information, it is natural for huge amounts of data to be accumulated. To cope with this, some form of ‘manipulation’ must be applied to the data to make them applicable for analysis. In this study, a repetitious process combining elements of content analysis and thematic analysis was used.

Content analysis is based on the systematic evaluation of documents with the aim of gathering information which can be utilized in answering the research questions (Grønmo 2004). During the research process, the selection of documents coincides both with the analysis and the collection of data (ibid.). As new documents were interpreted and analyzed, I was better able to answer the research problem, while getting a better understanding of which documents were of relevance and importance to the analysis. This was achieved through the process of thematic analysis – a form of pattern recognition within the data (Bowen 2009). This approach of data analysis entails structuring information, reading the data repeatedly, and coding the information in a way that produces categories and emerging themes (Marshall and Rossman 2011). It is through this process that certain trends within the data are identified and later used in the analysis of the empirical data. This process was a good fit for the study because it made it easier to stay focused on the data pertinent to the research objectives. In order to recognize these trends or patterns within the data, it is important for the researcher to be neutral. Because of closely following the case on the news and in newspapers, withstanding the necessary level of objectivity could be challenging at times. However, because the main report was written by an independent commission, I was less skeptical, and was able to maintain a neutral stance while analyzing the findings of the report.

During the course of the study, various decisions have been made regarding how to collect information and what information was to be selected.

3.2.2 Document selection

Knowing that most of the reports would be in Portuguese, a language I am not fluent in, I started the process of researching through reading investigative journalism reports by internationally recognized newspapers and outlets such as BBC and the Guardian. Once I had confirmed that the case encompassed certain elements I wished to study, the search was on to locate reliable documentation. According to Grønmo, it is important to make critical evaluations and contextual assessments of documents. This is done through the evaluation of availability, relevance, authenticity and credibility (Grønmo 2004). Making good judgements regarding the sources of data is particularly important when using content analysis because it is based on these documents that the researcher seeks answers to the research questions.

Because both Portugal and the EU seek to be transparent in their communication strategies, I knew official reports would be available to the public, it was only a matter of locating them. After using the search engine on the official Portuguese government website, www.parlamento.pt, I was able to locate what would be my main source of information: a 297-page long independent investigation into the June 2017 forest fires. Because the case also had a strong presence of EU involvement, EU Civil Protection reports were located to supplement and corroborate with the main report. These were found on the European Union's website, <http://ec.europa.eu/>. Lastly, when working out the timeline of the case I located an English summary of the timeline in the original main report on a website called portugalwildfires.com. Considering the level of difficulty of the language used in the Portuguese report, this summary was helpful validation tool. The independent commission and EU reports were used as the main sources of information because they are relevant, authentic and credible sources of empirical information. I often found that when reading journalistic reports, there would be clear connotations inserted to make the reader feel a certain way, thereby hindering objective assessment. Unlike news outlets, the reports presented in table 3 are published by democratic offices which will be held accountable by the public. Also, the Portuguese government ordering an independent commission to investigate the events of June 2017 in itself is a statement to the credibility of the documents.

Table 3: Document selection

Documents selected	Description
Relatório Comissão Técnica Independente/ Report by the Independent Technical Commission (2017)	Official report analyzing the events surrounding the forest fire in Pedrógão Grande, Castanheira de Pera, Ansião, Alvaiázere, Figueriό dos Vinhos, Arganil, Gόis, Penela, Pampilhosa da Serra, Oleiros e Sertā, between June 17 to 24 2017
European Commission (2017) Forest Fires in Europe, Middle East and North Africa	EU report explaining forest fire preparedness and response in Portugal
European Union (2018) Portugal Overview	General information about Portugal
European Commission (2018) Forest Fires	Explaining role of EU Civil Protection and ERCC in combating forest fires
ERCC Portal (2017) ECHO daily map 19/06/2017	ECHO map explaining crisis as of June 19 and providing overview of EU Civil Protection resources incorporated in crisis response.

3.2.3 Data reduction through content analysis

Once documents have been selected, an overview highlighting how the relevant data can be divided and structured according to categories should be established. It is in this process that the relationship between data collection and analysis comes into play, with the researcher interpreting the content with reference to the research problem while evaluating the relationship between the documents to identify commonalities (Grønmo 2004). Based on these commonalities, data can be structured by way of categorizing them (ibid.).

The first step in this process was collecting data and put them into chronological order. This was done to make sure that I could relocate the sources of data at any given time. Ideally, I would have preferred to code the data through codewords, which would have been the most efficient way to go through the documents considering they were electronic. However, because the main report was in Portuguese, having to use keywords in two languages proved time consuming and inefficient. Instead, I printed out all the reports, and before going through them I established three categories representing each of the three research questions and gave each

category a different color. Then I proceeded to read through the reports, using highlighters corresponding to the colors to mark information relevant to each of the categories. This was particularly helpful when analyzing the Portuguese report so that I wouldn't have to translate the whole document into English.

The aim of data collection is to identify information relevant to the research questions (Grønmo 2004). Considering the size of the collected data, constantly evaluating the data's relevance was done concurrently with the coding, thereby becoming a helpful tool in organizing the data and achieving a sense of structure. The analysis yielded three categories based on the three main themes in the research questions: nature of crisis, proactive resilience, and reactive resilience, as seen in table 4.

Table 4: Data material categories

Category	Themes
Nature of crisis	Context, transboundary crisis, crisis development, crisis termination
Proactive resilience (preparedness)	Planning, risk assessment, response system, Operations of mutual assistance (bilateral agreements, EU Civil Protection), communication, coordination
Reactive resilience (response)	Availability of resources, response, communication, coordination

3.2.4 Advantages and limitations of method

This study is an explorative case study based on content analysis of official documents. Utilizing this method has both its advantages and limitations. Let us first look at the advantages.

Because document analysis requires data *selection*, rather than data *collection* (Bowen, 2009) the method is less time-consuming in comparison with other methods. When comparing with other methods, document analysis is also very cost-effective considering the data has already been collected, leaving the researcher only to evaluate the quality of the documents (ibid). To compare, if I would have chosen to interview to get the same information, I would have to travel to Portugal and perhaps Brussel, which would have been both time-consuming and costly. Another advantage is the *availability* of data (ibid). Because the reports I have used in the study

are all in the public domain, they are easily re-located. The method has also been very advantageous in terms of its *exactness*, with the reports including exact names, references and details of events which would otherwise be very challenging to acquire (ibid.).

However, document analysis is not always advantageous. Because documents typically are produced for other purposes than research, they sometimes lack *sufficient detail* (ibid.). For instance, very little information was provided regarding the actual communication between involved actors during the crisis. As a result, the presence of some of the factors presented in the theoretical approach (see section 2.4.2) were hard to evaluate based on the empirical data I had collected. This is particularly true of the factor pertaining to local knowledge and involvement.

There is also often a risk of *low retrievability* (ibid.) when using document analysis. However, because the reports used in this study are public this is not a likely issue. Although as seen, there are some limitations to document analysis, it is my opinion that the advantages, in this case, clearly outweighed the limitations.

3.3 Challenges

Throughout the process of writing this thesis, there have been many challenges. However, the main challenge throughout the research process have been related to language barriers. I choose the case of Portugal since I am half Portuguese and the events in 2017 had a significant impact on me. I was in Portugal visiting my family shortly after the fires had happened, and I saw how the whole population was devastated, angry and looking for answers. I wanted to, in my own way, give them some. To do so, I quickly understood that I would have to use Portuguese reports, although I knew that understanding and translating them would be a great challenge, due to my limited language skills in Portuguese. Academic Portuguese is more complex than colloquial Portuguese, and because of this, online translation tools, such as Google Translate, do not simply work. In addition, because of my lack of expertise in the field of forest fires, the reading of detailed technical descriptions in Portuguese has proven to be difficult at times. I had to rely on external help, partially provided by my mother who speaks fluent Portuguese.

3.4 Reflecting on reliability and validity

In order to judge the quality of any research design, Yin (2014) proposes to judge the design according to certain logical tests. These four tests are based on concepts including trustworthiness, credibility, confirmability, and data dependability. These concepts coincide with the tests of construct validity, internal validity, external validity and reliability (Yin 2014).

Construct reliability speaks to identifying the correct operational measures for the concepts being studied (Yin 2014). This test is often challenging in relation to case study research, with the criticism being that the researcher fails to develop a sufficiently operational set of measures, and that the researcher's subjective opinions and judgments are used to collect data (Yin 2014). To cope with this challenge, I primarily relied on the tactic Yin refers to as *multiple sources of evidence*, meaning that during the data collecting process I made sure of supplementing the main report, Relatorio 2017, with other reports from the European Commission.

The second test, *internal validity*, seeks to establish a causal relationship, and is therefore of greater importance when doing explanatory than when doing exploratory studies (Yin 2014). However, as in pertains to case study research internal validity extends to the broader problem of making inferences (Yin 2014). In case study research, an investigator may 'infer' that a particular event resulted from some earlier occurrence, based on the evidence collected. However, it is not therefore said that this inference is correct. This was highly relevant when evaluating the efforts of the Portuguese Forest Fire Defense System: because I was studying an event that had already happened it was very challenging to judge to what extent the system had been resilient or not. To cope with this, I searched for patterns and explanations in the data material to fuel the discussion (Yin 2014).

Grønmo (2014) also talks about the importance of being critical in the assessment of data, which in this case were documents. A positive factor in using documents is that the sources of the data cannot be physically changed by researcher, thereby strengthening the reliability and validity of the data (Grønmo 2004). However, the researcher must be very aware of his or her stance or perspective, seeing as this may affect both data collection and interpretation (ibid.). A narrow understanding of the phenomenon studied may lead to a narrow election of documents, which again will lead to a lopsided presentation of the data. To cope with this challenge, I was very aware and critical of my sources, thereby assuring the data would be credible and trustworthy.

A third test deals with the challenge of *external validity*. This test addresses the issue of knowing whether the study's findings are generalizable beyond the immediate study (Yin 2014). In relation to this study's external validity the findings have proven relatively generalizable based on the fact that a similar crisis took place in the same system, only months after, thereby showing that the findings of this study reflect a general state of a system and were not a product of a unique crisis.

Lastly, the final test is judging the *reliability* of the study, which aims to address the trustworthiness of the case by judging whether the results of the case could be reproduced (Yin 2014). According to Yin, the main goal of reliability is to minimize the mistakes and biases in the study. This can be achieved through making as many steps as possible, conducting the research as if someone was looking over your shoulder (Yin 2014).

Firstly, once I had decided on the case, I found multiple investigative journalism reports from news outlets, such as BBC, New York Times and The Guardian, which focused on the same problem areas and had drawn a lot of the same conclusions. This strengthens the reliability of the study, because it shows that others have, in varying degrees, achieved the same results.

When using document analysis, the study will not be able to reflect observations and opinions of involved actors outside of those who have been interviewed in the reports. As a result, there is a possibility that the reports do not fully reflect the in-depth understanding of the actors involved in the crisis, that perhaps could have been achieved if Portuguese government officials, crisis managers, firefighters or other involved actors were interviewed. However, because the focus was on the event itself rather than individual experience, or in other words what happened rather than the motivations behind it, I decided that these limitations could be compensated for as long as the documents utilized showed a great appreciation for detail. Because there seems to be an inherent bias towards applying a single-method for collecting data, it was of great importance to ensure the data's reliability and validity through careful selection.

3.3 Research process

Table 5 presents an overview of activities performed throughout the research process. As illustrated below, the research process was a constant flow of assessing and re-evaluating the research in light of new findings.

Table 5: Research process

Period	Activity	Objective	Outcome
January	Literature review into the topic of crisis management of natural disasters, with an emphasis on earthquakes, floods and forest fires.	To gain knowledge on the topic of crisis management in natural disasters.	Acquired knowledge regarding managing crisis situations, and how this may differ according to crisis type.
February	Choose case(s) to focus on, locating empirical documents. Gather relevant theory regarding crisis management, transboundary crises and resilience. Start writing theoretical approach.	Once the topic was set, an in-depth exploration of these themes was necessary to start writing the theory chapter.	Narrowed in on potential cases. The process of writing the theoretical approaches chapter well on its way.
March- April	Collecting empirical data. Writing and re-adjusting theory chapter until finished. Letting the development of theoretical framework guide the study	Locating reliable documentation on forest fires. Focusing on research articles, books and government reports. The thought was to write an all-encompassing, detailed chapter which would need refinement and readjusting, rather than being too light.	Choice is made to focus on the forest fires in Sweden (2014) and Portugal (2017). Snow-ball effect, both in regard to studying the crises, but also in terms of writing the theoretical approach chapter. Preliminary establishment of theoretical approach
May	Translating data from Swedish and Portuguese to English. Data processing/analysis Write empirical findings chapter	Because thesis is in English. Focusing on data relevant to answering research problem and questions Making it detailed enough for reader to gain comprehensive understanding of crisis	Realization that analyzing two cases was time consuming leading to the decision to solely focus on Portugal. Establishment of empirical findings chapter

	Analysis of empirical data	Analyze the data in light of theoretical framework and empirical findings.	Establishment of analysis chapter
June	Data reduction	Removing information deemed unnecessary, redundant or irrelevant.	Completion of thesis
	Analysis and Conclusion	Draw conclusions	
	Final touches, proof reading etc.	Ensure quality of writing	

4. Empirical Findings

This chapter presents my case study, the Portuguese forest fires in June 2017, through empirical material collected from various reports, mainly from Portugal and from the European Commission and its Emergency Response Coordination Centre (ERCC). These reports are listed in table 3. The chapter has been structured into four parts. Firstly, section 4.1 accounts for Portuguese crisis management system, describing both preparedness and response aspects pertaining to forest fire crisis management. Section 4.2 presents the case, the June 2017 forest fire in central Portugal. Thereafter, section 4.3 gives a brief presentation of problem areas related to the prevention of the crisis. Lastly, section 4.4 accounts for the crisis response during the crisis.

4.1 The Portuguese crisis management system

Portugal is a semi-presidential republic of about 10.7 inhabitants, which is administratively divided into 308 municipalities, subdivided into 3,092 civil parishes (European Union 2018). Although the country, with its rich history of seafaring and discovery, was once known as an empire, the country itself is surprisingly small, only 92,345 sq km (BBC 2017). The country, situated on the very western tip of mainland Europe, was greatly impacted by a debt crisis at the beginning of this decade, forcing the country to make great budget cuts. However, as of late there has been a sense of positivity and economic growth resurfacing. As EU member since 1986, the country works closely with the EU in all aspects of governance, including civil protection activities where Portugal is one of the participating states of the European Union Civil Protection Mechanism (European Union 2018).

In Portugal, civil protection and crisis management activities are developed by the state, regions, local authorities, citizens and by all public or private entities who seek to prevent collective risks inherent to major accidents or disasters, mitigating their effects and protecting people and property at risk when such crises occur (Relatorio 2017). The governing body responsible for coordinating and executing these efforts is the National Authority for Civil Protection (ANCP). ANCP is a central governing entity working under the direct authority of the state, reporting to the Ministry of Internal Affairs (ibid.). ANCP is in charge of the planning, coordination and execution of civil protection tasks and operations on the national level. Within this context, ANPC develops prevention and response plans to crises and disasters, such as forest fires.

Following the principle of subsidiarity, most crises are dealt with at the lowest possible level, meaning that crisis plans usually seek to firstly mobilize local resources close to the affected area and population (ibid.). As a result, most municipalities have preparedness activities and crisis plans tailored to the risk profile of their area. However, when where local response mechanisms are not equipped to handle the crisis, there are national plans and pre-arranged patterns stating the progression at which different levels of the system are to become mobilized and involved in the response.

This is true of the Portuguese Forest Fire Defense System, which has been established by the Portuguese authorities to evaluate and asses the risk and mobilize response efforts when necessary. With forest fires being one of the hazards with the greatest risk potential in Portugal, this is a huge system devoted to overseeing and evaluate this risk. This system is an elaborate system with local, regional, national and international components, from local authorities all the way to EU Civil Protection Mechanism. This defense system consists of three pillars: (1) structural prevention, (2) operational prevention, both concerning preparedness activities, and (3) response. The first and second pillar concern preparedness activities, and the third is devoted organizing and mobilizing appropriate response once a forest fires occurs. The authorities and organizations responsible for the activities pertaining to the different pillars of the defense system differ greatly in expertise, legislative authority, and responsibility.

4.1.1 Forest Fire Preparedness

The Institute for Nature Conservation and Forests (ICNF) is one of the key actors involved in preparedness activities, overseeing planning at local, municipal and regional (district) levels. The municipal forest fire prevention plans typically have a 5-year span, while municipal operational plans are ideally updated on a yearly basis (European Commission 2017). The strategies and guidelines outlined in the prevention plans are to be followed by the so-called municipal forest technical offices. By the end of 2016, 267 such offices were established and 188 municipal plans for forest fire prevention approved (ibid.). The planning on the regional level is assured by 18 Regional Forest Plans which are updated before each summer in cooperation with municipalities and district commands for relief operations (ibid.). Within the forest fire prevention domain, some of the main focus areas are forest fuel management, renovation and upkeep of water points, management of forest roads, establishing and implementing preventive measures, and establishing bilateral agreements (ibid.).

The DECIF refers to the Special Structure to Fight Forest Fires in Portugal. This structure outlines the responsibilities of the differing actors in the structure and provides these actors with

forest fire response guidelines and strategies such as the proper operating of vehicles, operational leadership structures, common operational risks, checklists, and safety standards and procedures pertaining to ground forces, aerial firefighting and the use of bulldozers in firefighting operations (European Commission 2017). As for 2016, a new aerial firefighting operations manual was introduced to carry out a complete revision of the implementation of aerial firefighting in civil protection operations, resulting in an exclusive operation manual for aerial forest fighting operations (ibid.). This manual highlights the minimum requirements for Aircraft Centers, air traffic control procedures and safety recommendations (ibid.).

This structure comprises of the following entities (Relatorio 2017):

- Different firefighter units or companies:
 - Fire Combat Teams/Equipa de Combate a Incêndios (ECIN)
 - Permanent Intervention Teams/Equipas de Intervenção Permanente (EIPs)
 - Permanent Intervention Groups/Grupos de Intervenção Permanente (GIPE)
- GNR Elite Protection and Relief Intervention Group/Grupo de Intervenção de Proteção e Socorro (GIPS)
- Special Operations/Força Especial de Bombeiros (FEB)
- Sapper-firefighters (ESF) a Portuguese term for professional civil municipal firefighters who clean and maintain forests, as well as take part in extinguishing forest fires. They are managed by the government, and part of a national program.
- AFOCELCA teams: teams established by Portuguese landowners to assist in combating forest fires

The structure has the following aerial means available:

- Initial Response Helicopters/Helicópteros de Ataque Inicial (HEATI)
- Upscaled Response Helicopters/Helicópteros de Ataque Ampliado (HEATA)
- Upscaled Response Airplanes/Aviões de Ataque Ampliado (AVATA)
- Airplanes for surveillance and coordination/Meios Aéreos de Reconhecimento, Avaliação e Coordenação (MARAC)

Additional resources included in the structure:

- Technicians of the ICNF, the ANPC and the Forest Technical Offices (GTF) of the Municipal Chambers (CM), or other entities with technical qualification and expertise to be qualified to support the Commander of Relief Operations (COS) and the

Operational Command Post (PCO) when it comes to understanding the technical aspects of forest management and planning.

- National Body of Forest Agents, acting in the field of forest management and defense. Aims to safeguard the heritage of Portuguese forests.
- The Armed Forces
- The National Republican Guard/Guarda Nacional Republicana (GNR) and other police authorities
- Other forces and means, qualified to carry out forest fire response, from entities with a special duty of coordination, such as where the means are coordinated by the Civil Municipal Protection Services.

4.1.2 Portugal's response

In order to cope with the inherent risk of forest fires, the Portuguese National Authority for Civil Protection (ANPC) is responsible to establish an annual Operational Directive prior to the forest fire season (European Commission 2017). The Operational Directive for 2016 aims to:

- Define a unique structure for direction, command and control, and a specified structure dedicated to the response to forest fires (DECIF).
- Regulate the institutional coordination, coordination and involvement of organizations belonging to the Portuguese Integrated System for Relief Operations (SIOPS).
- Regulate the coordination and cooperation of other organizations/institutions involved in the forest fire prevention and response.
- Oversee the fulfillment of the strategic objectives set by the Government.

All involved actors must adhere to the Operational Directive, using it as a basis for evaluating local, regional and national emergency plans alike. The Directive is also utilized as a point of reference for all organizations within the Special Structure to Fight Forest Fires (DECIF) when evaluating directives, plans and orders (ibid).

The Operational Directive bases its operations on the following principles (ibid.):

- Around-the-clock surveillance
- Timely detection of forest fires
- Immediate dispatch of initial means of attack, continuously recovering initial attack capability.
- Rapid enforcement of resources in the operating theatre.

- Limitation of forest fire development
- Mitigation and permanent extinction of fire
- Unity of Command
- Unified coordination and management of operations

Another aspect of the firefighting system, which the report does not focus on, is the role of Portuguese volunteer firefighters. Portugal, a country which has proven prone to forest fires, cannot simply afford to have professional firefighters stationed all over the country. With the country's safety heavily depending on volunteer men and women who make up for more than 90% of Portugal's roughly 30.000 firefighters, these volunteers are providing the backbone of the country's civil protection resources. In fact, there are only seven professional fire departments in the country (Associated Press 2017). Volunteer firefighters have been a proud pillar of the Portuguese civil protection system, with similar scenes of men and women in uniform fighting scorching blazes racing through eucalyptus and pine forests being seen almost yearly.

Because of the very present risk of forest fires, the Operational Directive divides the distribution of available means for surveillance, detection and firefighting operations into five phases; Alpha, Bravo, Charlie, Delta and Echo. The measure of available means depends on factors such as forest fire hazard and territory vulnerability expected for a given period (European Commission 2017). In Portugal, the Charlie phase (July 1 – September 30) is recognized as the most critical period where the risk for forest fires is the highest, therefore also being the phase where most resources are available (ibid.). Table 6 below shows a resume of all firefighting resources available according to each phase based on the Operational Directive from 2016.

Table 6: Firefighting means available according to phase (European Commission 2017)

Phases	Elements	Vehicles	Aerial Means
Alfa (< 15MAY)	Means available on demand		2 - 5
Bravo (15MAY-30JUN)	6 570	1 504	32
Charlie (1JUL-30SEP)	9 708	2 043	47
Delta (1OCT-31OCT)	5 517	1 293	22
Echo (> 31OCT)	Means available on demand		2 - 5

With respect to the means, they are provided by both public and private entities/organizations such as the National Authority for Civil Protection (ANPC), Fire Stations, the National Guard (GNR), the Forest and Environmental Conservation Institute (ICNF), Police (PSP), the Armed Forces and the Association for Forest Producers (AFOCELCA) (ibid.).

4.1.3 Emergency Communication Systems

When responding to a forest fire, a communication plan must be in place, laying the premises for which means of communications the emergency personnel are to use. With regards to the fires in Pedrógão Grande (and Góis), the communication plan for rescue and response operations were based on two networks: The Integrated System of Portuguese Emergency Services Network (SIRESP) and the operational network for firefighters (ROB) (ibid.).

The SIRESP network is a trunked radio system, meaning that it has the ability to automatically direct radio traffic, making it more user friendly in operations involving many actors. The ROB, on the other hand, is an analog network which only allows one conversation at a time. In a large operation, such as these fires, this channel of communication typically does not work well because it does not facilitate the conditions necessary for handling a heavy flow of information. However, at the time of the implementation of SIRESP, operators were told that SIRESP was not a substitute for ROB, but rather a complimentary emergency network. According to the report, it has always been indicated that the two networks are supposed to work alongside each other, creating redundancy. Because although SIRESP is a newer technology, earlier civil protection operations have discovered vulnerabilities pertaining to the network, such as its use of the GSM network.

4.1.4 Bilateral agreements and the EU Civil Protection Mechanism

Portugal has bilateral agreements with countries such as Spain and Morocco. When activated, these bilateral protocols of mutual assistance provide the additional resources necessary to combat forest fires, such as vehicles, firefighters and Canadair (European Commission 2017). The EU Civil Protection Mechanism can also be activated to provide a rapid and effective response. The Mechanism assists countries in Europe and worldwide when the national capacities to respond to a crisis have been surpassed. It needs to be activated by the country under stress through an official request to the ERCC, the European Commission's Emergency Response Coordination Centre. The participating states (34 in total) send assistance in the form of modules (in the case of a forest fire, water-bombing aircrafts (Canadair) and helicopters, fire-fighting equipment) and personnel. The Mechanism guarantees a coordinated response of several actors, from the local to the international level (European Commission 2018).

The ERCC functions as the operational heart of the Mechanism and monitors a wide range of risks, including forest fires, at global level around the clock, while the European Forest Fire Information System (EFFIS) focuses on this particular risk in Europe (ibid.). Prior to the start of the forest fire season, the ERCC organizes for all participating states an information exchange meeting on their state of preparedness for the upcoming season (ibid.). Portugal is one of the most fire-prone countries in Europe and is constantly in contact with the ERCC.

4.2 The June 2017 Forest Fire in Pedrógão Grande

4.2.1 Context

In Portugal, the occurrence of forest fires is never a question of 'if', but rather a question of 'when' and 'how serious'. This basic understanding of the potential risk for forest fires has resulted in high expectations regarding local, regional and national capacities for preventing and responding to forest fires. At the same time, several political entities are involved in the crisis management cycle, as showed above.

June 17, 2017 was a particularly hot and dry day in mid-Portugal in the district of Leiria. The spring months that year had been particularly hot, with temperatures being well above average for this time of the year. As a result of these meteorological conditions, an alert signaling high probability of forest fires was in effect (Relatorio 2017). The Pedrogão Grande fire broke out in the Frades river valley. Because of the forest surrounding the place of ignition, it was hard to detect where the fire was coming from. Local inhabitants detected the smoke at 14:37 and called the emergency services at 14:39. They estimate the fire started around 14:30. According

to the report, the fire was initially relatively small (ibid.). Upon the arrival of the first responders the fire had already spread onto a patch of pine trees and eucalyptus adjacent to the water line. As a result of the amount of combustible material and the terrain, the fire spread making left and right flanks which further complicated the response efforts. If the fire was in a more open area of the valley, firefighting efforts would be easier, but because the vegetation was so thick the fire grew more intense by the minute (ibid.). What started out as a small fire in the rural forested area outside the municipality of Pedrógão Grande, quickly developed into one of the most devastating fires in Portuguese history.

The fire provoked not only damages to vegetation and households, but 65 fatalities and over 250 people injured (ibid.). Most of these fatalities were people aged between 20-59 years old, with this age group accounting for about 50% of the lives lost. Nine of the fatalities were less than 20 years old. The remaining victims were aged over 60 (about 35%). Half of the victims were residents of the region. Many of other victims were regular visitors who had family in the region. Whereas people usually wait in their homes until the fires are under control, the violence of the fires and the brutal noises made by the wind prompted people to leave their homes seeking to get to a safer place. 47 of the deaths happened when the fire was at its peak, trapping people inside their cars on a 400 meter stretch on the EN 236-1 road (ibid.). Over the course of four days, the fire engulfed 30,000 hectares, burning around 490 homes as well as 50 industrial buildings (ibid.).

Although there have been years where a greater area has been burned (at the time of this report), the year of 2017 has been the most tragic in terms of lives lost.

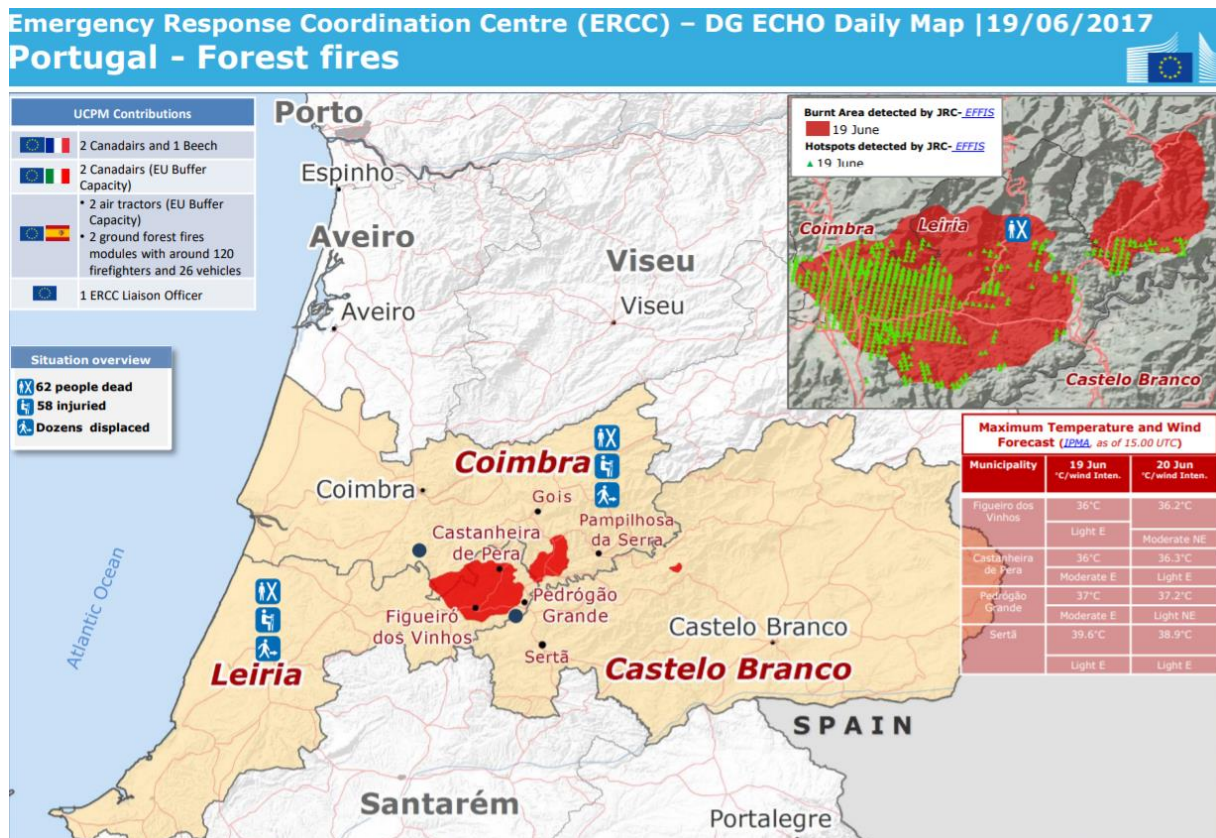


Figure 4: Showing fire development and deployed EU resources (ERCC Portal 2017)

4.2.2 Timeline

In this section, a timeline will be presented summarizing the most critical meteorological events and concurrent fire development. The timeline is based on the findings made in the official Independent Technical Commission’s report released in October 2017 (Relatorio 2017) and corroborated with a summary provided by the Portugal Wildfires website (2017). The report gives a detailed timeline of events during the Pedrógão Grande fire, with the details of the Góis fire only mentioned when of importance (time of ignition and time of merge with Pedrógão Grande fire on June 20). The report states that in the space of only a few days, there was a total of 18 different fires, with June 17 being the busiest day where firefighters had to respond to 9 fires simultaneously (ibid.). Both the fire in Pedrógão Grande and Góis started on June 17, only 9 minutes apart. However, in this thesis, an emphasis will be on the events surrounding the fire in Pedrógão Grande. The reasoning behind this choice is based on the fire in Pedrógão Grande being the largest and most critical response operation, with correlating devastating consequences. Nonetheless, the statistics regarding the overall consequences (lives lost,

hectares burnt etc.) does not discriminate between the different fires but illustrates the damages of the overall crisis.

The following table illustrates the area burnt by the fire according to days and hours. This table gives a good overview of how quickly the crisis escalated, and thereby providing the context necessary in explaining why mitigating it proved too challenging of a task.

Table 7: Area burnt according to days and hours (Relatorio 2017:65)

Date	Time Period	Burnt area Hectares (ha)	Burnt area Ha/h	Cumulative burnt area Ha	Cumulative Burnt area %
June 17	14:30-16:00	24,78	16,52	24,78	0,08
June 17	16:00-17:00	109,82	109,82	134,60	0,46
June 17	17:00-18:00	281,15	281,15	415,75	1,42
June 17	18:00-19:00	794,88	794,88	1210,63	4,12
June 17	19:00-20:00	2588,65	2588,65	3799,28	12,94
June 17	20:00-21:00	4458,57	4458,57	8069,75	27,49
June 17-18	21:00-03:00	5316,98	1063,40	13545,64	46,15
June 18	03:00-08:00	1818,62	363,72	15392,61	52,44
June 18	08:00-11:00	780,55	260,18	16173,16	55,10
June 18	11:00-13:00	952,58	476,29	17125,73	58,34
June 18	13:00-15:00	1443,48	721,74	18569,21	63,26
June 18	15:00-17:00	3369,29	1684,64	21938,50	74,74
June 18	17:00-19:00	1407,70	703,85	23346,20	79,53
June 18-19	19:00-02:00	3027,36	432,48	26373,56	89,85
June 19	02:00-05:00	2296,78	765,59	28670,34	97,67
June 19	05:00-10:00	405,36	81,07	29075,71	99,05
June 19-20	10:00-19:00	277,96	8,42	29353,67	100,00

The following tables are meant to describe the most crucial phases of the crisis from June 17 to June 21, when the crisis officially ended. The tables have emphasis on the meteorological conditions and how these affected the development of the forest fire. The concurrent crisis response will be presented in a later section.

June 17 14:30-16:00

Table 8: Summary 14:30 - 16:00 (Portugal Wildfires 2017)

Time Area Burnt	Meteorological factors	Behavior of fire	Response difficulties
14:30 – 16:00 25 hectares	Soil Moisture very low (~4%) Weak winds, but showing signs of velocity increase	Calm in the beginning but intensity grew as winds picked up. The estimated spreading speed during this period was 0.47 km/h.	The fire head was already surpassing extinction capacity 30 min after ignition. There were opportunities for extinction success in flanks, but containment was compromised by secondary outbreaks.

At 14:39, local villagers reported fire by telephone. The alert was received by the District Command of Relief Operations (CDOS) of Leiria at 14:43. Three vehicles were dispatched from the Fire Departments of Pedrógão Grande, Castanheira de Pera and Figueiró dos Vinhos. A light H31 fire-fighting helicopter was dispatched from Ferreira do Zêzere and arrives at fire at 15:05.

14:52: First alert of fire in Góis caused by dry thunderstorm.

Table 9: Summary 16:00 - 18:00 (Portugal Wildfires 2017)

Time Area Burned	Meteorological factors	Behavior of Fire	Response Difficulties
16:00 – 18:00 416 ha	Soil Moisture increasingly low Convective instability Increasing Winds	Increasing flame speed of 1.2 km/h. Extreme intensity Increase in quantity and length of projection materials.	Fire head intensity higher (12 000 kW/m) than fire well-organized fire response capacity (10,000 kW/m)

At 16:20, both ANCP and GNR report an incapacity to mitigate or control the main fire.

At 16:50 meteorologists noted some convective instability, a warning sign of severe weather changes. The southward expansion of the fire was increasing at an accelerated rate.

The reports (ANPC, GNR) and testimonies existing during this period note the occurrence of aerial projections causing secondary spot fires (16:30, 16:57), as well as fires presumably caused by lighting (17:33). Although most of these were kept under control, one of the secondary fires which occurred near Valongo had a relevant role in the expansion of the Pedrógão Grande fire in an SW direction.

Overall, this period is defined by a fire which due to convective instability and changes of wind orientation is growing rapidly in size. Concurrently the response efforts of the emergency services are becoming pushed to its limits and slowly becoming outmatched.

Table 10: Summary 18:00 - 19:00 (Portugal Wildfires 2017)

Time period Area Burned	Meteorological factors	Behavior of fire	Response Difficulties
18.00 – 19.00 1211 hectares	Soil moisture at record low, meaning the combustible material is highly flammable. Rapid change of wind direction to ENE → WSW, and increases in strength as a result of convective	Flame speed increasing to 2.3 km/h	Fire head burning at high intensity, about 20,000 kW/m, corresponding with flames being larger than 40 m.

	instability reaching maximum intensity at 18.00		
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Around 18:00, there was a rapid and pronounced change in the direction of the wind, which starts to blow from ENE to WSW and become stronger as a result of the convective instability. This change is evident in the videos of the surveillance camera located in the headquarters of the fire department of Pedrogão Grande. As a result, the fire changed the direction in which it was spreading.

At this time, the flame speed doubled again, (2.3 km / h), with triplication of the area burned and the rate of expansion of the perimeter compared to the previous period. The fire front is reported to be at extreme intensity with flames over 40 meters. The video surveillance available to the emergency services were reportedly very illustrative of the convective nature of the fire, with the Pyrocumulonimbus¹ cloud becoming visible on satellite images.

Table 11: Summary 19:00 - 20:00 (Portugal Wildfires 2017)

Time period	Meteorological Factors	Behavior of Fire	Response Difficulties
19.00 – 20.00 3799 ha	Wind increasing in speed and strength, also becoming more erratic. Convection column generating powerful updrafts, carrying fuel-rich hydrocarbons which are highly flammable. The heat propelling moisture into pyrocumulus clouds creating downdrafting winds.	The meteorological factors reinforce the already existing conditions which leads to an extreme flame speed of 3,9 km/h. Maturation of convective column making the fire increase in force and altitude.	The fire was now burning with the extreme intensity of somewhere between 20,000-60,000 kW/m, making it impossible for firefighters to contain it regardless of available means.

Extreme forest fires create extreme weather (see appendix 3 for explanation of meteorological terms). During this time the Pyrocumulonimbus cloud, also called ‘fire-breathing cloud’ was steadily increasing in its size and density. This is also the starting point of the most acute and extreme phase of the fire, with a front of strong, turbulent gusts of wind reportedly making cars

¹ Explanation in the Appendix.

shake and making it hard to open doors (Relatorio 2017). The smoke plume was also steadily increasing, with smoke now becoming detectable at an altitude of 13 km (until 20:20). Numerous secondary fires are also reported.

Table 12: Summary 20:00 - 21:00 (Portugal Wildfires 2017)

Time period	Meteorological factors	Behavior of fire	Response Difficulties
Area burned 20.00 – 21.00 8258 ha	Downburst as result of collapse of convection column	The collapse of the convection column resulted in the burning hydrocarbons in the column “raining” or projecting onto combustible material on the ground, resulting in a 10 min period of fire spreading at 15 km/h which resulted in the majority of casualties of the fire.	Uncontrollable, regardless of resources available.

Between 20.00 – 20.10, the top of the smoke plume abruptly collapsed from an altitude of 13 km above ground to approximately 6 km. This collapse of the convection column caused a local ‘downburst’ which has a violent and dramatic effect on the fire, with witnesses describing it as a sudden bomb of fire spreading flames in all directions. The violent sounds and scary visuals drive villagers into getting into their cars to escape. At the same time, the fire spreads from Vila Facaia (see Appendix 3 and 4) to EN-236-1 in 10 minutes.

Because of the downburst, the fire is spreading at an astounding 15 km/h, with IMPA’s report stating wind speeds in the Pedrógão Grande area reaching 70 to 90 km/h depending on the terrain (Relatorio 2017). At 20:30, a further increase of smoke plume intensity made the column rise again to an altitude of 13.5 km, possibly causing a second downburst. By 21:00 the atmospheric conditions had calmed, resulting in a significant reduction in the speed at which the fire was spreading.

17 June summary

During the course of the first day, what began as a subtle forest fire developed under abnormal meteorological conditions into becoming a scorching blaze covering thousands of hectares and taking dozens of lives. As shown above, the most intense period is between 18:00-21:00, with the fire expanding extensively and with great intensity, reducing the possibility to circle around it and extinguish flames from all directions. With the wind constantly changing direction, the firefighters on the ground find themselves placed at the tail of the fire, making it impossible for them to intervene in their respective flanks. This was further exacerbated by the downburst happening shortly after 20:00.

18 June summary

During June 18, the fire had burned much of the surrounding area of Castanheira de Pera and reached Figueiró dos Vinhos. The fire was spreading predominantly in a southern direction. By 13:00, fire had burned 3552 ha in the last 10 hours. At around 19:00 the fire intensified, burning at the rate of 1037 ha/h. At the time, the fire was moving at an average speed of 3.8 km/h.

International assistance was requested, activating bilateral agreements and EU Civil Protection mechanism.

June 19 summary

Between 19:00 the night before until 05:00, an additional 5324 ha were burnt.

June 20 summary

The fire in Góis grew more intense, spreading in a NNW direction until merging with the Pedrógão Grande fire.

June 21 summary

The fire in Pedrógão Grande, which by now had ravaged 30,000 ha of land, was finally extinguished at 16:43 – exactly 4 days, 1 hour and 43 minutes after it started.

June 22 summary

The Góis fire was also extinguished.

4.2.3 Operations of mutual assistance

On June 18, Portugal activated bilateral agreements (with Morocco and Spain) as well as the EU Civil Protection Mechanism (EUPCM), subsequently requesting aerial and terrestrial firefighting resources. Through the bilateral agreements, Portugal received two airplanes from Morocco, and both vehicles and personnel from Spain (Relatorio 2017). Through the EUPCM, further assistance from France, Italy and Spain was deployed. On the same day as the request was put in, an EU Civil Protection liaison officer arrived in Portugal to ensure the efficient coordination of foreign resources into the Portuguese crisis response. ANCP also activated the Copernicus Emergency Management Service to produce and provide accurate surveillance of the forest fire (ERCC Portal 2017).

As seen in figure 4, once the Mechanism was activated additional resources from other participating countries in the EU Civil Protection Mechanism were deployed, with France providing two Canadair and a Beech airplane, Italy provided an additional two Canadair, and Spain providing two Air Tractors, two ground forest fire modules consisting of about 120 firefighters and 26 vehicles (ibid.).

4.3 Prevention

4.3.1 Predictability

The Pedrógão Grande fire is an interesting and challenging case when it comes to assessing the extent to which the fire could have been predicted. According to the Independent Commission's report, there are factors which were predictable, such as the changes of wind direction which could have been predicted with accurate meteorological monitoring (Relatorio 2017). On the other hand, there were factors which could not have been predicted, such as the column's collapse and following downburst which greatly exacerbated the fire (ibid.). The fires also happened before the beginning of the Charlie phase, when operators are not expecting it – therefore affecting the risk perception. In relation to the 'unpreventable' factors, the Commission concludes that no emergency service, foreign or domestic, could have predicted and prevented the fire entirely. The fire of Pedrógão Grande is therefore an example and a warning of how current firefighting systems are not prepared to face new forms of forest fires rooted in climate change, as the main report pointed out.

4.3.2 Compliance with municipal prevention plans

Forest management is a key factor in Portugal. As rural populations in Portugal have dwindled, large parts of the privately-owned land have become neglected, leaving it to overgrow and become potential fire fuel. As a result, the Portuguese Forest Fire Defense system had to call for prevention planning on the municipal level to ensure that forests are being managed (Relatorio 2017). According to the Independent Commission's report, however, the municipalities of Pedrógão Grande and Castanheira de Pêra did not have a Municipal Fire Protection Plan validated by the Institute of Nature Conservation and Forests. As a result, the municipalities had not received government funding earmarked to promote preparedness activities during the past few years (ibid.).

The Independent Commission's report also criticizes the National Civil Protection Authority (ANCP) and fire departments arguing that the Institute of Nature Conservation and Forests should have a greater presence in preparedness activities, primarily the management of forests since this is their area of expertise.

Another central wildfire factor is the domination of eucalyptus trees in Portuguese forests. Although the native forests of Portugal originally consisted predominantly of oak and pine trees, the Australian species of eucalyptus boomed in Portugal with the rise of paper industries in the mid-20th century (BBC). Following the June forest fires, both national and international press have criticized the Portuguese government for allowing farmers to plant such huge quantities of the tree species. Although it is a profitable tree, it is highly flammable. In relation to the June 2017 fire, the Independent Commission's report states that eucalyptus trees are dominant in the area around Pedrógão Grande, also pointing out that eucalyptus trees were planted along route N-236, where 47 people died either in their cars or trying to flee the fires (Relatorio 2017).

4.4 The response

In this section, a summary of the response mobilized to respond to the fire will be presented, with an emphasis on the events in Pedrógão Grande. According to the Independent Commission's report, Portuguese officials divided the response into different phases: the initial response (ATI: Ataque Inicial) and the upscale response (ATA: Ataque Ampliado).

The initial response (ATI)

The ATI is an organized and integrated intervention, sustained by an initial dispatch up to 2 minutes after the fire was confirmed, mobilizing aerial resources (if available) and organized

following the concept of triangulation, which incorporates three different firefighting teams in addition to an air vessel.

The report states that there was a two-hour window of opportunity to get the fire under control where the initial response forces did their best to combat the fires. After that period, however, for several hours after, the report claims there was a lack of direction in the firefighting and the involved actors just did as “well as they could with what they were given”.

Once the alert was received in the emergency operations center of Leiria at 14.43 June 17, the operators followed its protocol of establishing the triangulation: volunteer units were dispatched from the fire station in Pedrógão Grande with one vehicle, another vehicle from Castanheira de Pera and a third vehicle from Figueiró dos Vinhos. The air vessel was a light helicopter parked at in Ferreira do Zezere, with a team from the Special Forces Fire Department, which arrived at 15.05. As the team in the helicopter was flying over the area, the Operation Room was alerted to mobilize four additional response units.

The region of Pedrogão Grande is a priority area for forest fire prevention. Considering how rapidly the fire was spreading and the yellow risk level alert, the independent commission questions why another helicopter (H08), which was stationed in Pampilhosa da Serra was not dispatched to respond to the fire in Pedrógão Grande, either as an additional air resource in the initial response plan or even as a first option, given that it was stationed closer than the helicopter that was parked in Ferreira do Zêzere. It must be noted that the H08 was later mobilized for the Góis fire, but at the time of dispatch no such warning was given.

The report also questions (given the possibility mentioned above) why the H15, stationed in the station of Pombal and being available, was not activated for the fire of Pedrógão Grande. It is also known that the distance between the Station of Pombal and the starting point of the fire is 41.9 km, which is technically above the guidelines for mobilization of aerial means in ATI (40 km radius). The report concludes that given the conditions in Pedrogão Grande, an activation and dispatch of helicopter H15 and H08 could have been beneficial and should have been prioritized.

It should be noted that the nearby fire in the municipality of Góis, in the district of Coimbra, which began at 2.52 pm, or 9 minutes after that of Pedrógão Grande, mobilized two air assets in the initial fire response. An hour and thirty-six minutes later, they were able to mobilize two Canadair. It is recognized that these mobilizations for Góis would have influenced the mobilization of more resources in time for Pedrógão Grande, because of it being during the

Bravo phase only so many aerial resources were available, which would eventually lead Portuguese officials to request foreign assistance.

During the first 30 minutes, the Fire Department of Pedrógão Grande mobilized 7 vehicles and 23 firefighters.

Upscale response (ATA)

After 1,5 hour elapses, the second phase of the crisis response (ATA) is initiated. This advanced response may even start sooner depending on how success initial response has been. When the second stage commences, the amount of resources mobilized is decided by the Emergency Operations Commander (COS, Commandante das Operações de Socorro).

According to the report, the second stage began at 16:13. During this stage, 167 firefighters, 48 vehicles and two aerial means were mobilized. The passage from the first to the second response stage typically implies a strengthening of means and resources (both ground and aerial). It is during this stage that the leadership must coordinate both vertically and horizontally, going higher up in the hierarchy according to the level of mobilization necessary to respond to the crisis. This reinforcement of resources is achieved through a process of balancing local ground-based relief with regional, national and even international resources.

However, although the additional resources had been requested, at 16:13, these resources were not yet incorporated in to the response. In fact, according to the report, a major mistake was made in failing to mobilize response teams situated in Castelo Branco, considering that if they were dispatched at 16:13 they would have reached the fire early enough to make a considerable difference in containing the fire in Pedrógão Grande.

Two GRIF teams, from Santarém and Castelo Branco, were requested to be mobilized at 17:30 and 18:00 respectively, which made sense because districts like Viseu and Aveiro were affected by the Góis fire. However, at 5:50 pm, a GRIF team from Setúbal and another from Évora were mobilized for this fire, which arrived at the theater at 23:00, June 17, and at 15:18, June 18.

This group of the FEB and a second group of the FEB were mobilized 22:00 and both arrived at the theater at 15:00 on June 18, when the fire had already assumed an enormous dimension and fatalities had already occurred.

In short, several reinforcement groups were mobilized, from several districts, and the only one located in a neighboring district, with immediate state of readiness, was not mobilized. In the

various contacts made by the Independent Commission, no rational justification was found for this decision.

As mentioned, the report also found that when moving from the initial to the upscale response phase, there was a shortage of aerial means: for about two hours (between approximately 16:00-18:00) in the most critical phase of the fire, there was no aerial resources operating in response to the Pedrógão Grande fire.

In summary, this phase of the response to the Pedrógão Grande fire was greatly impaired by the fact that there were other fires developing only a few kilometers away, making it challenging for leaders to make decisions regarding where resources were most needed, and whether resources should be concentrated on combating the fire or whether ground resources should be withdrawn from the fire fronts to concentrate on ensuring perimeter defense and possible evacuations. What became clear was that there were not enough resources to ensure all of these tasks.

The following list summarizes the main characteristics and challenges of the upscaled response:

- Ground resources mobilized, but still in transit.
- Scarcity of aerial means, with no helicopters/planes being available for two-hour period, and no new resources mobilized.
- Convection column collapses, creating downburst shortly after 20:00.
- The firefighting means of Pedrógão Grande and others committed to the initial response end up staying at the rear of the fire, with the fire preventing their efforts of moving around it.
- The firefighters of Castanheira de Pera were quickly involved in the perimeter defense of the villages in its county, but had difficulties responding to all the requests.
- The firefighters of Figueiró dos Vinhos were also involved in perimeter defense of the villages in the county, however experienced lack of resources.

These characteristics paint a picture of an intense fire spreading to an immense territorial area challenged with a lack of available resources.

On June 18, the country was confronted with the tragic news of dozens of fatalities in the forest fire of Pedrógão Grande. At this stage the mobilization of both aerial and terrestrial means and resources become much more effective. National and international resources were mobilized. Bilateral agreements with Spain and Morocco as well as the Mechanism were activated,

constituting in nine Canadair, two Air tractor, and foreign ground personnel being incorporated into the response. For the first time, Portugal made a request for foreign ground resources, with Spain mobilizing units from Madrid, Galicia, Andalusia, Extremadura and UME (Emergency Military Unit).

From June 19, all conditions improved, with effective coordination and cooperation between resources facilitating the mitigation of a fire that had spread across seven counties. Finally, on June 21 at 16.43, after being active for four days, one hour and forty-three minutes, the fire was extinguished. By then 224 entities, including 175 domestic fire-fighting companies, had been a part of the response.

4.4.1 An evaluation of the Emergency Communication System

When evaluating the fire, the independent commission found that SIRESP failed on multiple occasions. The report states that this was to a degree remedied by personnel switching to public networks, saying that the use of these networks made it possible to overcome some of the inefficiencies of the SIRESP network (Relatorio 2017). The report states that the failure of the communications system is partly due to the fires burning communication wires, but also because of the system's inherent limitations making it prone to user overload and poor utilization.

The report also points out that the SIRESP network is based on outdated technology (when compared to modern 3G and 4G technology). Although it may have been groundbreaking when first introduced, the independent commission argues that the government have failed in not prioritizing an update of the SIRESP technology, so it would work better in conjunction with modern cellphone technology.

5. Discussion

In this chapter, the empirical findings are discussed in view of the theoretical framework. As stated in the methodology chapter, this study has applied a single-case explorative research design. The discussion aims to explore and explain the transboundary nature of the crisis as well as crisis management aspects, to then answer the following research problem: *“To what extent was the June 2017 fire in Portugal a transboundary crisis and to what extent was resilient crisis management achieved”?*

5.1 The transboundary nature of the June 2017 forest fire in central Portugal

The nature of a crisis will adherently affect our ability to respond to it. In the theoretical approach it was argued that crises of transboundary nature are increasingly becoming ‘the new normal’. In this section, I seek to explore the transboundary nature of the crisis through answering the following research question: *Is the June 2017 forest fire a transboundary crisis, and if so, what were the challenges this had on the crisis response?*

In order to assess the degree of ‘transbandedness’ of the crisis, the fire will be assessed according to the three dimensions offered by Ansell et al. (2010): (1) political and geographical, (2) functional and (3) time.

In relation to the first dimension, the June 2017 forest fire challenged both geographical and territorial boundaries. Although the fire ignited in a relatively small rural area in the municipality of Pedrógão Grande, it quickly escalated and was constantly threatening new areas. By the time the fire had been extinguished it had spread to seven municipalities, threatening several villages and destroying thousands of hectares of land.

Pertaining to the forest fire, political and geographical borders were crossed both vertically and horizontally, meaning that the first responders quickly comprehended that the crisis was escalating at a pace beyond their capacity, making it clear that they required assistance from higher levels in the response system to respond to the crisis. In the space of the four days of the crisis, there are many examples of this form of vertical transboundary activity. For instance, this becomes very clear in the upscaling of crisis response which took place about 1,5 hours after the response started. Another prominent example of such activity is the involvement of The National Authority of Civil Protection (ANCP). One may argue that the authority to command and coordinate being shifted to ANCP (strategic level) reflects the crisis developing from a local crisis to a full blown national crisis with potential national political consequences.

The crisis also spread horizontally, across boundaries between different political jurisdictions operating at the same level of government. This was clear in the involvement of foreign resources operating at the same level of government, which needed to be coordinated into the Portuguese response system in order to have an effective impact on the response. Through the activation of bilateral agreements and the EU Civil Protection Mechanism, the Portuguese emergency response was strengthened. However, in order for that to happen, communication and coordination between foreign and domestic leaders was crucial.

The second dimension refers to the crossing of functional boundaries, such as threatening critical infrastructures and life-sustaining systems. Forest fires are crises of violent nature, since they burn everything with no distinction. In regard to the fires in Pedrógão Grande, the fire affected both private and public land and infrastructures, burning thousands of hectares of land, 490 homes and 50 industrial buildings. Typically, crises that cross functional borders are difficult to manage as results of the different actors and systems operating differently. One may also argue that this is often further complicated by different actors having different priorities. However, when responding to a brutal forest fire, the top priority will always be saving lives. One can therefore imagine that, although functional boundaries may have been crossed, the challenge of cooperation may be alleviated by the fact that the involved actors share a common goal, namely saving as many lives as possible.

The third dimension of a transboundary crisis is time. As suggested by Ansell et al. (2010), our understanding of a crisis may improve if assessing the Pedrógão Grande fire as a link in a chain rather than a single event. Although the crisis has a clear time table stating the time in which the fire ignited and a time in which it was finally extinguished, one can argue that the root of the crisis is at least partially found long before June 17 and has political ramifications which will be felt in the years to come. In this case, this is particularly true of the forest management on Portuguese land.

As mentioned, Portugal is a country which is prone to forest fires. Although this particular crisis had extreme repercussions and consequences, it is not the first time this has happened, and neither will it be the last. If looking at the crisis as a link in a series of events, the crisis subsequently loses its clear beginning and ending, resulting in the crisis transcending temporal boundaries. The Independent Commission seems to have adopted this stance, considering the report's focus on the lack of preparedness activities such as compliance with forest management plans. The challenge of managing these types of crises is mainly in ensuring that the preparedness and response are in alignment with the current risk of a new event.

Ansell et al. (2010) state that an ideal-typical transboundary crisis is a crisis that scores high on all three dimensions, consequently making them harder to respond to than a crisis that score low on the three dimensions. When evaluating the June 2017 forest fires, one can argue that the crisis scores high on all three dimensions, with particular emphasis on the vertical and horizontal activity across political and geographical boundaries, and in regard to the dimension of time. Thereby, it can be established that the 2017 forest fire in Portugal, after the understanding of Ansell et al. (2010) is a transboundary crisis.

Following the assessment in the previous section, it has been established that there is a strong presence of transboundary characteristics in the crisis, which again had repercussions in the form of transboundary challenges affecting crisis management and to what extent crisis management is resilient.

As implied by Boin, crisis management demands a timely and rapid coordination. Ensuring communication and coordination between involved actors typically becomes increasingly challenging as the crisis grows larger and more complex. This is clearly the case in during the June 2017 forest fire, where we see a clear need for vertical coordination activity to ‘pull’ resources from higher up in the response system to cope with the crisis evolving and becoming increasingly harder to cope with. What started as a relatively small local incident quickly escalated involving regional, national and international resources and thereby turning into a large-scale response operation.

In the first couple of hours of the response operation, the central challenge was ensuring a working and effective relationship between local resources (such as the local Pedrógão Grande fire department and the volunteer and professional fire departments arriving from other regions). As the hours went on, the crisis also required the involvement of regional and national resources. This is illustrated by the displacement of firefighters from other districts, but also the involvement of the National Authority of Civil Protection.

Because of the crisis producing extensive interdependence across jurisdictions, sectors and time, it created a huge demand for cooperation and coordination which was extremely difficult to manage. On one side, it seems that a framework was in place, as showed in the Forest Fire Defense System, regarding which actors were to be involved in the response. However, from what was gathered in the reports it does not seem like this framework extended to guiding these actors in coordinating and communicating with each other, and more importantly there seems to be some uncertainty regarding the localization of the authority to command. This is clearly

shown in the Forest Fire Defense System's failure of balancing response efforts with the evacuation and communication tasks as the fire expanded to a larger geographic area, threatening multiple villages and roads. This could however also be due to a lack of resources.

Once the crisis grew bigger, this challenge also took on an international dimension, with aerial means, vehicles and personnel arriving from countries such as Morocco and Spain. Despite the role of the EU and other countries in the response operation, it must be noted that crisis management activities are founded on national sovereignty. In practice, this means that crisis management tasks first and foremost are the responsibility of the host country, which in this case is Portugal. Foreign resources may only be incorporated into the response by request. When requested, a central challenge revolves around the ability to coordinate and cooperate with these foreign resources without creating mismatches between domestic and foreign capacities. Both the ability to coordinate domestic and foreign resources would greatly depend on communications/planning prior to the crisis and the ability to communicate during the crisis (information-sharing). From what can be gathered from the empirical documents, it seems Portuguese government had a well-established relationship with both the countries in the bilateral agreements and the EU Civil Protection Mechanism, seeing as their response seemed both timely and coordinated.

In summary, it seems that coordination was more successful once crisis management took on an international dimension. This may be due to many factors. Firstly, by then the intensity of the fire had lessened, making it easier for thinking before acting, whereas the first day of the crisis needed immediate response. This was further helped by the fact that ERCC was providing around the clock surveillance, making it easier to comprehend where resources had to be implemented. One may also wonder if adequate power of command was only achieved once the fire became a national priority, consequently achieving clarity in who is involved, who is responsible, and who is in charge, as said by Kruke and Olsen.

Kruke and Olsen also point out the problem of having many involved actors potentially hampering the coordination and joint response efforts. Although it is difficult to make a clear argument on whether this was a problem during the forest fire, it is clear from looking at the description of the Forest Fire Defense System that there is a very large number of involved actors in one single system who represent different sectors, who have different areas of expertise, and who have differing levels of training. Considering the very restricted amount of time to respond to the crisis, one must question whether the role and responsibility of each involved actor was successfully communicated.

5.2 Proactive resilience

The June 2017 forest fires in Portugal illustrate that there are several factors that may influence resilient crisis management as illustrated by Kruke and Morsut (2015). As prompted in the theoretical approach, the question of achieving proactive resilience is a matter of hindering the crisis from reaching its crisis potential. Proactive resilience activities typically happen in the pre-crisis phase and revolve around prevention and preparedness. In this section, the aim is to evaluate proactive resilience aspects and the factors which influence them. In order to do so, the following research question was established and sought answered: *To what extent were proactive resilience measures taken, and what factors influenced them?*

As argued by Kruke and Morsut, the degree in which the crisis is coped with is in direct correlation with the level of *preparedness* on various hierarchical levels. Preparedness and proactive resilience go hand in hand, thereby assessing this factor is an important step in answering the research question.

When discussing the preparedness to the crisis, we must look at the activities in the pre-crisis phase. In relation to the case at hand, the establishment of a Forest Fire Defense System, where the National Authority of Civil Protection (ANCP) is the central governing entity, shows that forest fires are recognized as a huge threat to the country of Portugal. To deal with this threat, ANCP develops prevention and response plans. As argued by Kruke and Olsen (2005) resilience will not be achieved if not planned for. Based on this argument, it may be argued that planning is the most important preparedness activity, because it ensures that involved actors are informed of what to do, what is expected of them, and who is in charge. The existence of such plans is therefore a first step in securing resilient crisis management. Portugal's efforts in establishing bilateral agreements and working closely with the EU shows that on the highest hierarchical levels, there is a clear understanding of a constant residual forest fire risk which must be planned for. However, like most European countries, Portugal wishes to handle crises on the lowest possible level, meaning that preparedness activities should also happen on local and regional levels as well national.

As Portuguese authorities have identified forest management as a crucial preparedness factor, they have encouraged all municipalities to have a Municipal Fire Protection Plan. With the ownership of Portuguese forests being highly fragmented, ensuring both the existence of and compliance with municipal plans is a detrimental proactive resilience measure relating to forest fires. While there is a clear intent of ensuring preparedness, as shown by the establishment of

municipal forest technical offices and general national presence of municipal planning, there seems to be little to no political power making sure that such plans not only are developed but complied with. This is clearly seen in the municipalities of Pedrógão Grande and Castainheira de Pêra, where we witness the domino effect of how a shortage of municipal planning led to a lack of financial resources enabling the municipalities to prioritize preparedness activities. This is highly problematic, because it shows that the national ambition does not reflect the local state of preparedness. In other words, this reflects a system which addresses the risk nationally, but does not seem to have the resources to enforce that the risk is being managed locally. This is where the resilience of Portuguese forest fire preparedness stumbles and seems to come to a halt.

Further complicating this issue is the abundance of eucalyptus trees in Portuguese forests. It is a known fact that eucalyptus trees are much less resistant to fire than the native trees of the Portuguese forests. Considering the meteorological profile of Portugal, one can imagine that native trees are more resilient to forest fires than foreign tree species, leading us to question whether there should be taken legislative measures limiting the growth of the foreign tree species, eucalyptus, despite its rapid growth granting paper producers quicker earnings. What should be of higher priority: safety or economic gain?

Another factor influencing the crisis management is *allocation of resources*. When discussed in terms of proactive resilience, this factor pertains to how crisis managers have planned for resources to be allocated, not how it affected the response (reactive resilience). As stated by Kruke and Morsut, risk and preparedness assessments should be carried out to provide the foundation for resource allocation. In terms of assessing forest fire risk, Portugal's Forest Fire Defense System relies heavily on statistics. It is based on this risk assessment that the availability of resources is decided. This is illustrated by the Operational Directive dividing the distribution of available means into phases, meaning that they expect the most dangerous forest fires to happen during the phase at which most resources are available, which in Portugal is the Charlie phase. In accordance with the statistics behind the reasoning of these phases, a forest fire such as the one in Pedrógão Grande would be expected to occur during the Charlie phase, beginning July 1. However, the fire started June 17, during the Bravo stage, when fewer resources were available, straining the response entities' ability to respond to the fires. This leads us to question whether these phases should be re-evaluated, subsequently questioning the reliability of the system's ability to predict forest fires, especially considering the future impacts of climate change. To corroborate this argument, I briefly mention here that another deadly fire

happened in October (also not in Charlie phase). Thus, it may be time for Portuguese authorities to re-evaluate whether these phases are a safe and effective way of assessing risk and thereby deciding the availability of forest fire resources.

Lastly, another factor which can affect proactive resilience is the involvement of *local knowledge and capacity*. As stated by Kruke and Morsut, it is beneficial to benefit from the local community's knowledge and experience, because they typically have greater knowledge regarding local vulnerabilities, resources and capacities. Based on the information in the reports, I unfortunately know little about to what degree locals were involved in the crisis management of the fire. What I do know is that the first firefighters to arrive at the fire were local volunteer firefighters. Because there are a limited number of professional firefighters in Portugal, rural areas, like the municipality of Pedrógão Grande relies on volunteers to ensure their safety. A positive factor in the first responders being local are that they most likely have a better understanding of the local terrain, therefore becoming valuable assets to the firefighters arriving from other parts of the country.

5.3 Reactive resilience

When we fail to prevent the crisis, the aim becomes to mitigate it. This is when we move into the acute phase of the crisis. Thereby we are also shifting our focus from preparedness to response, and concurrently from proactive to reactive resilience. In this section, the aim is to evaluate reactive resilience aspects and the factors which influence them. In order to do so, the following research question was established and sought answered: *to what extent were reactive resilience measures taken, and what factors influenced them?*

As pointed out by Hollnagel, reactive resilience is in many ways a state of constant firefighting, where crisis managers are giving maximum effort to 'bounce back'. When it comes to responding to a crisis, a huge factor influencing those capabilities is the *speed of crisis development and termination* (Kruke and Morsut 2015). In general, forest fires are examples of fast burning crises. This is also true of the June 2017 forest fire, which in the span of four days engulfed over 30,000 hectares of terrain, pushing the response structures to its limits and beyond.

Another factor affecting the crisis management of the forest fire was the *scope and size of the crisis*. According to Kruke and Morsut, the greater the scope and size of the crisis, the larger is the demand for resources. This was clear in the June 2017 forest fire, where the sheer size of the crisis contributed to the response involving local, regional, national and eventually

international capacities. In view of the understanding of crises provided by Quarantelli (see Table 2.2), the forest fire started as an *emergency*. Forest fires are normal occurrences in Portugal, and when this one was first reported, it was still relatively manageable, thereby only calling for local responders. However, this quickly changed as severe meteorological conditions and dry combustible material made for a combination that would quickly surpass the local capabilities. In a matter of hours, what started as an emergency had developed into a full-fledged *crisis*, taking dozens of lives, damaging infrastructure and land, and requiring the mobilization of every available response structure.

The main factor influencing the reactive crisis management of the forest fire was the *availability of resources*, referring to the level of readiness for response structures to be mobilized (Kruke and Morsut 2015). When a crisis has a rapid development, it makes it more challenging to respond to it because of the simple point that there is no time to plan, just to act. Although the fire started relatively small, it developed at such a pace that ordinary measures were insufficient in coping with the crisis. Additionally, because of the crisis preparedness being in the Bravo phase, fewer local resources were available resulting in resources having to be mobilized from other districts.

The Independent Commission's report states that there was a two-hour window in which it was possible to get the fire in Pedrógão Grande under control. Although local volunteer firefighters arrived at the scene relatively quickly, the greatest error made during the initial response was the failure to mobilize the two additional available helicopters (H15, H08) which both were stationed relatively close to the fire. Instead, the one helicopter which was mobilized arrived at 15:05, about 35 minutes after the fire started. The failure of mobilizing H15 and H08 may have been due to communication and coordination errors. It may also be a product of failing to recognize the severity of the fire threat. To compare, there were two Canadair mobilized relatively quickly for the fire in Góis. The poor efficiency of the initial response may also partly be contributed by lack of leadership, which was reported by firefighters on the scene. In summary, the response operation's lacking ability to get the fire under control within the two-hour window of opportunity reveals insufficiency regarding the initial response itself, and a failure to recognize that the threat would greatly surpass the capabilities of ordinary response measures.

An hour and a half into the response operation, the upscaled response is initiated. Although the passage from the first to the second stage of the response operation should imply an immediate increase in availability of resources, this rapid upscale of response measures is not immediately

felt on the scene. This is partly due to leadership failing to mobilize a response team in the neighboring district of Castelo Branco. Although it is known that the capacity to mobilize firefighting companies is compromised in the Bravo phase (in comparison to Charlie stage), this local response group should have been mobilized, even as a measure of anticipation. Because of there being no additional local response teams, the fire kept on spreading while the mobilized response teams were in transit, resulting in a failure to take advantage of the two-hour window of opportunity.

Another discrepancy in the upscaled response was the time in which it took for the two aerial means to be incorporated into the response operation. With aerial means being some of the more effective ways of combating forest fires, it could be argued that the two-hour window in which no aerial means are in effect (16:00-18:00) coinciding with the period of upscaling the response (16:13) reflects poor utilization of resources and coordination. It is also during this period of time that the convective instability is increasing causing the fire to spread with extreme intensity. In other words, when it is most crucial that the response is upscaled, mobilizing additional resources, there were less aerial resources available than during the initial response.

It is following this period of time that the fire, mostly due to meteorological conditions, reaches its peak and most of the fatalities occur. Although the intensity at which the fire spread was largely attributable to the downburst that happened following the collapse of the convection column, one must wonder if the lack of adequate response exacerbated the crisis.

As identified by Boin, Cadar and Donnelley, a key factor in crisis management is the presence of coordination capacity. However, in order for coordination to be achieved, the involved actors in the response operation must be able to communicate. A major factor hampering the communication between response entities during the fire was the breakdown of the emergency communications network, SIRESP. With the fire destroying communication lines, the system became overused, therefore not working effectively. As a result, communication was greatly compromised, which led to emergency officials not being able to communicate with each other or the public concerning evacuation routes. As a result, authorities failed to block the road in which 47 people were trapped by the flames. The real tragedy is that 70% of the victims died fleeing from homes that were never reached by the fires, illustrating the insufficiency of communication between authorities and locals. In hindsight, one must agree with the Independent Commission's argument that the government made a grave mistake in dismissing or putting off prioritizing the modernization and updating of the SIRESP technology,

considering how such advancements could have made a difference in the evacuation of villagers.

Following the devastating events of June 17, the following days are characterized by a much more resilient response. This is mainly due to the decrease of convectional instability paired with the mobilization of foreign forest fighting resources becoming available following the activation of bilateral agreements and the EU Civil Protection Mechanism. Once the extreme meteorological conditions had calmed, crisis leaders with the help of international resources, such as surveillance from ERCC, were able to get an improved understanding and better visibility of the forest fire, thereby ensuring an effective influx of resources. The overall lack of mention of coordination challenges pertaining to the integration of foreign resources is a clear indication that the communication between Portugal, its bilateral partners, and the EU is satisfactory.

To summarize, the availability of response resources called for a horizontal coordination between the Portuguese Civil Protection Agency and equivalents in Morocco and Spain, and for vertical coordination between Portuguese authorities and the EU (Civil Protection Mechanism).

5.4 Lessons learned from the June 2017 forest fire in central Portugal

The assessment of proactive and reactive resilience measures as they pertain to this case yielded some overall thoughts regarding problem areas of the Portuguese Forest Fire Defense System. These are presented to summarize the key problem areas pertaining to resilient crisis management as it related to this particular crisis.

Firstly, there seems to be a mismanagement between different emergency services, highlighted by the lack of clarity regarding how a large-scale forest fire like this one should be coordinated. The forest fire also uncovered issues pertaining to the system's lacking ability to adjust to the present forest fire risk, thereby displaying an urgent need to understand the phenomenon and adapt the structures of civil protection to acquire the capacity for anticipation and planning, substituting the logic of 'more resources' for the logic of knowledge and proactivity. This relates to central issues such as the lax regulations of private landowners, the lack of compliance with legislation (e.g. municipal protection plans), the availability of forest fire resources, the upkeep and updating of emergency networks, and landowners maximizing profits by planting eucalyptus consequently turning Portugal into a tinderbox. Judging by the empirical data, the main challenge lies in ensuring vertical coordination activity, in which successful cooperation

and coordination exists between local, regional and national Portuguese response entities – both in preparedness and in response.

6. Conclusions

The purpose of this thesis has been to study the transboundary nature of the June 2017 forest fires in central Portugal, and to what degree resilient crisis management was achieved. This research objective yielded the following research problem:

To what extent was the June 2017 forest fire in Portugal a transboundary crisis and to what extent was resilient crisis management achieved?

Forest fires are prime examples of crises which have the potential to cross multiple forms of boundaries, thereby becoming transboundary crises. This was clearly the case with the June 2017 forest fire in Portugal, in which we saw a small forest fire quickly escalate from a relatively small and ordinary emergency into a full-blown catastrophe, concurrently crossing multiple forms of boundaries (geographic, political, functional and temporal) thus taking on characteristics resembling what Ansell et al. refer to as the ideal transboundary crisis. The crisis' high scores across the dimensions of 'transboundedness' produced enormous difficulties which, paired with factors such as extreme speed of crisis development, challenged the degree to which resilient crisis management could be achieved.

Based on the lone fact that the crisis occurred, we already know that proactive resilient crisis management was not achieved, because the ultimate goal of being proactive is to prevent a crisis from happening. However, as set forth in the theoretic approach, proactive resilience also refers to planning for the residual risk, thereby making studying the crisis' *preparedness* just as important as its *prevention*. When it comes to Portugal, forest fires cannot be completely prevented. However, they can be prepared for.

Portugal is a modern Western country, with a professional crisis management system in place. In regard to the system's approach to proactive resilience, there is a clear understanding that forest fires are a threat to the country which must be planned for, as seen by the municipal planning initiatives, established bilateral agreements and EU cooperation. However, as discovered on June 17, 2017, even a modern crisis management system must adjust to cope with the new normal of transboundary crises, as clear gaps between national ambition and local state of preparedness were uncovered.

In terms of planning, a central issue seems to be a lack of political power ensuring that national initiatives, such as desire for all municipalities to have municipal forest fire defense plans, are complied with. Although there is no way to know whether the compliance with such plans would have made a difference in the development of this particular crisis, it is still a key finding because it reflects the system's general state of preparedness.

This was further challenged by the Portuguese Forest Fire Defense System being in the Bravo phase, which is a lowered state of preparedness. Although this thesis solely focused on the June 2017 fire, it is briefly mentioned that a fire also occurred in October the same year. The reasoning for mentioning this was to show that the risk and vulnerability assessment in which the availability of resources is based on needs re-evaluation. When two of the deadliest forest fires in Portuguese history both happen during a state of lowered preparedness, it is time to make changes, especially considering future impacts of climate change.

Despite clear efforts in ensuring preparedness through proactive resilience measures, such as planning and risk and vulnerability assessments, these efforts were not efficient in hindering the crisis from further development, thereby moving the crisis into the acute phase, where the crisis management no longer concerns preventing and preparing but responding.

When moving into the acute crisis phase, the aim becomes to react to the crisis as fast and efficiently as possible and 'bounce back', hence why it's referred to as reactive resilience. Although Portugal has a well-established Forest Fire Defense System, comprising of various response entities which have differing areas of expertise, we saw the system struggle to cope with a transboundary crisis, such as the June 2017 forest fire. As a result of the system being in a compromised state of preparedness, less resources were also available to combat the fire. As the forest fire rapidly spread, the response capability was unable to keep up with the tempo at which the crisis was developing. This reflects a system which was unable to recognize the possibility of the fire surpassing the capacity of ordinary response measures. In other words, they failed in realizing the crisis' potential. The crisis response also failed in transitioning efficiently enough from an initial to an upscaled response, thereby missing the two-hour window of opportunity to get the fire under control. Further diminishing the reactive crisis management was the failure of coordination, which was seen both in the mobilization of aerial resources, and when communication was compromised with the breakdown of SIRESP hindering orders of blocking the N 236-1 road from being communicated.

Although Portugal has a system which is designed to ensure both proactive and reactive crisis management, we saw this system partially fail both in prevention and response when faced with a transboundary crisis.

6.1 Need for further research

Crises which are transboundary in nature forces us to rethink how crisis management is organized and works. As shown in this study, our traditional crisis management systems may prove too rigid and sectorial for the new wave of crises that will arise.

As in the case of the 2017 forest fire in Portugal, ensuring proactive and reactive resilience seems to be the responsibility of numerous entities on all levels of the crisis management hierarchy. However, a sense of cohesiveness is missing. There seems to be a clear need for a more comprehensive and holistic approach to make crisis management more resilient, incorporating both proactive and reactive resilience measures in a more flexible system.

I do think, however, that in order to develop such a system, we need more information regarding how ‘transboundedness’ influences crisis management, and how to measure it. To summarize, there is a necessity and demand for qualitative research which seeks to study how to achieve resilient crisis management when coping with transboundary crises, and quantitative research to develop tools to measure ‘transboundedness’.

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Appendix

Appendix 1

The following illustration is comprised of information found in the official report investigating a forest fire in Sweden in 2014 and describes the different parts of a forest fire.

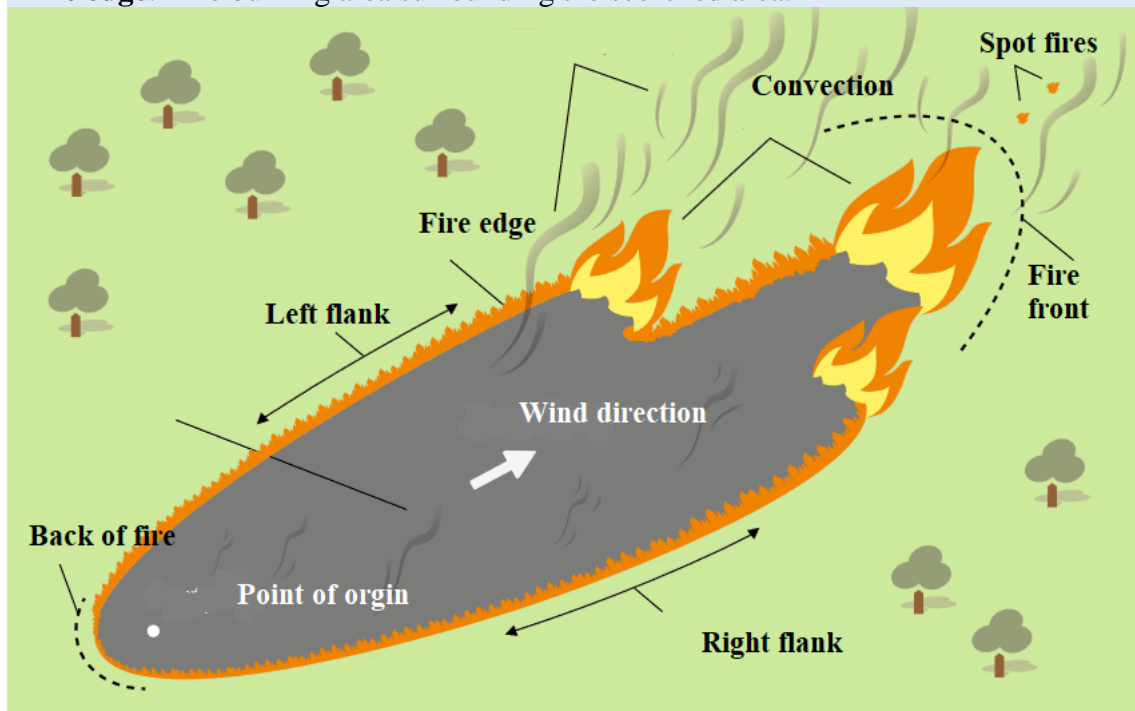
THE PARTS OF A FOREST FIRE (MSB, 2014):

Spot fires: a fire in which sparks or embers at a distance from the main fire. They occur when burning particles are transported by the wind into new territories.

Fire front: where the fire spreads and is at its most intense. The part of the fire front which moves fastest in terms of spreading is called the head of the fire.

Flank: The area in between the back and front of the fire. The left and right flanks are indicated and decided by the wind direction from the back to the front of the fire.

Fire edge: The burning area surrounding the scorched area.



Reference: MSB (2014). The 2014 Forest Fire in Västmanland: Observer report. Karlstad: Swedish Civil Contingency Agency (MSB)

Appendix 2

Technical terminology to describe atmospheric occurrences during the June 2017 forest fire.

Convection: *The transfer of heat by the movement of a gas or liquid. Because hot air rises, heat transfer through convection tends to move upward. During wildfires, burning materials on the forest floor create convection currents that preheat the leaves and branches of trees above the fire. The vertical air currents can also lift burning materials.*

Convection column *is an ascending column of gases, smoke and debris produced by the heat of a fire that generates powerful updrafts. The height of a column into the atmosphere depends on the degree of atmospheric instability, heat output of the fire and speed of higher altitude winds. The heat also propels moisture that condenses into pyrocumulus clouds.*

Pyrocumulus Clouds *are puffy cumulus clouds formed by the hot air and smoke released into the sky during wildfires. If a cloud column builds high enough, it can become a...*

Pyrocumulonimbus *cloud which is essentially, a fire-fuelled thunderstorm cloud. The anvil-shaped thunderheads on top of the smoke plumes spawn extreme turbulence, down-drafting winds, and even hail that, rather than cooling flames, stokes them by churning out even more erratic winds. They can also produce lightning.*

Convective Instability *is the effect of atmospheric conditions such as changes in temperature, moisture and pressure. If the air is unstable, the vertical movement of air is encouraged, and this tends to increase fire activity.*

Downburst *is a strong ground-level wind system that emanates radially from the surface landing point in a straight line in all directions. They can contribute to very sudden changes in surface winds, moisture and temperature.*

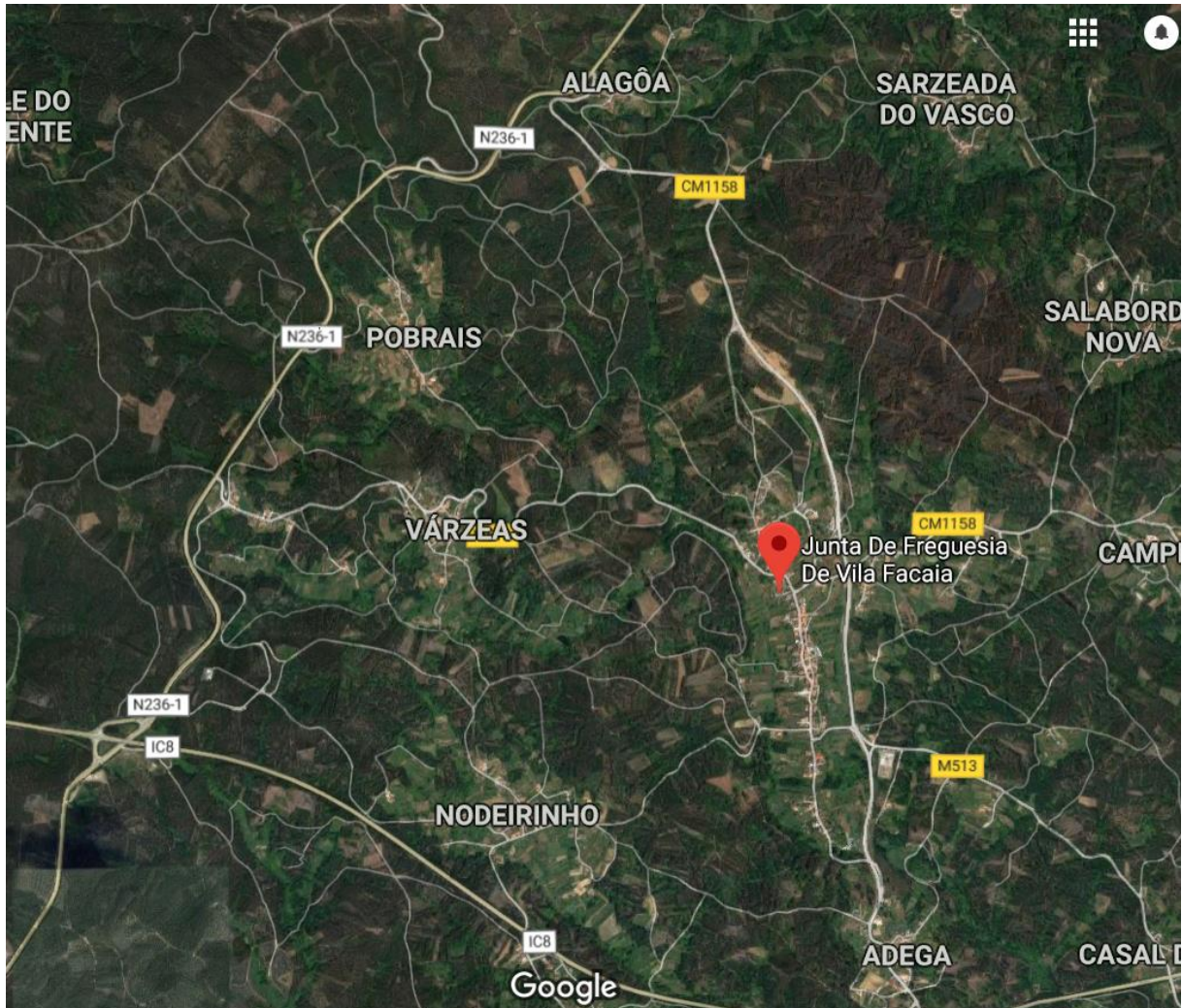
(Portugal Wildfires, 2017)

Reference: Portugal Wildfires (2017) Pedrógão Grande Fire Timeline. Retrieved from:

<http://www.portugalwildfires.com/pedrogao-grande-fire-timeline/>

Appendix 3

Google map illustrating the localization of where the fire spread onto road N236-1 in the evening of June 17.

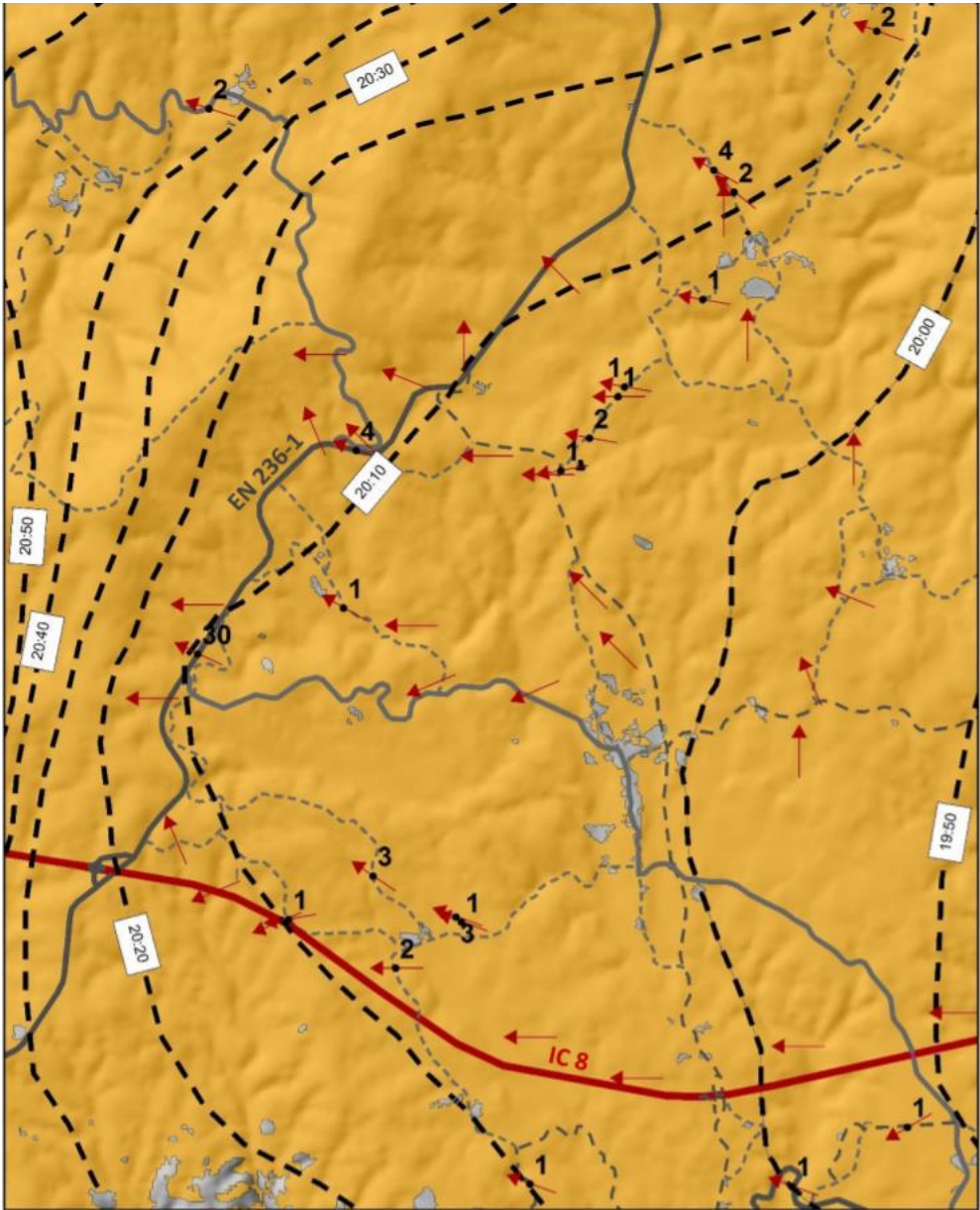


Reference: <https://www.google.com/maps/place/Junta+De+Freguesia+De+Vila+Facaia/@39.9373868,-8.2269055,562m/data=!3m1!1e3!4m5!3m4!1s0xd2293febddff57b:0xd764d73d47e8611f!8m2!3d39.9373827!4d-8.2247168>

Appendix 4

The map provided by the Independent Commission. Illustrates same area as the Google map in appendix 3.

Red arrows representing direction of which the fire is spreading. Dotted black lines are representing the time the fire arrived at that point. The black dots illustrate the location and number of fatalities.



Reference: Relatorio 2017