

An aerial photograph of a volcanic landscape. The foreground and middle ground are dominated by dark, jagged volcanic rock formations. A winding road snakes through the terrain. In the distance, a small village with red-roofed buildings is nestled on a hillside. The sky is filled with soft, white clouds. The overall tone is somber and dramatic.

GREENPEACE

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GREENPEACE REPORT ON WILDFIRES IN PORTUGAL
MORE THAN 80 YEARS OF DATA SHOW THAT THE COUNTRY MUST CHANGE

by

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INTRODUCTION

THE RISK OF WILDFIRES AND ITS MANAGEMENT

Eradicating wildfire risk completely is an almost impossible task due to its sheer complexity, but by understanding how it works, we can learn to better manage it, adapt, and safeguard our future. We must try to better understand the risk in order to better manage it. As with any other risk, the wildfire risk is composed of the danger (or hazard), the exposure, the potential loss, and the recovery (cf. Chuvieco et al., 2022). These components are interdependent through a series of very complex processes involving several factors, some of physical or biological nature, others of socio-economic or human nature, acting in a wide range of temporal and spatial scales. Knowledge of these processes is the object of science and practice, considering all aspects in an integrated way without neglecting any, leading to

The integrated management of wildfire risk involves the following phases: preparedness, prevention, suppression and recovery. These phases are also interdependent and are equally important.

It is from this integrated perspective on wildfire risk that we analyse the situation of forest fires in Portugal, seeking to consider all their aspects.

CONTENTS OF THIS REPORT

As in several other countries, the wildfire risk in Portugal has been changing over the past decades due to the positive or negative effects of various factors, some related to natural or physical conditions and others to socioeconomic, political, and organisational activities. Using statistical data on national fire occurrence and extension, which have been available since 1943, and on climatic factors, vegetation cover and properties, population evolution, and administrative changes in the wildfire risk management system, we provide an overview of wildfires in Portugal and their evolution over the past decades. The long-term data are used to provide an overall perspective on some of the major factors present over these eight decades; greater attention will be paid to the period from 2000 to 2025, for which we have more data available.

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OVERVIEW OF WILDFIRES IN PORTUGAL

CHARACTERIZATION OF THE FOREST SYSTEM IN PORTUGAL

Continental Portugal has an area of 89015 km² which is mostly covered by vegetation with potential to support wildfires. The evolution of the forested areas covered by forested extensions (mostly plantations), shrubs, agriculture, and other land uses, between 1867 and 2025 is shown in **Figure 1a**). As can be seen, during this period the forest cover increased during the entire period with the exception of the last years; the agricultural area increased until around 1960, but decreased afterwards, remaining practically stable from 1990 to the present. Pasture and shrubland areas decreased until 1960, due to the expansion of forested and agricultural lands, but have been increasing since then due to both the abandonment of agriculture and wildfires. The urban area has increased constantly. The evolution of the composition of the forest cover, in terms of the main species, during the same period is shown in **Figure 1b**). As shown in the figure, *Quercus suber*, which is native to Portugal, increased its area until 1950 and has declined slightly since then due to disease and fire. *Pinus pinaster*, which is another important species, had its area expanded at the beginning of the 20th century, following important afforestation programs, to create economic value and improve the landscape in the country; after 1970 this area declined due to fires and conversion to eucalyptus. *Eucalyptus globulus*, which is intensively used by the paper production industry, had its area of occupation expanded in the seventies, to

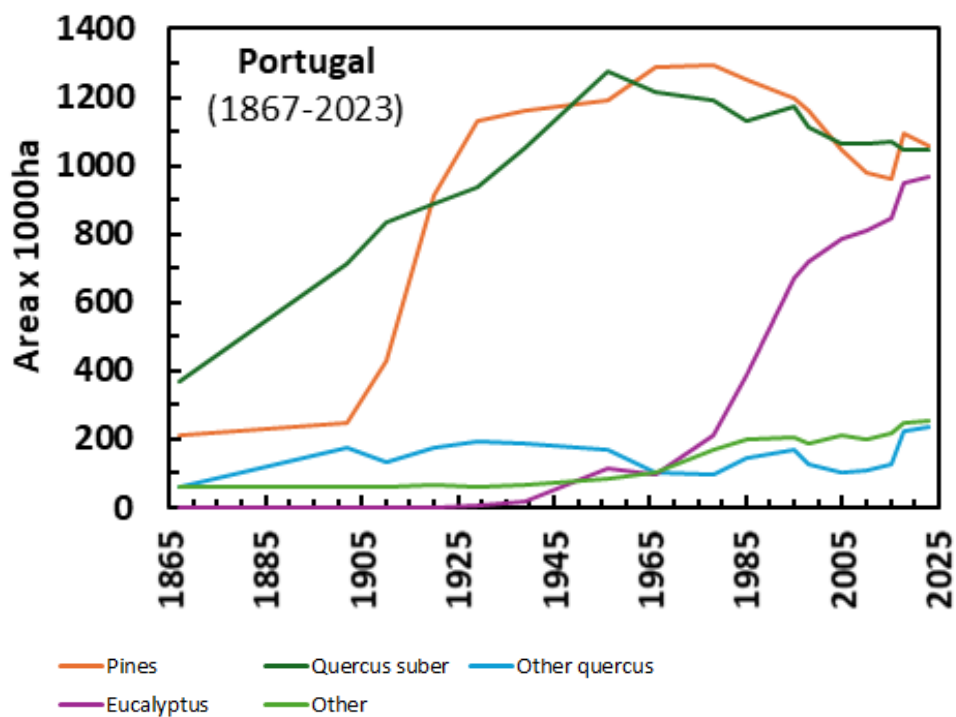
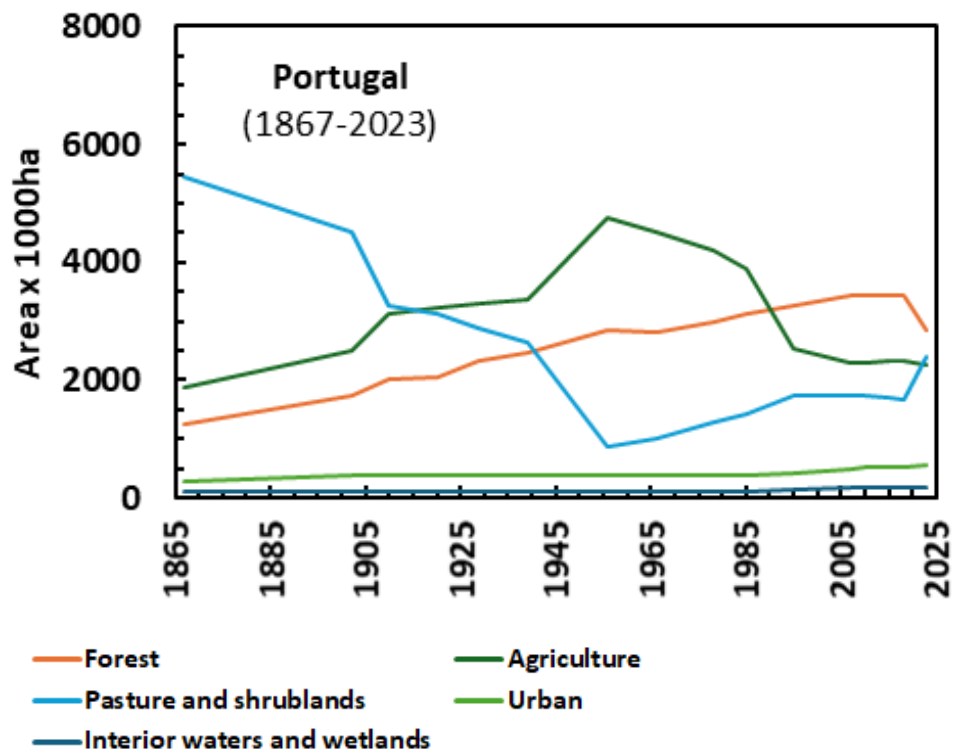


Figure 1 – (a) Evolution of the ground cover of Portugal (1867-2023). (b) Evolution of tree species (1867-2023).

Around 90% of the forest and agricultural land is owned by private citizens or companies; the Government owns around 5% of the forested areas, while 5% are managed by local communities in a mix of private-public system. The private properties are very much divided, making their average size very small and not adequate for profitable management; in some parts of the country due to the property division associated to heritage processes, the limits and ownership of some properties are not clearly defined. As a result of this, the management of the forested areas is not very efficient or uniform; larger properties in the South of Portugal or those that are owned by pulp production companies are better managed and tend to be less prone to fires.

Portugal has an area of 9% covered by the National Network of Protected Areas (which includes natural parks) (Florestas, 2025) and 21.2% of its territory that is considered part of Natura 2000 Network, to protect biodiversity and landscape (Directorate-General for Environment, 2025). Portugal has a rich biodiversity. However, some species and habitats, particularly in marine environments, are insufficiently protected. Portugal has recently approved additional designations for marine sites. Furthermore, Portugal needs to adopt management plans for the sites already designated, identifying site-specific conservation objectives and measures, and providing the necessary technical, human, and financial resources.

CLIMATIC CONDITIONS

The climate in Portugal is dominated by two major influences: the Atlantic Ocean and the Mediterranean Sea. The first one is felt mostly in the wet season and is associated to moist air from the ocean that brings rainfall in most of the North and Centre of the country promoting a good productivity of vegetation and biomass growth; the Mediterranean influence is felt in the summer period, that is characterised by relatively high values of the temperature and low values of humidity, sometimes with heat waves and spells of dry air from North Africa and central Spain, which create very bad conditions to fire management.

Most of mainland Portugal is classified as temperate under the Köppen-Geiger classification (Beck et al., 2023), with dry summers (Cs), including hot-summer (Csa) conditions in inland southern and northeastern regions and mild-summer (Csb) conditions in the northern and coastal areas. A small area in the southeast presents semi-arid steppe conditions (BSk).

Due to climate change and ocean warming, tropical storms are being felt at higher latitudes with increasing frequency. The Ophelia storm in 2017, the Leslie storm in 2018, and the Kristin storm in 2026 are examples of storms that affected Portugal in recent years, bringing very strong winds. Of these, only the Ophelia (15 October) passed along the western coast of Portugal during a period of high wildfire risk; the many fires that occurred developed into conflagrations, and the total area burned that day set a record of 240 thousand hectares.

VEGETATION DISTRIBUTION IN PORTUGAL

The vegetation distribution and land use in mainland Portugal are defined by the transition between two major biogeographic regions: the Eurosiberian Region in the North and Northwest, and the Mediterranean Region covering the remainder of the territory (Neto, 2009). This geographic duality, combined with human intervention, has created a complex landscape characterised by distinct forest types, agroforestry systems, and shrublands (Fabião & Oliveira, 2006).

-Native species

The distribution of native flora is largely determined by different bioclimatic factors, including precipitation and thermicity (Godinho-Ferreira et al., 2005; Fabião & Oliveira, 2006; Neto, 2009):

- **The Eurosiberian North (Atlantic influence):** This area is dominated by deciduous forests. The Common oak (*Quercus robur*) is prevalent in the Northwest's rainy, oceanic climates. In the transitional mountainous areas of the interior North and Centre (such as Serra da Nogueira), the Pyrenean oak (*Quercus pyrenaica*) becomes the dominant species. High-altitude regions also harbour rare formations of Birch (*Betula celtiberica*) and typical mountain shrublands.
- **The Mediterranean South and Centre:** This region is characterised by sclerophyllous, evergreen vegetation adapted to summer drought. The Cork oak (*Quercus suber*) thrives in more oceanic Mediterranean climates, while the Holm oak (*Quercus rotundifolia*) dominates the drier, more continental interior.
- **Specific Habitats:** Coastal regions feature unique dune vegetation and salt marshes (*sapais*). Riparian corridors featuring Alders (*Alnus glutinosa*), Willows (*Salix spp.*), and Poplars (*Populus spp.*) cut across both regions, following river basins.

-Land Use Occupation

Current land use (Figure 2) reflects centuries of management, notably the expansion of production forests and the maintenance of traditional agroforestry (Fabião & Oliveira, 2006; Neto, 2009; Direção-Geral do Território, 2025):

- **Production Forests:** Large areas, particularly along the coastal Centre and North, are occupied by Maritime pine (*Pinus pinaster*) and Eucalyptus (*Eucalyptus globulus*). These species are also found growing together, in mixed stands, often due to a lack of management.
- **Agroforestry (Montados):** The Alentejo is characterised by the Montado system, a human-maintained landscape where sparse cork or holm oaks coexist with pastures or cereal crops.
- **Shrublands and "Low Vegetation":** Often representing stages of forest degradation or land abandonment, shrublands (*matos*), including heathers (*Erica* spp.), gorse (*Ulex* spp.) and rockroses (*Cistus* spp.), among others, occupy vast areas of the interior and mountainous regions.

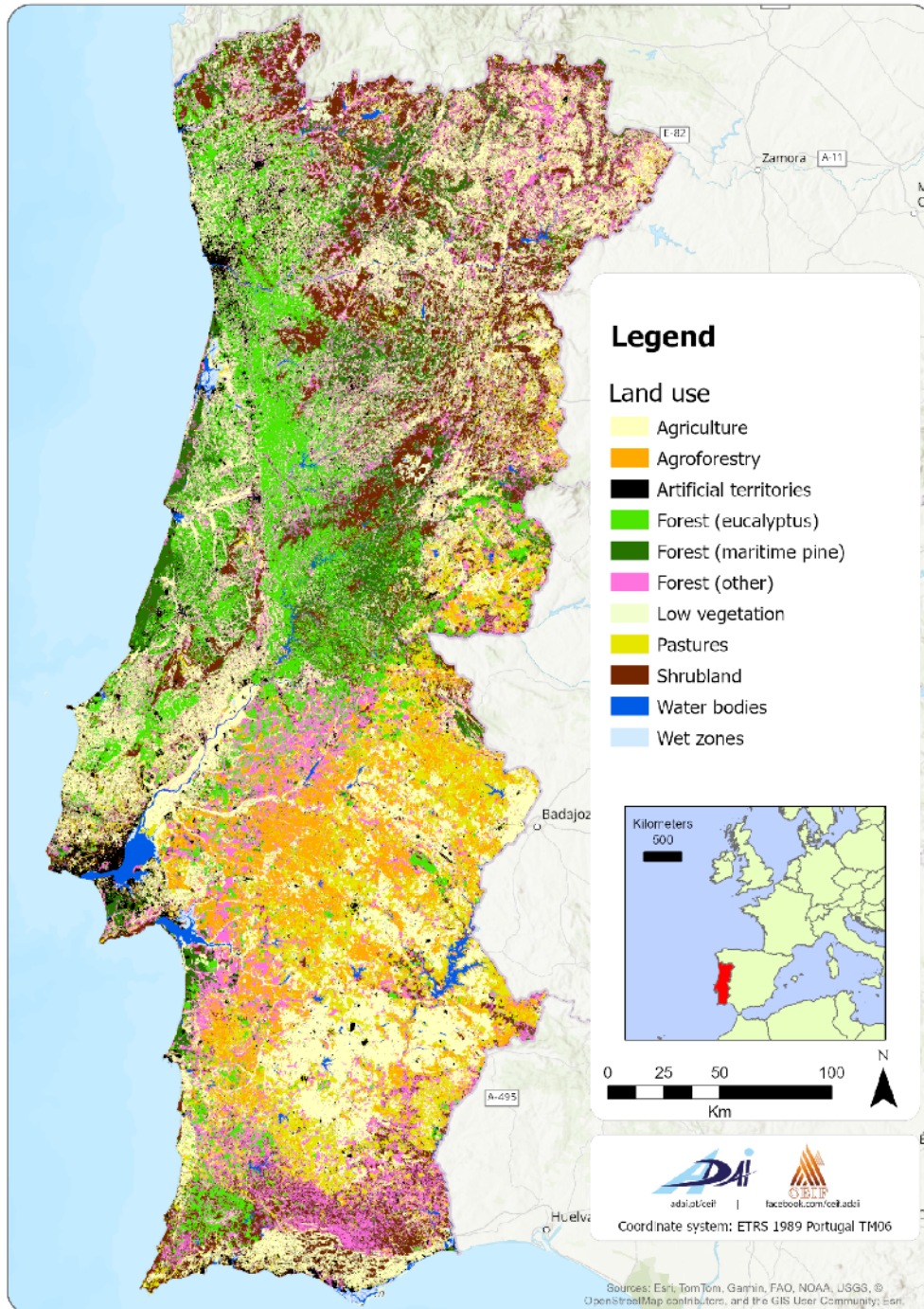


Figure 2 – Land use map of Portugal (data from the Portuguese Directorate-General for Territorial Development (DGT) – COS 2023)

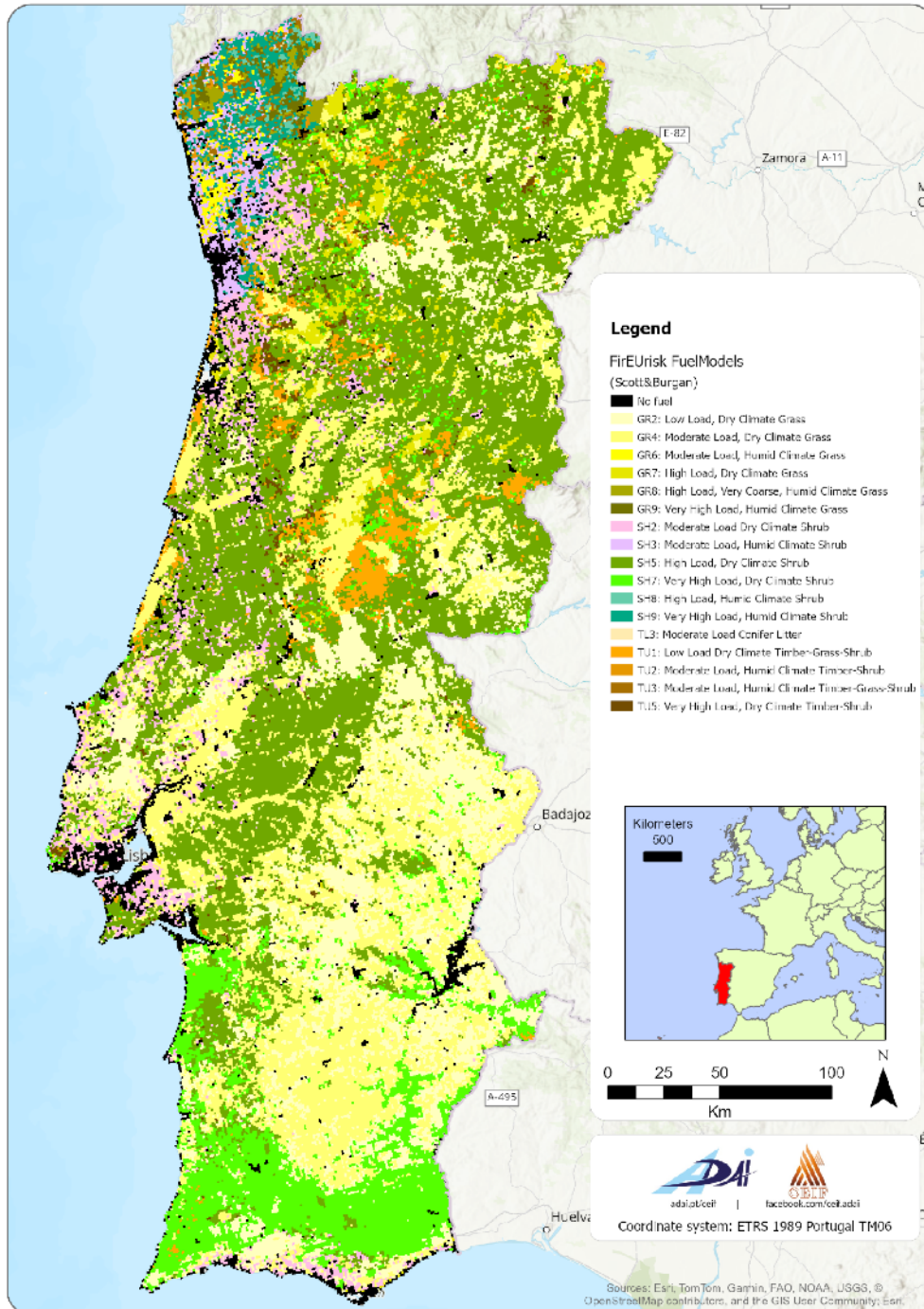


Figure 3 – Fuel map, created in the FirEUrisk project, depicting the Scott & Burgan (2005) models

-Fire Risk and Fuel Models

The landscape's fire potential can be described using fuel models, which represent a set of physical parameters characteristic of each vegetation type. These characteristics are the numerical inputs required to run fire behaviour models (Ribeiro, 2011; Aragoneses et al., 2023). During the EU-funded FirEUrisk project (www.fireurisk.eu, consulted on 14/05/2026), fuel-type and fuel-model maps were developed for the European Territory. The latter was created using the Scott & Burgan (2005) fuel model classification, and the result for Portugal is shown in Figure 3. Generally, the distribution is the following:

- **Grass and Shrub Models (GR and SH):** A large part of the territory is characterised by grass and shrub fuel models. The Centre Region, Alentejo, and the interior North-east are dominated by grass models (GR2, GR4) and high-load dry-climate shrubs (SH5). Algarve and the coastal areas of Alentejo have typically very high load shrub models (SH7). Overall, all these areas are prone to fast-moving fires, particularly where agricultural land has been replaced by invasive shrubland.
- **Timber and Understory Models (TU):** These models (e.g., TU1, TU2, TU5) characterise the forested coastal strip and the Montado regions. In these models, the fire risk is determined by the "fuel ladder" created by the understory (grasses and shrubs) beneath the tree canopy.
- **Timber Litter (TL):** Found in denser, managed forest patches, where the primary fuel is dead leaves and woody debris on the forest floor.

The transition from traditional agriculture to unmanaged shrubland significantly increases fuel loads, making many interior regions more vulnerable to high-intensity fires.

HISTORICAL FIRE OCCURRENCE

In Portugal, we have statistical data on annual fire occurrence, expressed as the number of fires (NF) and the burned area (BA), maintained by the Forest Service since 1943. Since 1980, the number of ignitions (NI) has also been recorded; technically, an ignition is considered a fire if its area exceeds 1 hectare. These data are shown in Figure 4, which spans more than eight decades.

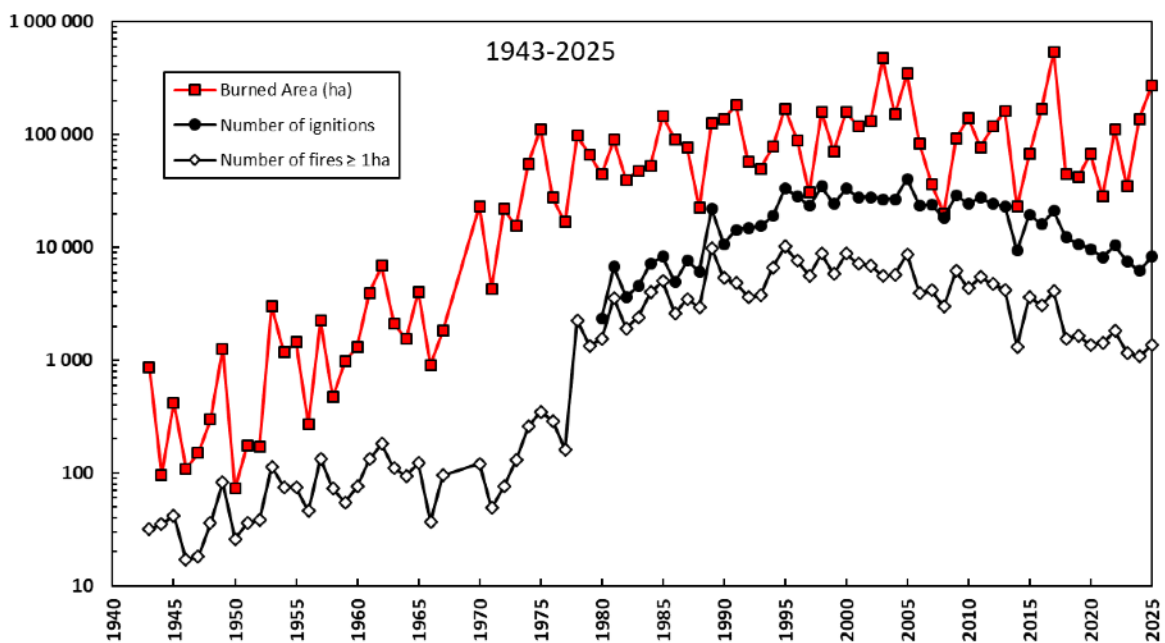


Figure 4 – Yearly evolution of the number of fires, burned area in hectares and number of ignitions in Portugal, between 1943 and 2025. Data source: 1980-2025 (ICNF, 2025).

As can be seen, during the past century, the number of fires was on the order of 100 or fewer, and the annual burned area did not exceed 10 kha. After 1980, the number of fires reached 1000 and increased until 2006, reaching a maximum of 3000, after which it has been decreasing steadily, due to several sensitisation campaigns and support for the performance of rural burns.

The burned area before 1977 ranged from a few hundred to around 10 kha, but in the following years it increased to an order of magnitude of 100 kha and has remained at that level to the present. Since 2000, there have been four years with very large BA: 2003 (471 kha), 2005 (347 kha), 2017 (540 kha) and 2025 (271 kha). During this period, there were also five years with relatively low BA values: 1988

IMPACT ON HUMANS

Among the impacts of forest fires, the most important are those affecting humans, namely their health and lives. Unfortunately, wildfires create dangerous conditions and can cause deaths not only of operational agents but also of common citizens.

In Figure 5, the cumulative number of deaths associated with wildfires in Portugal since 1966 is shown separately for firefighters, ordinary citizens and other fire management-related personnel. Due to a lack of data, the values are certainly

As can be seen, until 2017 the number of operational agents was largely superior to that of citizens, but this situation was reversed in 2017, in which 122 persons were killed by fires, including only three operational agents. This fact of fires affecting nowadays mainly common citizens is felt in many other countries as well, underscoring the increasing role of fires in the wildland urban interface.

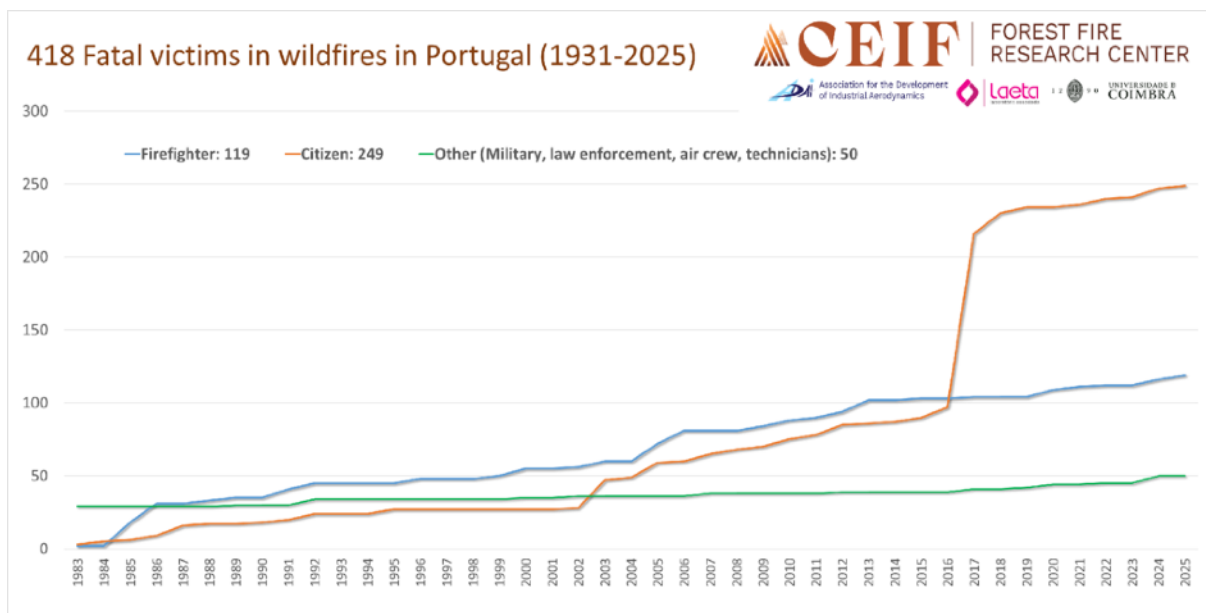


Figure 5 – Cumulative number of fatalities in each year in Portugal, since 1983, for operational agents and for common citizens.

SOCIOECONOMIC CHANGES



One characteristic of the Portuguese territory, including the rural and forested areas is the traditional presence of settlements, composed by thousands of small villages or houses scattered isolated or in small groups in the landscape. In the past, this corresponded to a large presence of people in agricultural and forestry management activities, who maintained the fields, cattle, and biomass in equilibrium under a relatively stable climatic scenario. **Since the middle of the XX century, as in other countries, there was a significant decline in agriculture in Portugal and a transfer of population from rural areas to larger cities, sometimes within the same municipality, but often to other parts of the country or even out of Portugal.** These changes had a profound impact on landscape and fire risk management.

The villages remain in the territory, with their houses and other structures, but with much less people. Very often, very few and ageing people live in these villages, although during summer, many more may return, as well as tourists, compounding the risk. To overcome the lack of personnel trained to face wildfires, it is necessary to bring elements from different agencies to the territory, at least when fire emergencies occur.

According to data from the census of 1991, 2001, 2011, and 2021, the population of the 308 municipalities indicated a marked decrease and aging of the population, with a marked trend of population moving from the interior to the littoral of the country, as shown in Figure 6. This significantly contributed to increased land abandonment and lack of fuel management in larger areas.

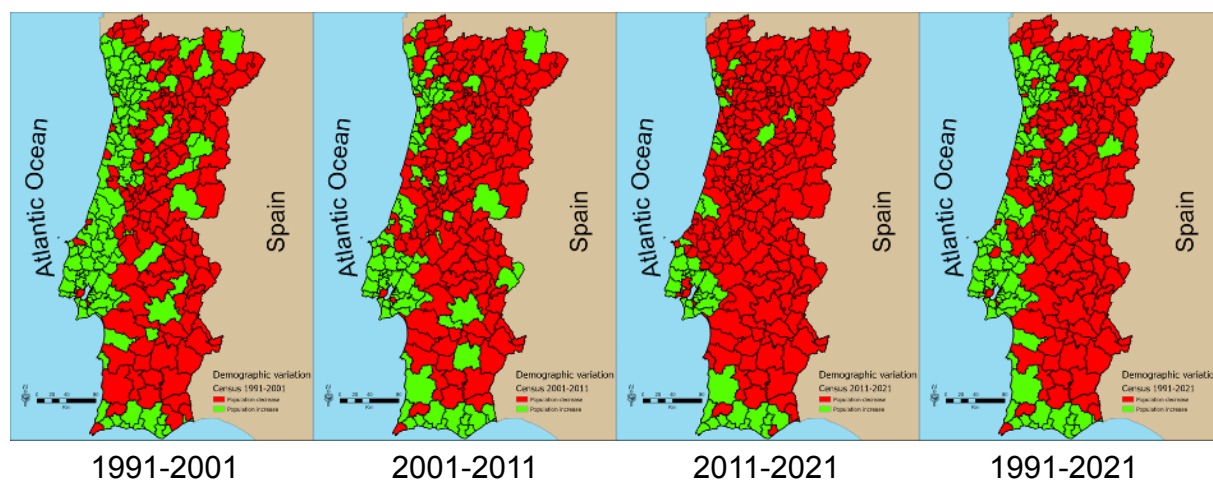


Figure 6 – Demographic variation in Portugal between 1991 and 2021 in the municipalities. Those marked in red lost population in the period.

The World Urbanization Prospects report, from the United Nations (2019), highlights two major and interrelated global demographic trends: the steady shift of populations from rural to urban areas and the progressive ageing of the population. At the same time, declining fertility rates and increasing life expectancy have led to a rise in the proportion of older individuals, accompanied by a relative reduction in younger populations.

These dynamics are reshaping labour markets, social systems, and economic structures, creating both challenges and opportunities for sustainable development. However, these changes are dramatic with respect to wildfire-related consequences.

Over the past decades, the world has transitioned from predominantly rural to predominantly urban, with more than half of the global population now living in cities, and projections indicate continued urban growth in the coming decades.

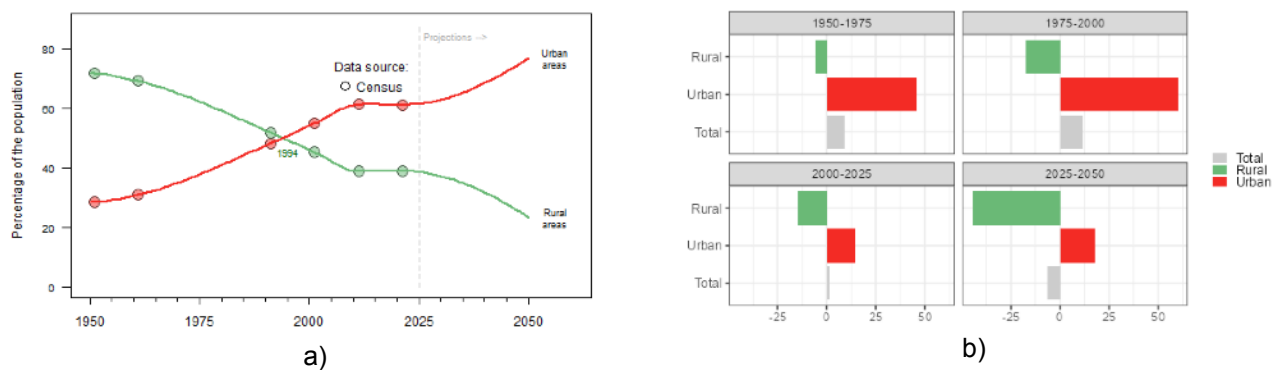


Figure 7 – Percentage of Portuguese population living in urban and rural areas as well as respective growth over 25 years interval periods. Source: 2025 United Nations, DESA, Population Division. World Urbanization Prospects 2025.

These trends are particularly pronounced in Portugal, as also confirmed by the 2021 Census. The country has experienced a strong process of urbanisation, as shown in Figure 7, with the population increasingly concentrated in coastal metropolitan areas such as Lisbon and Porto, while many inland and rural regions face depopulation. Simultaneously, Portugal is among the most aged countries in Europe, characterised by low birth rates and an ageing population. In 2021, individuals aged 65 and over accounted for 23.4% of the population, compared with only 12.9% aged under 15, and the ageing index rose sharply to around 182 elderly per 100 young people, up from 128 in 2011.

This dual dynamic intensifies regional asymmetries, accelerates the ageing of rural territories, and places pressure on social protection systems and public services. As a result, Portugal exemplifies how global demographic patterns manifest at the national level, requiring targeted policy responses to address territorial cohesion and demographic sustainability.

Besides, the wildland–urban interface in Portugal has also expanded significantly over recent decades, driven by rural abandonment, vegetation encroachment, and dispersed urban development. Estimates suggest that areas associated with interface fire regimes may cover about 12% of the national territory, underscoring the structural significance of this phenomenon. Despite its importance, consistent long-term time series remain limited, with recent efforts focusing on national cartography and spatial assessments (AGIF, 2022; DGT, 2018; Ribeiro, 2023).

METEOROLOGICAL FACTORS

Meteorology is the study of the state of the atmosphere surrounding the Earth, which is constantly changing in both time and space. These changes, when described in terms of their influence on wildland fire, constitute fire meteorology. Meteorological factors that directly or indirectly affect fire behaviour can be divided into: i) conditioning factors and; ii) determining factors.

Conditioning factors - favourable to ignition by conditioning the moisture content of fine fuels. This group includes the following factors: precipitation, air temperature and relative humidity.

Precipitation, expressed in millimetres (litres per square meter), affects the water content of the soil and also the moisture content of forest fuels (live and dead). The persistence of precipitation at the beginning of the hydrological year (October) favours the growth of fine vegetation, which may be available to support the fire spread in the summer. However, the absence of precipitation during the months leading up to summer, with values much lower than the climate normal (average precipitation values that characterise a region over a period of 30 years), can lead to a situation of drought or water deficit that favours the general dryness of forest fuels, which are available to support the fire spread (Viegas & Viegas, 1994).

The temperature of the air changes in a diurnal cycle due to solar radiation, but it can also change as warmer or colder air masses enter. Typically, the temperature tends to increase during the day and to decrease at the end of the day. This diurnal cycle is of great importance in wildfires, as it directly affects the flammability of forest fuels, since the heat required to raise fuel temperature to the ignition point depends on their initial temperature and that of the surrounding air (Schroeder & Buck, 1970).

Relative humidity of the air (RH) is the percentage of the mass of water vapour in the air, in relation to the mass of vapour necessary to saturate the environment. A RH value equal to 100% corresponds to a saturated atmosphere, in which there is condensation, while a value of 30% or less corresponds to very dry air, which also favours the drying of fuels. RH also has a diurnal cycle but tends to decrease throughout the day, and increase at the end of the day - it changes inversely to the temperature cycle.

Determining factors - those that affect the fire spread directly. This group includes wind and atmospheric stability.

Wind is generally defined as the horizontal movement of atmospheric air (atmospheric wind) characterised by the following components: wind speed (or intensity) in m/s, and direction (where the wind comes from) referred to the North in *degrees*. Wind speed, as well as direction, varies from one point to another, and at a given point it changes continuously over time (slow variation). There is another variation due to the turbulence of the wind flow, which is manifested by sudden variations in wind speed in a short period of time (gusts). These variations directly influence fire propagation conditions.

The wind speed profile increases with altitude (it is zero near the ground and reaches a maximum at the top of this layer). However, in a wildfire, this profile can be changed due to the wind induced by the fire, which can lead to the fast fire development even if the atmospheric wind is low. Therefore, in a wildfire the wind can be defined as the sum of the *atmospheric wind* and the *wind induced by the fire*.

Atmospheric stability is characterized by the variation of the air temperature in the vertical direction, measured by its gradient of temperature or rate of variation, dT/dz , [$^{\circ}\text{C}/\text{m}$], which determines whether the atmosphere is stable, neutral or unstable. Atmospheric stability may either encourage or suppress vertical air movement. The heat of fire itself generates vertical movement, at least near the surface, but the convective circulation thus established is affected directly by the stability of the air (Schroeder & Buck, 1970). In turn, the indraft into the fire at low levels is affected, and this has a marked effect on fire intensity. Also, in many indirect ways,

These key meteorological parameters are typically used in fire danger rating systems to indicate the probability of fire ignition and spread (United Nations, 2009). These systems are based on meteorological conditions and their influence on the moisture content of forest fuels. A variety of fire danger systems are used worldwide to integrate meteorological and fuel information into a single or a limited number of indices (Dowdy et al., 2009).

In Portugal and many other European countries, the Canadian Fire Weather Index System (CFWIS) has been adopted because it has shown good performance as a representative of fire danger conditions compared with other fire danger systems (Viegas et al., 1999). Based on the formulation by Van Wagner, (1987), the CFWIS estimates the moisture content of dead fuels using daily meteorological observations (temperature, relative humidity, precipitation, and wind speed), typically taken at midday local standard time.

The final output of the system is the Fire Weather Index (FWI), which estimates the potential fire intensity as the rate of energy release per unit length of the fire front (Van Wagner, 1987). Increasing FWI values correspond to higher fire danger levels, typically classified into five categories: Low (FWI<8.5), Moderate (FWI<17.2), High (FWI<24.6), Very High (FWI<38.3), and Maximum (FWI>38.3) (IPMA, 2023).

The adoption of the FWI system in different regions often requires adjustments to local conditions (Alexander, 2008), and therefore calibration with regional data is essential. This is typically achieved through the analysis of historical fire weather data and fire occurrence records (e.g., (Viegas et al., 2004)).

- Extreme weather events

Extreme weather events are defined as natural occurrences over a specific time and space characterized by rare magnitude, duration, or extent relative to local climatology (Astitha & Nikolopoulos, 2022). Extreme weather events play a decisive role in transitioning typical wildland fires into large wildfires and extreme Wildfire Events (EWEs), which are characterised by erratic behaviour, overwhelming intensity, and rapid spread that exceeds conventional control capacities (Tedim et al., 2020).

Extreme weather makes wildfires faster, more intense, and harder to control.

A range of extreme meteorological processes can influence wildfire behaviour, including convective activity and storm-related wind events. In Portugal, this is illustrated by the June 2017 Pedrógão Grande wildfire, associated with the approach of a convective system (Pinto et al., 2022), and by the October 2017 fire events, when the extratropical transition of Hurricane Ophelia generated very strong winds over active fires, significantly enhancing fire spread and behaviour (Ramos et al., 2023). Among these exceptional events, heatwaves and drought stand out as the most persistent and spatially extensive drivers over time.

- Heatwaves and droughts

Heatwaves (often referred to as heat waves or extreme heat) are typically defined as prolonged periods of anomalously high temperatures relative to local climatology. According to the Portuguese Institute of the Sea and the Atmosphere (IPMA, 2026b, 2026c), based on World Meteorological Organization criteria, a heatwave is defined as a period of at least six consecutive days during which the daily maximum temperature exceeds the climatological average by 5 °C, based on a reference period (currently 1991-2020).

Drought is typically defined as an extreme climatic condition characterised by deficits in precipitation and atmospheric moisture relative to local climatology, affecting both the duration and spatial extent of dry conditions (Kosović et al., 2022; Wehner et al., 2017). The Drought Code (DC) of the Canadian Fire Weather Index system (CFWIS) is a critical indicator in Portugal for tracking the moisture levels of live vegetation and deep organic layers (Viegas et al., 2001).

While the impact of heatwaves on dead fine fuels is often significant but short-lived, sustained extreme temperatures have a much more profound long-term impact on live fuels (shrubs and canopy) and larger dead fuels like logs and branches (Sullivan & Matthews, 2013). This desiccation increases the total volume of fuel available for flaming combustion, leading to higher local energy release and enhanced potential for fire spotting (Sullivan & Matthews, 2013).

The influence of heatwaves and prolonged drought on wildfire activity is evident in several extreme fire seasons, particularly in Mediterranean environments. Years such as 2003, 2005, and 2017 are frequently identified in the literature as among the most extreme in Europe, characterised by the concurrence of drought, heatwaves, and large wildfire activity (Alonso et al., 2025; Ramos et al., 2023), illustrating how these compound conditions contribute to exceptional fire activity (Menezes et al., 2024).

In 2003, Europe experienced prolonged heatwave conditions, with large wildfires in Portugal occurring during the extreme heatwave of 3-5 August, resulting in a burned area of approximately 380,000-400,000 ha, far above historical averages (Ferreira-Leite et al., 2017; Viegas, 2004). Similarly, the 2005 fire season followed eleven consecutive months of below-normal rainfall, resulting in severe and persistent drought conditions. By August, 71% of Portugal was affected by drought, including 29% under extreme drought, while high temperatures further contributed to widespread wildfire activity across Western Europe (Alonso et al., 2025; San-Miguel-Ayanz et al., 2013). In Portugal, this led to approximately 338,000 ha burned and 35,698 fire occurrences (San-Miguel-Ayanz et al., 2013).

In Portugal, the 2017 wildfires (17 June and 15 October) exemplifies also the compounding effects of drought and heatwave conditions, which resulted in extremely low fuel moisture content and favoured rapid fire intensification under hot and dry atmospheric conditions (Ruffault et al., 2020). The 2017 fire season was record-breaking, with approximately 500,000 ha burned and 122 fatalities (Ribeiro et al., 2020).

More recently, persistent and extremely high temperatures across Western Europe and the United Kingdom led to widespread heatwaves and associated wildfire activity in mid-July 2022, as documented by the European Forest Fire Information System (San-Miguel-Ayanz et al., 2023).

The 2022 fire season further reflects this pattern, with concurrent heatwaves and drought conditions contributing to significant wildfire activity across Portugal and Europe (Almeida et al., 2024; Alonso et al., 2025).

In 2025, a heatwave during July and August exhibited exceptional characteristics in terms of duration, being the longest on record for the inland regions of northern and central Portugal (IPMA, 2026a). Between July and October, 60-99% of the territory was affected by meteorological drought, with moderate to severe drought conditions observed in southern regions by October. In August, the number of fire occurrences reached 2284, and the total burned area increased significantly from 4758 ha to 254,296 ha. The number of wildfires with burned areas exceeding 1000 ha also increased from 12 since the beginning of the year to 25 during this period, according to provisional national reports from ICNF (2025a). Given the recent nature of this event, the relationship between the 2025 wildfires and extreme meteorological conditions has not yet been documented in the scientific literature.



Figure 8 presents two complementary perspectives on the temporal evolution of heatwave activity in Portugal between 2003 and 2025. Figure 8a shows the number of heatwaves derived from IPMA annual climate bulletins, providing a consistent national-scale characterization of heatwave frequency (IPMA, 2026b). However, frequency alone does not fully capture event severity.

Figure 8b therefore incorporates heatwave duration, calculated from station-based data (summer months only) as the mean duration of heatwave periods divided by the number of stations experiencing heatwave conditions (IPMA, 2026c).

This metric provides an indication of the persistence of heatwave conditions across the territory.

In addition, **Figure 8b** includes annual burned area (BA), allowing a qualitative

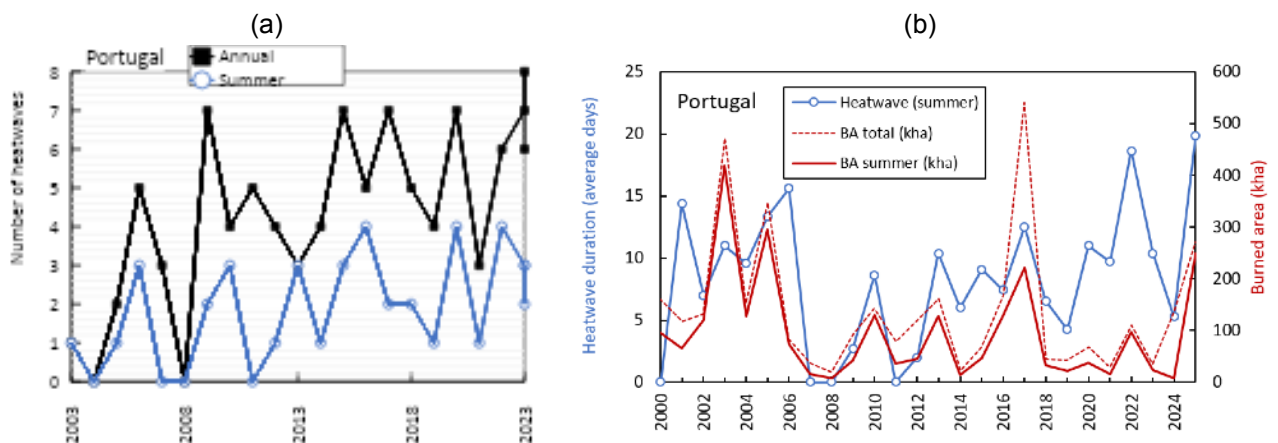


Figure 8 – Heatwave activity in Portugal (2003-2025): (a) number of heatwaves annually and in the summer, derived from IPMA climate bulletins; (b) average heatwave duration (days), based on station data for the summer period (June-August) (primary axis), and annual burned area (BA, kha) from ICNF (secondary axis).

The relevance of duration is particularly evident in years with high burned area, as mentioned before (2003, 2005, 2017, 2022, and 2025), with 2025 standing out as the year with the longest duration of heatwave conditions. This trend is consistent with the increasing relevance of heat-related fire weather conditions in recent wildfire activity.

FIRE CAUSES

As reported, the very high number of fire ignitions in the Portuguese territory was a major drawback of the system. Therefore, a great effort was first made to understand the causes of the fires and then to work on reducing the most important ones, especially because it was recognised that **more than 95% were caused by human action**. A great effort was made to investigate the causes of the fires, and as a result, about 89.84% of the ignitions between 2015 and 2025 were investigated. For the burned area, this proportion is close to 99.30%, indicating that most of it is linked to fires with known causes.

In Figure 9, the ten most important anthropogenic causes in terms of burned areas in the period 2001-2025 are shown. The correspondence classification based on the number of ignitions yields a similar ranking, but we consider the burned area more relevant to our analysis.

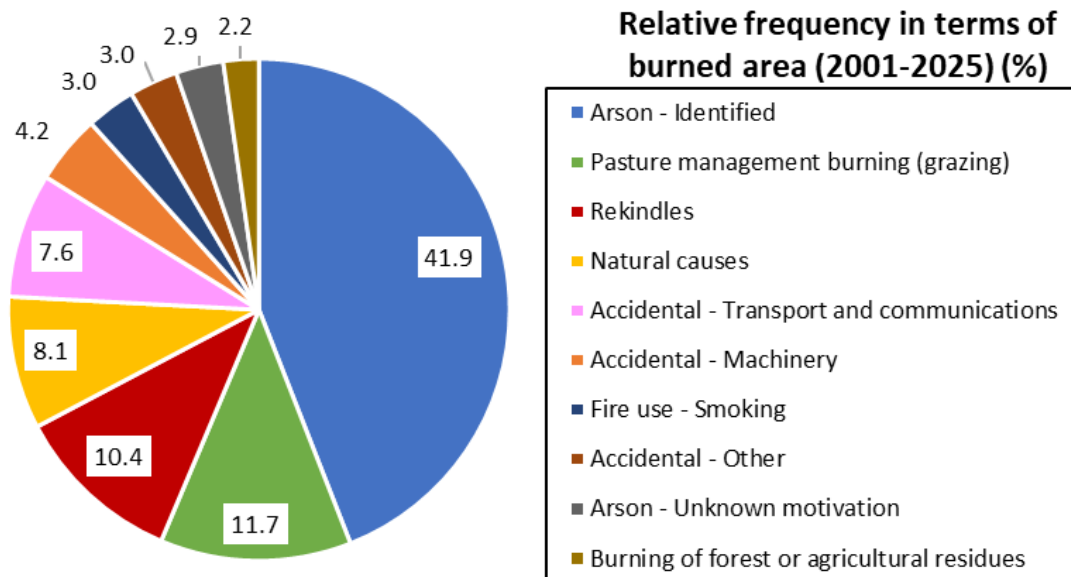


Figure 9 – Relative frequency (%) of the ten leading wildfire causes in terms of burned area (2000-2025). Values correspond to the percentage of total burned area attributed to each cause. Data source: ICNF (2025).

Natural causes, specifically lightning, although less frequent than anthropogenic ignitions, can be associated with significant burned areas, **accounting for 8.15% of the total burned area between 2000 and 2025**. Higher contributions were observed for arson (41.9%), pasture management burning (11.7%), rekindles (10.4%), and accidental causes, related to transport and communications, including power line-related ignitions (7.6%).

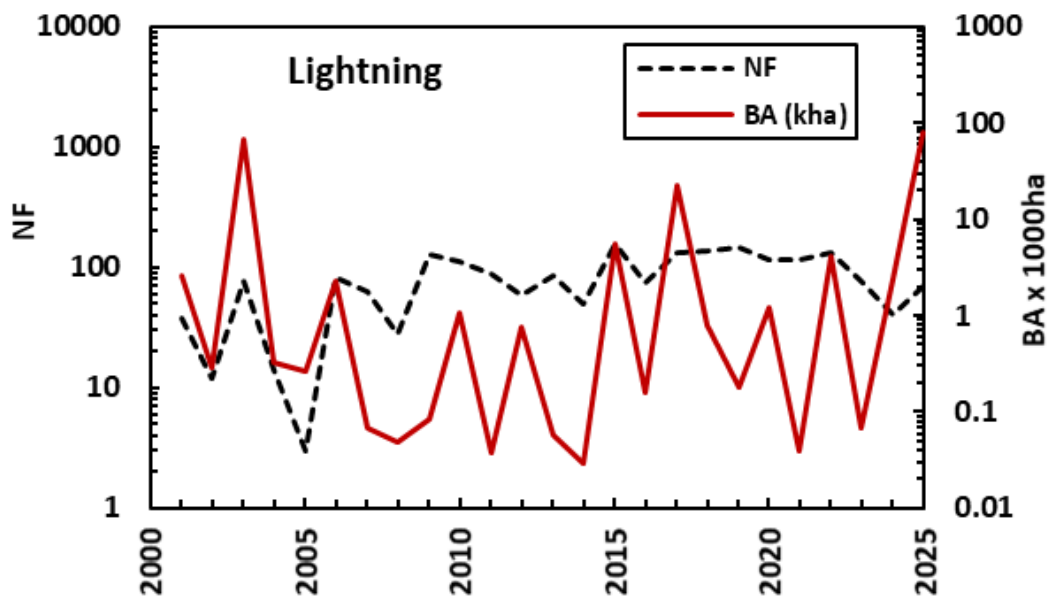


Figure 10 – Annual variability of lightning-caused wildfire activity between 2001 and 2025. The dashed black line represents the number of fires (NF) on the primary axis, and the red line represents the burned area (BA, kha) on the secondary axis. Both variables are shown on a logarithmic scale. Data source: ICNF (2025).

The evolution of natural causes that are depicted in Figure 10, indicates that although the number of cases is not very high, it is gradually increasing. The same happens with the BA that has an increasing trend and has been quite important in some years, like 2003, 2017 and 2025, indicating that naturally caused fires must be considered, even if all the human caused fires could be avoided. In 2025, at least three of the ten major fires of the year were caused by lightning, including the largest fire recorded in Portugal until now, which started in Piódão on the 13th of August and burned 68.5 kha.

Climate change not only fosters drier and warmer conditions, but also increases the formation of thunderstorms. Several scientific studies warn that rising temperatures will lead to a significant increase in lightning: it is estimated that for every degree Celsius of temperature increase, the frequency of electrical discharges will grow by around 12% (Science, 2014). If current trends persist, the number of wildfires caused by lightning could increase by up to 40% (Nature Communications, 2023) before the end of the century, posing a new challenge to wildfire management and prevention in

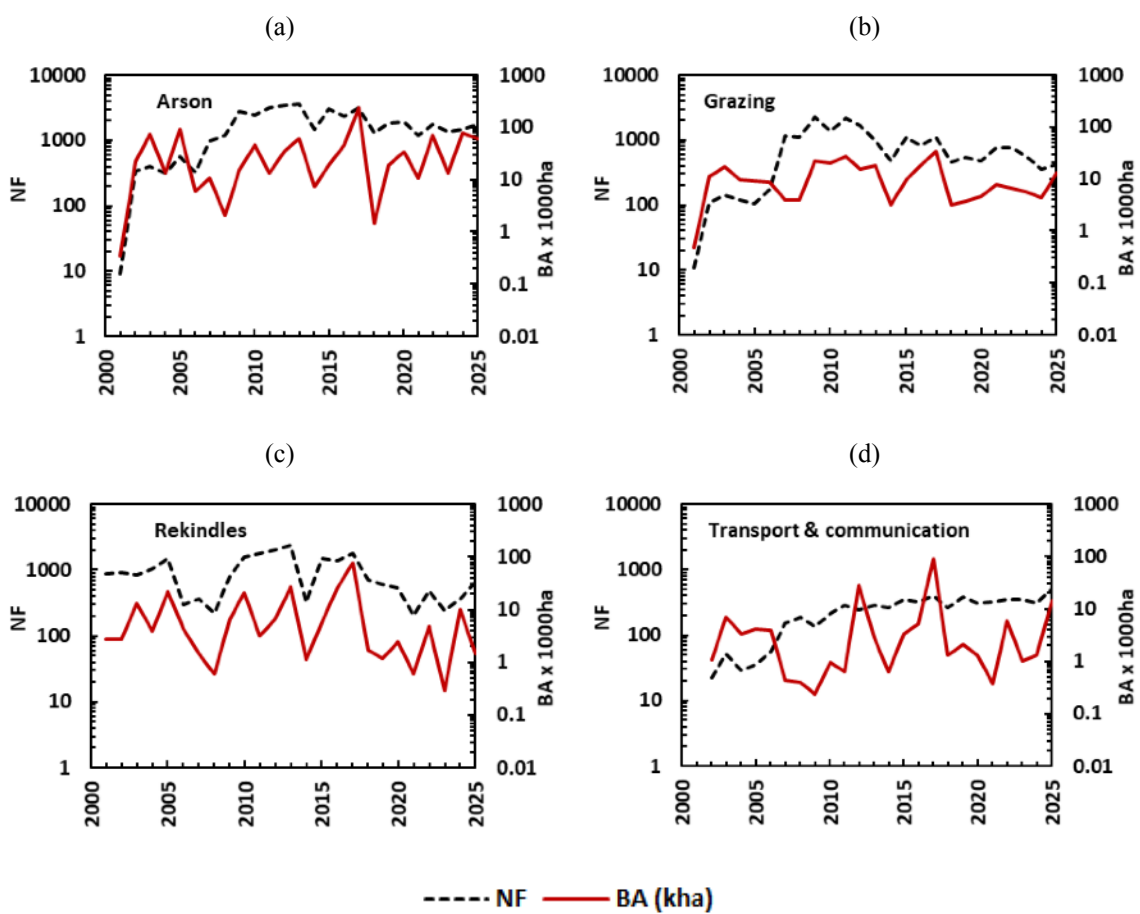


Figure 11 – Annual variability of wildfire activity for the main causes in terms of burned area between 2001 and 2025: (a) arson, (b) pasture management burning (grazing), (c) rekindles, and (d) accidental causes related to transport and communications. The dashed black line represents the number of fires (NF) on the primary axis, and the red line represents the burned area (BA, kha) on the secondary axis. Both variables are shown on a logarithmic scale. Data source: ICNF (2025).

The evolution of the four most representative anthropic causes is shown in Figure 11, in terms of both the number of ignitions and BA. Arson or intentional fires (Figure 11a)) are perceived by public opinion as being one of the most frequent causes of fires. With the great effort of the cause investigation, it was possible to establish that they represent between 20% and 30% of fire ignitions. Possibly, this value could be higher if cases whose cause was undetermined were included, but a significant and concerning factor is that BA due to arson is highly relevant and increasing. The number of ignitions caused by fires related to pasture renewal (Figure 11 b) – grazing), which reached around 3000 in 2010, decreased to around 500 in 2025, due to the already mentioned effort. Consequently, the resulting BA is also decreasing.

Despite the great effort to reduce the number of fire rekindlings, due to incomplete suppression and mop-up (Figure 11 c)), their occurrence is quite important, and, in some cases, very large areas were burned after the fires were considered extinct. As shown in Figure 11 d) the number of fires caused by transport and communication, which include mainly electric lines, is increasing. The same happens with the BA, which was particularly relevant in 2012 and 2017.

FIRE SUPPRESSION ORGANIZATION

As shown in Figure 4 the number of ignitions in Portugal was very large, and many of them were concentrated in the period of high danger. In Figure 12 the daily number of fires in the country is shown from 2003 to 2025, indicating that on some days, more than 700 ignitions were registered in the middle of summer. Fortunately, after 2006 and especially after 2017, these numbers were significantly reduced. This was achieved through extensive campaigns across all sectors of the population; the events of 2017 contributed greatly to increasing this awareness across the population, but the expansion of the fire monitoring system, using video cameras and ground patrols, also provided a push. **One other very effective measure was a campaign conducted with farmers, shepherds, hunters and others who require the use of fire to reduce biomass, renew pastures or improve hunting areas, to work with them to regulate and support their burns.** In this way, a great number of illegal ignitions that were abandoned when they escaped were avoided, and consequently, the number of fires requiring intervention was significantly reduced.

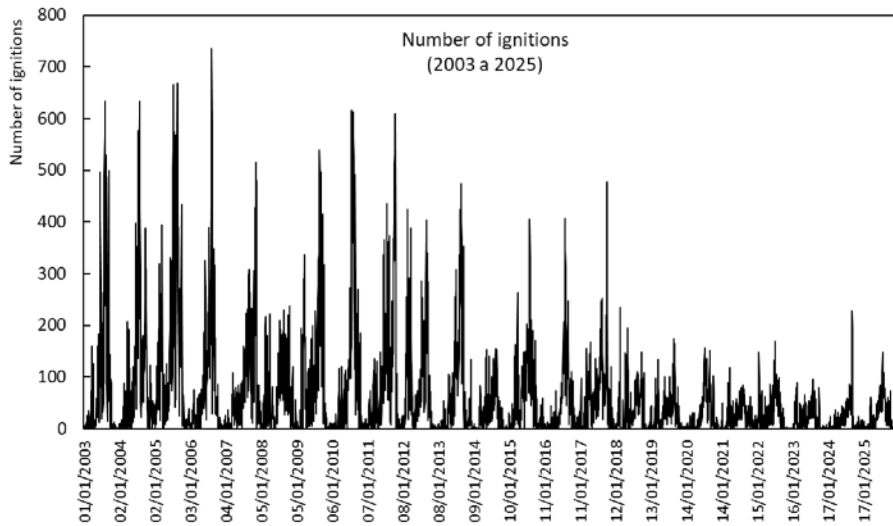


Figure 12 – Evolution of the number of daily fire occurrences (NIG) in Portugal from 2003 to 2025. Data source: ICNF (2025).

Over the past decades, the wildfire suppression system in Portugal has undergone significant structural and organisational changes. As shown in Figure 13, the number of firefighters increased between 1950 and 1990 from 15k to around 42k, then decreased over the following two decades to around 30k. Recent numbers indicate that this decrease was mainly due to the reduction of volunteer firefighters, which was partially compensated by the corresponding increase in the number of professional firefighters, which rose from 8k to around 13.5k, between 2010 and 2023. The percentage of professional firefighters increased from 13% in 2013 to 41.2% in 2023.

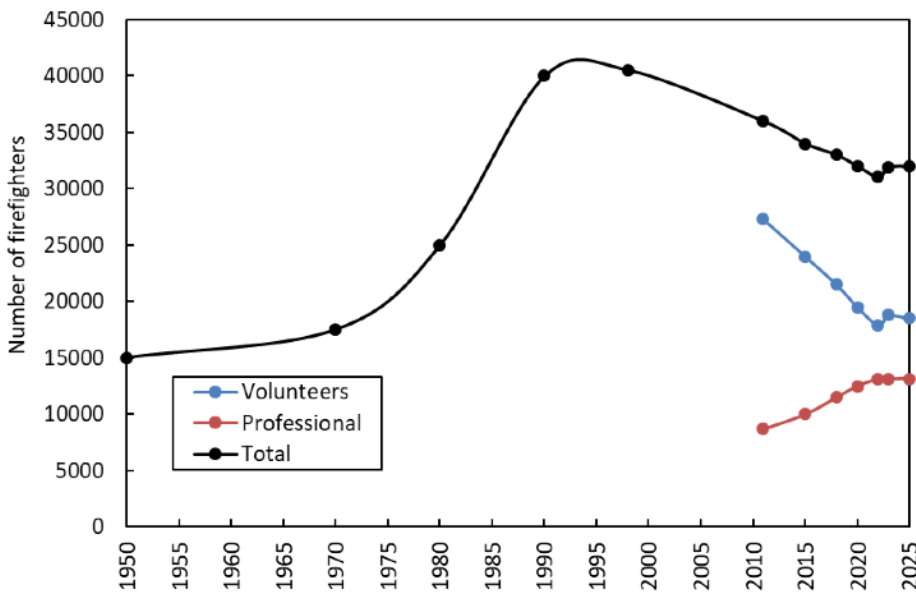


Figure 13 – Number of Portuguese firefighters over the last decades. Data from Portuguese reports, being some years estimated from global indicators and indirect values.

In 2016, the firefighting capacity consisted of 1557 teams, 7487 agents, 1601 vehicles, 165 professional firefighting teams, and 47 aerial means, having an overall cost of 38 M€ per year. As a result of the continuous increase in funding over recent years, the national level involved more than 31 M€ from the state budget for 2023/2024, together with local funds from municipalities, to ensure professional teams within most local firefighting associations.

Overall, it is expected that these professional teams will provide better availability and operational performance. In 2026, the overall cost is estimated between 65-75 M€, which represents also a significant increase of capacity; 2596 teams, 15149 agents, 3463 vehicles, 770 professional firefighting teams and 81 aerial means.

Since 2017, the National Republican Guard (GNR), the Forest Authority (ICNF), and the Portuguese Civil Protection Special Force (FEPC) have also increased their numbers over the past two decades, as shown in Figure 14. Data from the Portuguese integrated system indicate that several forces represent GNR 15,4%, ICNF 19,2% and civil protection 1,7%, respectively, of the total system capacity.

Firefighters still represent most of the forces 63,7%. Overall, the number of human resources in the Portuguese system has increased by 45% since 2017, as reported by the Portuguese Integrated Rural Fire Management System (SGIFR) and the Agency for Integrated Rural Fire Management (AGIF).

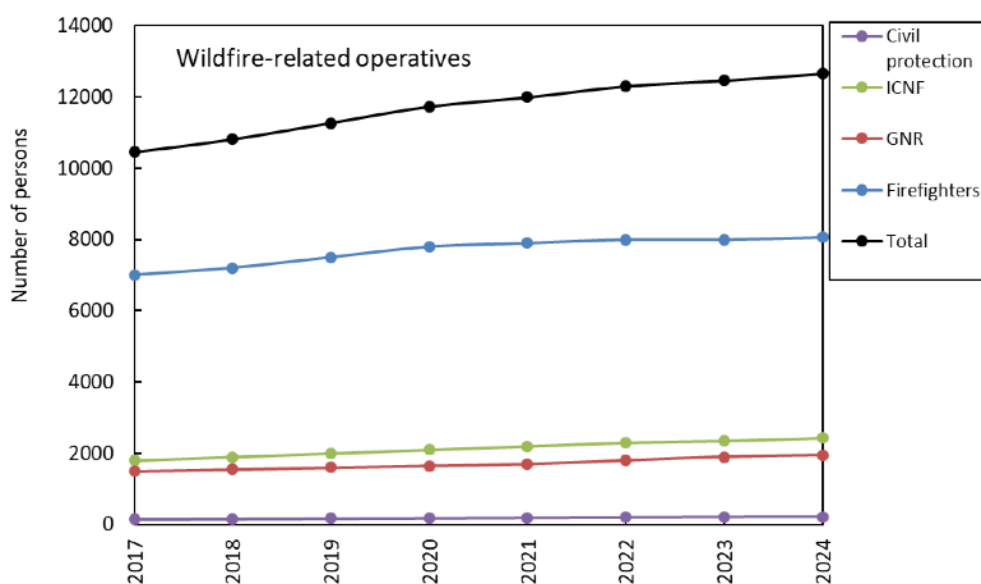


Figure 14 – Number of Portuguese firefighters and other civil protection personnel involved in wildfire events.

Overall, the system and involved forces have also been accompanied by improvements in coordination, equipment, and operational planning. Also, the number of courses and hours of operational training were reinforced to overcome the increasing complexity of wildfires.

In parallel with the reinforcement of firefighting capacity, Portugal has significantly increased its focus and funding on preventive measures, particularly in fuel management and prescribed burnings. As stated by AGIF, the preventive actions accounted for approximately 55% of total investment in 2024, reflecting a structural shift towards fuel management and landscape-scale interventions. Additionally, prescribed burnings were progressively expanded as a strategic tool, with regional programmes targeting annual increases in treated areas. **However, the results are still far from the planned objectives. Data is also still scarce and not standardised, and it is highly dependent on multi-level reporting (AGIF, 2025; SGIFR, 2024).** As shown in Figure 15, the data reveal a clear upward trend in the cumulative area treated with prescribed fire, particularly after 2017, although annual implementation remains highly variable, reflecting ongoing challenges in operational capacity and program consistency.

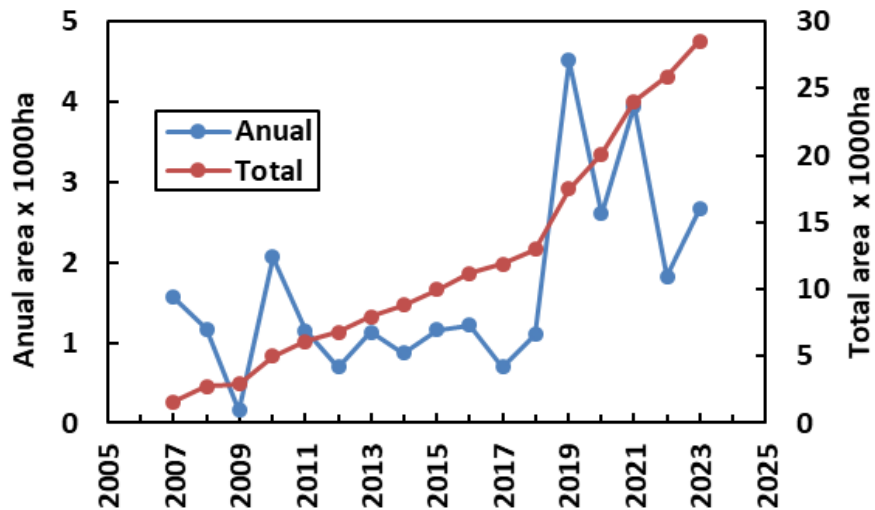


Figure 14 – Number of Portuguese firefighters and other civil protection personnel involved in wildfire events.

Since 1943, wildfire risk governance in Portugal has undergone numerous changes, some related to significant political shifts or structural or institutional changes following important fire-related disasters. A brief account is given here to explain some of the modifications that affected fire management. Before 1975, Portugal had an authoritarian government with extensive territory-wide surveillance by rural guards.

Although the fire suppression forces were not well organised or equipped, the presence of the population in rural areas and the use of forest fuels for multiple purposes led to only a few ignitions, which were promptly suppressed, resulting in few large fires.

The organisation of risk management has improved significantly from 1980 to the present day, namely, the fire suppression capacity. Great effort goes into the initial attack on the fire, especially on high-risk days: normally, when a fire is detected, an airborne team is launched very quickly, along with at least three ground crews from the nearest fire brigades.

As a result of this effort, the percentage of fire ignitions that escape the initial attack and grow to more than 1 hectare decreased from 50% in 1980 to 9% in 2006, but has increased to approximately 15% in recent years (Figure 16).

This increase reflects both the reduction in the number of fires and the tendency of other indicators to show an increase in risk as well.

Initial intervention has improved, but the risk has risen again in recent years.

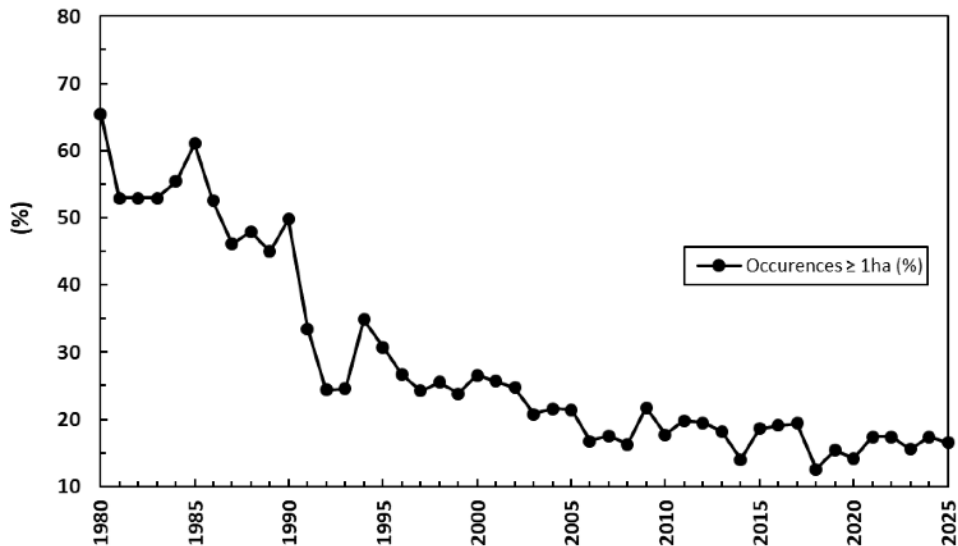


Figure 16 – Percentage of ignitions (NI) that become fires (NF), from 1980 to 2025. Data source: ICNF (2025).

The capacity to suppress a fire depends, among other factors, on the presence of other fires on the same day and in the same region. We assessed this effectiveness analysing the average area burned per day as a function of the number of fires in the country for periods of five years, between 1992 and 2024. Figure 17 shows the corresponding results. As expected, the burned area per day increases with the number of daily fires; the growth exponent of a power law fitting is close to two, indicating that this growing rate of the burned area is much higher than a linear proportion. It is interesting to notice that between 1992 and 2011, the average burned area decreased from one quinquennium to the next, but afterwards the opposite happened. As can be seen, if the daily number of fires exceeded 200, there were no marked differences between the quinquennia, indicating that improvements in fire suppression efficiency did not matter, as the system was overwhelmed when the number of ignitions exceeded that threshold. In the last two periods of fire years analysed, the maximum number of daily fires did not exceed 200, but the average value of the burned area per day increased substantially, confirming the tendency of risk increase during the last decades, already provided by other indicators.

When there are too many ignitions, the system becomes overwhelmed.

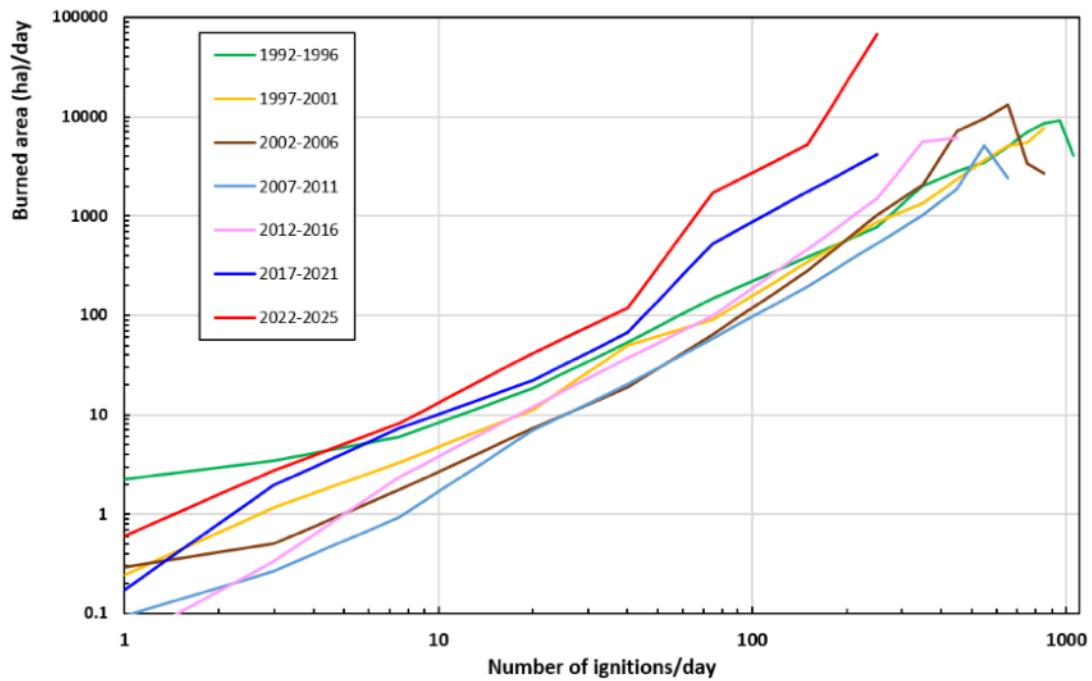


Figure 17 – Average value of the burned area per day in Portugal, as a function of the daily number of fires, for periods of five years, as indicated in the legend. Data source: ICNF (2025).

03

EVOLUTION OF THE LARGE FOREST FIRES

The Large and Very Large fires

It is well known that large fires contribute most to the area burned each year, but small fires should not be neglected, as each one prompts the dispatch of fire suppression forces, disperses resources, and therefore disrupts the fire suppression system. Besides this, some small fires, like those caused by farmers to dispose of unnecessary biomass, sometimes run out of control and can cause injuries or even the death of their authors, and therefore cannot be neglected.

In Portugal, a fire is considered large if its area exceeds 100 hectares, and very large if its area exceeds 500 hectares. As shown in Figure 18 a), the yearly number of very large fires between 1980 and 2025 does not show any statistical trend, while the extreme fires ($BA > 5000$ hectares) only appeared after 2003, and their number tends to increase. In Figure 18 b), the burned area shows a linear trend with NF_{500} , the number of large fires ($BA > 500$ hectares). Some outliers of this trend correspond precisely to the four years that had the largest BA, indicating that other factors, like some extreme fires, like those that occurred in 2017 and 2025, can contribute to have BA values above (or below) what should be expected in a year with the same number of NF_{500} .

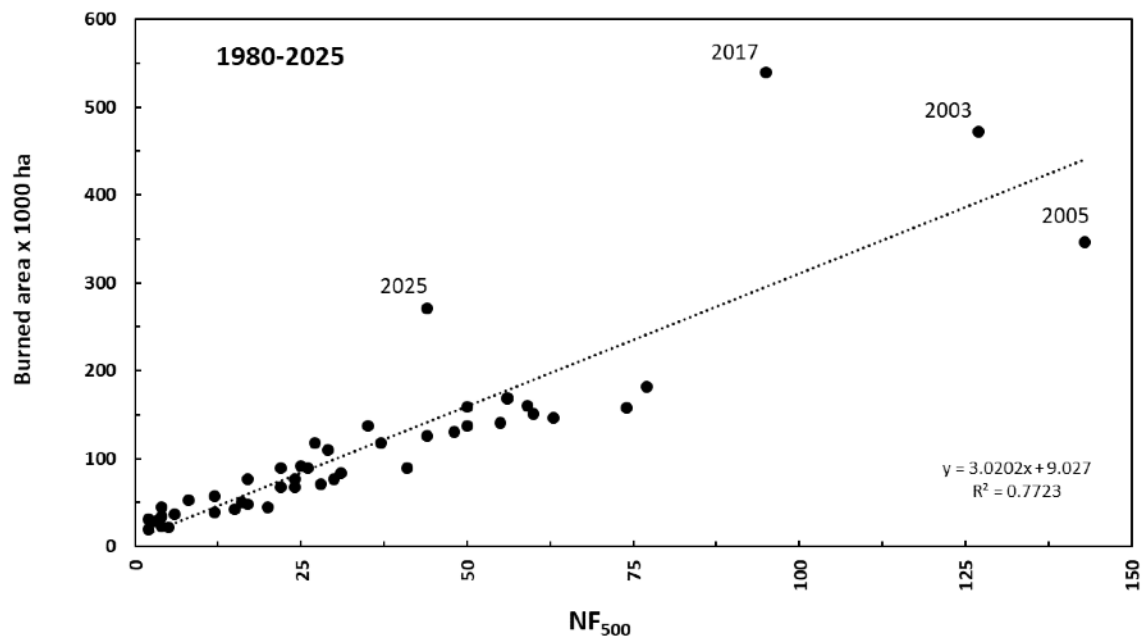
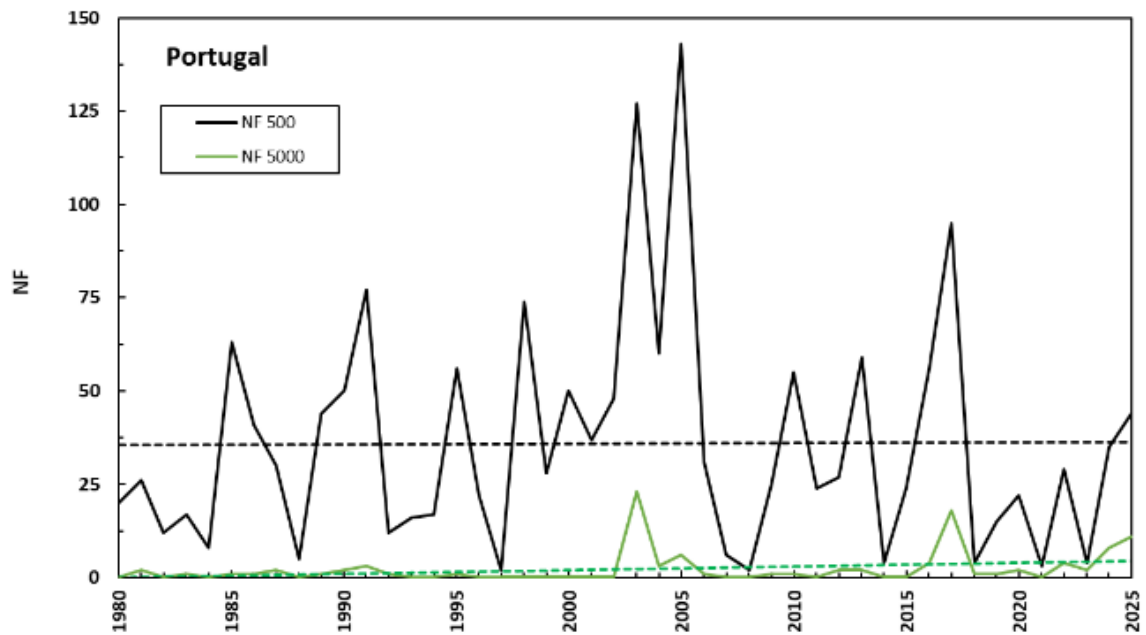


Figure 18 – (a) Evolution of NF_{500} and NF_{5000} , the yearly number of fires larger than 500 ha; (b) Relationship between the annual values of the burned area and NF_{500} . Data source: ICNF (2025).

THE FIVE LARGEST FIRES IN EACH YEAR

The general perception that the risk of wildfire increased during the past decades is confirmed by the analysis of the areas of the five largest fires in each year in Portugal, which are shown in Figure 19. As can be seen in that figure, before 2003, only one fire with BA > 10 kha was recorded, whereas in the following years, more than 26 fires in that category were recorded. In 2017, all the largest fires exceeded all those that had occurred before, and in 2025, the largest ever fire with a BA of **68.5 kha** was recorded. The linear trend of the average value of the five largest fires burned in each year, illustrated in Figure 19, shows that it increased on average from 0.95 kha, in 1980 to 9.73 kha in 2025.

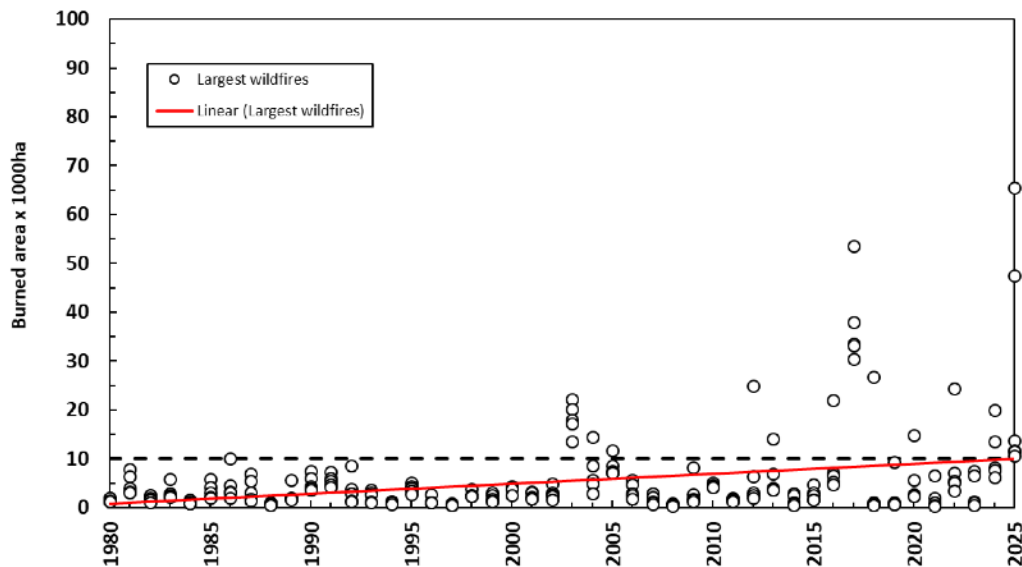


Figure 19 – Area of the five larger fires registered in each year between 1985 and 2025. The dotted line indicates the 10kHa threshold, and the continuous line indicates the linear trend of the average value of the larger fires. Data source: ICNF (2025).

In **Table 1**, a list of large wildfires with burned areas exceeding 10000 ha that occurred in Portugal between 2000 and 2025 is given.

Table 1. List of large wildfires with burned areas exceeding 10000 ha that occurred in Portugal between 2000 and 2025. Data source: ICNF (2025).

Ref.	Date	Place		Burned area (ha)	Duration (hours)	Cause
		Municipality	District			
1	30/07/2003	Nisa	Portalegre	17869	-	Arson – not criminally responsible
2	01/08/2003	Gavião	Portalegre	20087	120	-
3	01/08/2003	Proença-a-Nova	Castelo Branco	13500	271	-
4	01/08/2003	Oleiros	Castelo Branco	11300	261	-
5	02/08/2003	Chamusca	Santarém	22190	129	Natural - lightning
6	02/08/2003	Sertã	Castelo Branco	10500	68	-
7	08/08/2003	Monchique	Faro	13144	249	-
8	12/08/2003	Silves	Faro	12656	179	Arson – not criminally responsible
9	11/09/2003	Monchique	Faro	17213	193	Unknown causes
10	26/07/2004	Loulé	Faro	14508	102	Unknown causes
11	13/08/2005	Pampilhosa da Serra	Coimbra	11707	143	Arson – not criminally responsible
12	18/07/2012	Tavira	Faro	24843	56	Accidental – Transport and communication
13	09/07/2013	Alfândega da Fé	Bragança	14136	50	Rekindles
14	08/08/2016	Arouca	Aveiro	21909	195	Unknown causes
15	17/06/2017	Pedrogão Grande	Leiria	30359	115	Accidental – Transport and communication
16	17/06/2017	Góis	Coimbra	17521	125	Natural - lightning
17	23/07/2017	Sertã	Castelo Branco	33640	106	Arson – not criminally responsible
18	11/08/2017	Alvaiázere	Leiria	22824	71	Arson – not criminally responsible
19	15/10/2017	Lousã	Coimbra	54487	42	Accidental – Transport and communication
20	15/10/2017	Arganil	Coimbra	37959	71	Rekindles
21	15/10/2017	Sertã	Castelo Branco	33193	40	Arson – not criminally responsible
22	15/10/2017	Figueira da Foz	Coimbra	19026	35	Arson – not criminally responsible
23	15/10/2017	Alcobaça	Leiria	17265	37	Rekindles
24	15/10/2017	Vouzela	Viseu	15745	33	Arson – not criminally responsible
25	15/10/2017	Seia	Guarda	11925	46	Arson – not criminally responsible
26	15/10/2017	Seia	Guarda	11808	42	Arson – not criminally responsible
27	03/08/2018	Monchique	Faro	26764	200	Unknown causes
28	13/09/2020	Proença-a-nova	Castelo Branco	14878	95	Arson – not criminally responsible
29	06/08/2022	Covilhã	Castelo Branco	24333	666	Arson – not criminally responsible
30	16/09/2024	Vila Nova De Paiva	Viseu	19996	85	Arson – not criminally responsible
31	17/09/2024	Castro Daire	Viseu	13526	95	Arson – not criminally responsible
32	09/08/2025	Trancoso	Guarda	46917	353	Use of fire – Smoking
33	13/08/2025	Arganil (Piodão)	Coimbra	68478	303	Natural - lightning
34	13/08/2025	Sátão	Viseu	13753	203	Natural - lightning
35	15/08/2025	Freixo de Espada À Cinta	Bragança	11466	92	Accidental – Transport and communication
36	15/08/2025	Sabugal	Guarda	10619	211	Arson – not criminally responsible
37	16/08/2025	Sabugal	Guarda	11815	187	Use of fire – Campfires/ Bonfires

In Figure 20, a map of Portugal showing the main large fires in 2017, 2022, 2024, and 2025 is presented. It is clear from this figure that, with very few exceptions, most of these fires occurred in the Central and North regions of Portugal, confirming the trend observed in past years. It should be noted that in other years, some large fires occurred in southern Portugal as well, indicating that the risk of wildfires is present across the entire country.

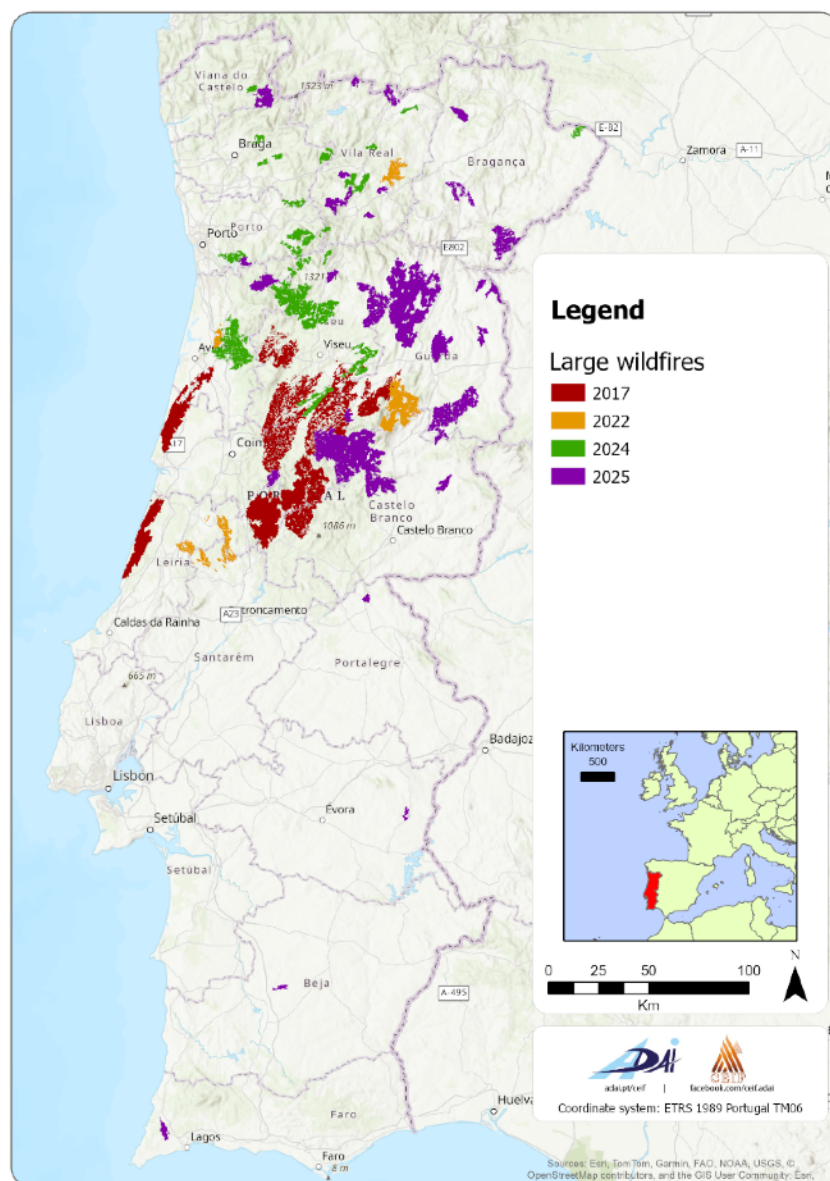


Figure 20 – Map of the major fires that occurred in Portugal in 2017, 2022, 2024 and 2025.

THE PEDRÓGÃO GRANDE FIRE OF 17TH JUNE 2017

The fire of Pedrógão Grande, that occurred on the 17th of June of 2017 was a landmark in the history of wildfires in Portugal for its death toll of 66 persons in a relatively small area and in the scope of few hours. The total area of the fire was 30,4 kha. Given its importance this fire was analysed by two official committees (CTI, 2017; Viegas et al., 2017) and was the object of several scientific studies, namely **Pinto et al., (2022)** and **Viegas et al., (2023)**.

This fire was caused by an electrical line that produced two ignitions, 3km apart and separated in time about one hour, producing a very intense fire propagation in conditions that were poorly understood by the operational community. The interaction between the two fires, induced by an approaching thunderstorm, produced a fire acceleration similar to that observed in some previous large fires, as described in **Raposo et al.(2018)**. The development of the fire plumes as a result of fire spread were carefully analysed in **Pinto et al., (2022)**. A field survey of the fire progression allowed the estimation of a peak rate of spread of 14km/h, which is a record value for Portugal. The evolution of the fire was replicated in a laboratory experiment as reported in **Viegas et al., (2023)**.

The report of **Viegas et al. (2017)** provides a detailed account not only of the fire spread but also of the accidents and on the impact of the fire on the houses and structures.

As a result of this fire several changes were introduced in the organization of fire management in Portugal and in the legislation. Its large impact on the lives of many citizens caused great impact on the entire society and facilitated the introduction of some changes and the enforcement of the legislation.

THE FIRES OF 15TH OCTOBER 2017

In the same year of 2017, and also out of the normal period of fires, a second episode of very large fires affected the country, producing in a single day a burned area of around 240kha, which is a record for Portugal, and 52 fatalities in several large fires.

A substantial fraction of tropical cyclones routinely undergoes extratropical transition as they move into midlatitudes (Jones et al., 2003)). However, events maintaining hurricane-force winds near Europe remain rare (Pérez-Alarcón et al., 2023). In certain cases, these transitioning systems can directly contribute to extreme wildfire conditions.

An example is the October 2017 wildfires in Portugal, when the extratropical transition of Hurricane Ophelia generated very strong winds over active fires, significantly enhancing fire spread and behaviour (Ramos et al., 2023).

The passage of Hurricane Ophelia off the coast generated strong winds (gusts > 50 km/h), which interacted with unusually high temperatures (> 30 °C) and extremely dry fuels (Tedim et al., 2020). On that day alone, 507 fire events were recorded (Tedim et al., 2020), including seven classified as Extreme Wildfire Events (Fernandes et al., 2022).

After the 15th of October a decrease of the number of resources was anticipated, due to a change for a lower level of alert, according to the national planning, besides there was a forecast of rain in parts of Portugal, for the following days. This situation prompted many farmers to perform burns, with at least 60 fires officially associated with agricultural burnings and debris burning activities., contributing to part of the 476 fires that were registered on this day according to the statistics of ICNF (2025b). Unfortunately, the approach of the thunderstorm caused very strong and dry southerly winds, which caused the spread of these fires, that became conflagrations.

As in the case of the fire of Pedrógão Grande, the National Assembly created a committee to study these fires, and a report was published (Guerreiro et al., 2018). Similarly, the Government invited the University of Coimbra to prepare a report on these fires and related accidents (Viegas et al., 2019).

The largest fire in this series was initiated by an electric line in Prilhão, Lousã, burning around 64.5 kha. This fire caused the death of 13 people.

Besides the fatalities and the extensive damage to the forest and the environment, these fires caused significant loss of structures, namely residential houses and industrial areas.

These fires were analysed in detail in the University of Coimbra's report. The fires of 2017 prompted the National Science Foundation to launch several research projects with academia in the following years.

THE FIRES OF 2022

In 2022 the meteorological conditions were very favourable to the occurrence of wildfire, making this a year similar to 2003, 2005 and 2017. The total burned area was 110 kha, with fires in various parts of the country, particularly in the north and centre of Portugal. There were four fatalities. Given the relevance of the fires in 2022 the Portuguese government designated a group of scientists to analyse the conditions associated to the main fires that occurred in this year (cf. José M. Mendonça e Cristina Máguas Coord., 2023).

The main fires that occurred in 2022 which were analysed in this report were:

Serra da Estrela

This was the largest fire of this year, burning a total of 24.3 kha, making it the sixth largest fire until 2022. It spread for 12 days, from the 6th to the 17th of August, with relatively high values of the temperature and low humidity, with strong wind on a mountainous area.

Murça

This fire developed between the 17th and the 21st of July and burned a total of 7.19 kha. In this fire two citizens were killed by the fire, while trying to run away from their home in Penabeice, on the 18th of July.

The fire was ignited around 16h25, near Carva, at two points, possibly associated to an electric line of 15 kV. On the following day after an episode of very strong wind the fire spread very rapidly, threatening several communities. The population was successfully evacuated from some of them but due to the fire intensity these operations were suspended. During this period a fire truck was lost and the fatal accident occurred.

Albergaria-a-Velha

This fire developed between the 13th and the 20th of July, in a relatively flat ground, burning a total of 2791 ha. This fire was caused by arson and during the first hours, under a very strong wind it threatened a major motorway and an industrial area, causing important economic damages.

Ourém

In the region of Ourém, in Central Portugal, there was a series of fires that spread in various areas, from the 7th to the 12th of July, threatening various villages and small cities. The two more important were the Freixianda fire (2936 ha) and the Caranguejeira fire (2930 ha). These fires caused a great impact in the economy of a very populated area, as well as disruptions on the traffic in two major motorways in the area.

THE FIRES OF 2024

Until the 14th of September of 2024, the burned area was 18,289 ha (ICNF, 2025b), making this the year with the lowest burned area since 2000. Unfortunately, in the period from 15th to 17th of September, there was a spell of very warm days with episodes of very strong Northeast wind that resulted in some very bad fires with a total burned area of 116,915 ha, and 15 fatalities.

The main occurrences were in Albergaria-a-Velha (Aveiro) and Vila Nova de Oliveirinha. The latter was marked by the loss of three firefighters who were caught by an eruptive fire while trying to suppress a spot fire in the base of a steep slope, inside a canyon.

In mid-August, between the 15th and 23rd, there was a fire on the island of Madeira that destroyed 5116 ha, causing great alarm in the population and disrupting the tourist activity during that season.

THE FIRES OF 2025

According to the records, 2025 was the fourth-worst year in Portugal in terms of burned area (250 kha) and the worst ever in Europe, with more than 1 million hectares affected. The fires of this year caused five fatalities, among civilians and firefighters.

The occurrence of two successive heat waves at the end of July and between the 12th and 22nd of August created conditions for the spread of several very large fires, which, in a few days, overwhelmed the capacity of the fire suppression system.

For the first time, we had six fires in the same year with burned areas larger than 10 kha, and the largest fire ever registered in Portugal. This was the fire that started in Piódão on the 13th of August and burned an area of 68.5 kha over 8 days.



©Pedro Armestre/Greenpeace Portugal

An interesting aspect in 2025 was the relatively large number of lightning-ignited fires, including some of the year's major fires. Interestingly, in 2025, 5% of fires were ignited by cigarettes and **accounted for 19% of the total burned area (AGIF, 2026). This was a fire cause considered negligible in previous years' statistics; this value indicates it cannot be neglected.**

In spite of the very bad fire weather conditions of 2025, which are comparable to those of 2003 or 2005, the burned area, the house destruction and especially the number of fatal victims were relatively lower. This fact can be attributed not only to an overall better organization of the fire suppression system but also to the presence of a large number of citizens in rural areas.

As the worst period of fires occurred in mid-August, many people had returned to their original villages or were spending their vacations there as tourists. These citizens worked with firefighters, when present, to fight the fire and especially to protect their villages and farms.

04

WILDFIRE GOVERNANCE AND WILDFIRE MANAGEMENT IN PORTUGAL

This chapter examines how wildfire governance in Portugal evolved from a predominantly suppression-centred model towards a more integrated, though still incomplete, approach to rural fire risk.

It also discusses the main public debates surrounding wildfires, the cooperation developed with Spain, the institutional and scientific actors shaping policy, and the lessons drawn from recent extreme fire seasons.

EVOLUTION OF WILDFIRE GOVERNANCE IN PORTUGAL

Wildfire governance in Portugal did not emerge from a single reform or a clearly designed long-term strategy. It evolved in fragments, often under pressure, and usually after particularly severe fire seasons. For much of the twentieth century, fires were still regarded as a largely seasonal rural disturbance – serious, certainly, but mostly manageable through suppression and local response. The wider territorial dimension of the problem was poorly understood, or at least politically secondary. That older landscape was itself very different. Rural territories were more densely populated, agricultural activity was more widespread, and biomass was continuously removed through grazing, fuelwood collection, small-scale farming, and daily land-use practices that no longer exist across much of the country. Fire existed then as well, sometimes extensively, but within a different social and territorial context.

The transition began slowly during the second half of the twentieth century. This process accelerated in the 1990s, as agricultural decline deepened and rural exodus intensified. People left the interior, often permanently. Thousands of small properties were abandoned or managed only intermittently. Shrub vegetation expanded into former agricultural land, while large areas of pine and eucalyptus plantations spread across parts of the country with limited long-term planning regarding landscape continuity or fire behaviour. By the eighties, the change was already visible in fire statistics. The number of ignitions increased sharply, and large fires became more frequent (Parente et al., 2024).

Institutionally, however, the response remained centred on combat capacity. Throughout the 1980s and 1990s, public investment focused heavily on firefighting structures, equipment, and firefighters. Volunteer fire brigades expanded their role and visibility. Summer operations became progressively larger and more complex. Prevention existed mostly in discourse, legislation and technical reports, but rarely occupied the same political space as suppression. **In practice, the system adapted to fires by becoming better at fighting them, not necessarily at reducing the conditions that allowed them to become catastrophic.**

The fires of 2003 changed the tone of the debate. The scale of the burned area and the high number of fatalities shocked public opinion and exposed weaknesses that could no longer be treated as occasional failures associated only with weather extremes. Two years later, 2005 reinforced that perception. There was increasing recognition that the problem was structural and linked to landscape organisation itself, not merely to operational shortcomings during difficult summers. Some of the reforms introduced after 2003 and 2005 tried to move in that direction. The National System for the Defence of Forests Against Fire, established in 2006 (Decree-Law 124/2006 of 28 June), brought prevention, surveillance, suppression, and post-fire recovery into a single policy framework and tightened fuel-management obligations around settlements and infrastructure. Even so, the institutional grammar of the system remained largely operational. Major efforts were undertaken to improve the initial attack capability. Political attention tended to intensify during and immediately after major fire seasons, then gradually return to suppression readiness and emergency logistics. Structural prevention moved more slowly, partly because many of the underlying problems were not easily solvable through legislation alone. Fragmented ownership, poor cadastral information, demographic ageing and low economic returns from active land management continued to shape large parts of inland Portugal. By the mid-2010s, there was already a growing sense among many researchers and practitioners that the system was struggling to keep pace with the changing nature of extreme fires. Fire behaviour under severe meteorological conditions increasingly exceeded the assumptions on which much of the operational model had been built. This became brutally evident in 2017 with the dramatic fires reported in Chapter 2.

After 2017, the language of governance began to change more visibly. **The expression “forest fires” started to give way to “rural fires”, partly because the fires themselves no longer fitted neatly within forest boundaries.**

Agricultural land, shrublands, villages, isolated houses and transport infrastructure had become part of the same risk landscape. The distinction mattered politically because it implied that the issue could not be treated solely as a forestry problem.

The reforms launched after 2017 were broader than previous ones, but they did not appear all at once. The first turning point came with the reform package approved in October 2017: AGIF (Agency for Integrated Rural Fire Management) was created in 2018 (Decree Law 12/18 of 16 February); the National Plan for Integrated Rural Fire Management (PNGIFR) was approved in 2020 (Resolution of the Council of Ministers 45-A/2020 of 16 June); the National Action Programme (PNA) followed in 2021 (Resolution of the Council of Ministers 71-A/2021 of 8 June); and the legal framework of the Integrated Rural Fire Management System (SGIFR) was consolidated later that same year (Decree-law 82/2021 of 13 October).

This sequence matters because it shows that the shift towards integrated fire governance was gradual, legislatively layered and still unfinished. At the same time, **scientific institutions gained greater visibility in public debate and policy design.**

Research on extreme fire behaviour, fuel dynamics, climate change and landscape resilience became more influential after 2017, not least because existing operational explanations had proven insufficient. Prescribed burning, fuel mosaics, and community protection strategies began to receive more attention, although implementation on the ground remained uneven (AGIF, 2020).

European cooperation also became increasingly relevant. Portugal had long participated in European civil protection mechanisms, but the scale of recent fires across Southern Europe reinforced the perception that these events were part of a broader Mediterranean problem shaped by similar climatic and territorial pressures. Cooperation with Spain intensified in certain operational and scientific domains, particularly in cross-border coordination, joint training initiatives, and research projects related to fire risk and resilience.

Nowadays, many of the structural conditions that favour large fires remain largely unchanged. Some may even worsen over the coming decades.

Landscape transformation occurs slowly, especially in territories marked by depopulation and weak economic activity. Prevention measures are difficult to sustain politically due to the implementation and maintenance costs and because their effects are often invisible when they succeed.

Suppression, by contrast, remains immediate, visible and publicly scrutinised. Portuguese wildfire governance today is neither the old suppression-centred model nor a fully consolidated integrated system.

In practice, the country now operates within a more complex and better-coordinated framework, but not yet within a fully consolidated, integrated system. However, much of the tension between emergency response and structural prevention remains unresolved, particularly under increasingly extreme climatic conditions.

THE MAJOR DEBATES SURROUNDING WILDFIRES IN PORTUGAL

The debates on wildfires in Portugal are not limited to the fire itself. They also involve conflicting interpretations of rural decline, forestry models, climate change, public responsibility and the role of the State. Some of these discussions are highly technical, others deeply political, and several became more visible after 2017. In this section, some of the issues that more consistently shape the Portuguese wildfire debate are discussed.

- Climate change and extreme fire weather

Climate change has become an unavoidable factor in discussions of wildfires in Portugal. While earlier debates focused mainly on ignitions and suppression capacity, recent decades shifted attention towards the broader environmental conditions under which fires develop. **Longer droughts, recurrent heatwaves and increasingly unstable summer conditions are now part of the background against which large fires occur (IPCC, 2021).**

Still, the relationship between climate and fire is often simplified in public debate. Extreme weather alone does not explain the scale of recent disasters.

Severe fire behaviour usually emerges from the interaction between atmospheric conditions and highly combustible landscapes shaped by decades of abandonment and fuel accumulation. In this sense, climate change intensified an already vulnerable territorial structure rather than creating the problem from scratch (Parente et al., 2024).

After 2017, discussions around “extreme wildfire events” or “new generation fires” became more common, particularly within scientific and operational circles. The idea that certain fires may exceed suppression capacity under specific conditions gained increasing acceptance, even if its practical implications remain politically uncomfortable.

- Rural abandonment and landscape transformation

Rural abandonment remains one of the most structurally important drivers of wildfire risk in Portugal. Throughout much of the twentieth century, agricultural activity, grazing and everyday land use maintained relatively fragmented landscapes across large areas of the country. That territorial mosaic progressively disappeared as inland regions lost population and economic activity.

The result was not simply demographic decline, but a profound ecological transformation.

Former agricultural land became shrubland, fuel continuity increased, and many territories gradually lost their capacity for active management. Fragmented ownership patterns further complicated intervention, particularly where ageing populations and abandoned properties dominate the landscape.

At the same time, the expansion of dispersed settlements increased exposure to wildfire risk. Fires increasingly affect not only forests but also villages, isolated houses, roads and infrastructure embedded within unmanaged vegetation.

- The eucalyptus debate

Few issues generate as much controversy in Portugal's wildfire debate as **eucalyptus plantations**. The species became symbolically associated with large fires, especially after 2017, and remains at the centre of disputes involving environmental organisations, forestry interests and political actors.

Part of the debate, however, tends to oversimplify the problem. Eucalyptus can contribute to severe fire behaviour, particularly when poorly managed or integrated within highly continuous fuel landscapes. Yet major fires also occur in shrublands and unmanaged pine areas. In many regions, fuel continuity and land abandonment appear more decisive than the presence of a single species alone. Even so, eucalyptus came to represent broader tensions regarding forestry models, economic priorities and landscape management in rural Portugal. The legal tightening introduced after 2017 on eucalyptus afforestation and reforestation – especially through Law 77/2017 of 17 August, which amended the legal regime of afforestation and reforestation actions, and later through Decree-Law 12/2019 of 21 January – reflected not only technical concerns, but also growing public pressure and strong political symbolism.

- Suppression versus prevention

Portuguese wildfire governance has long been marked by an imbalance between suppression and prevention. Firefighting remains highly visible, politically sensitive and strongly mediated, while prevention tends to receive sustained attention mainly after catastrophic seasons.

Over time, Portugal developed a large and increasingly sophisticated suppression system. Prevention evolved more slowly. Fuel management programmes, prescribed burning and landscape planning expanded gradually, although implementation remained uneven across the territory.

After 2017, criticism of the suppression-centred model intensified. Several studies and official reports have argued that operational reinforcement alone cannot compensate for accumulated territorial vulnerabilities under extreme climatic conditions (CTI, 2017; Viegas et al., 2019). Yet, shifting political and financial priorities towards long-term prevention remains difficult, partly because successful prevention is far less visible than emergency response.



- Disinformation and common narratives

Large fire seasons in Portugal are frequently followed by waves of misinformation and speculative explanations. Conspiracy narratives involving organised arson networks or hidden economic interests tend to circulate widely after catastrophic events, despite limited evidence supporting such interpretations at the national scale.

Official investigations consistently show that most ignitions result from negligent or accidental human activity rather than organised criminal action. Nevertheless, simplified explanations often gain public traction because they appear more emotionally understandable than the cumulative effects of territorial abandonment, governance failures and climatic pressures.

After 2017, distrust towards institutions also became more visible, particularly regarding communication failures and emergency management. In some cases, this mistrust contributed to an environment in which misinformation spread more easily.

Much of the Portuguese debate around wildfires still oscillates between overly simplified explanations. Some reduce the problem almost entirely to climate change; others to criminal intent. In reality, wildfire risk in Portugal emerged from the interaction of long-term territorial, social and climatic processes that rarely fit into a single narrative.

COOPERATION BETWEEN PORTUGAL AND SPAIN IN RURAL FIRE MANAGEMENT

Cooperation between Portugal and Spain gained particular prominence as wildfires intensified across the Iberian Peninsula. Shared ecological conditions, cross-border landscape continuity and increasingly similar fire-weather patterns created strong incentives for joint action, not only in emergency response but also in research, planning and policy learning. The most relevant forms of this cooperation are examined below.

- Operational cooperation across the border

Cooperation between Portugal and Spain in wildfire management long predates the current European mechanisms, although for many years it remained relatively informal and strongly dependent on local operational relationships near the border. Firefighters, civil protection authorities and security forces on both sides often developed practical forms of collaboration before formal structures were fully in place. Geography made that inevitable. **It is a cliché, but the truth is that fire does not recognise administrative borders, particularly in the interior regions where ecological continuity frequently overlaps with sparse population and difficult access.**

Over time, these forms of cooperation became more institutionalised. Bilateral agreements between the two countries gradually established procedures for mutual assistance, resource sharing and operational coordination during large fire events. In practice, however, the intensity of cooperation has varied with the severity of fire seasons and the simultaneous pressures experienced by both countries. During extreme summers affecting the entire Iberian Peninsula, available resources naturally become more constrained.

The integration of both countries into the European Union Civil Protection Mechanism considerably reinforced this coordination framework (European Commission, 2024). Requests for aerial resources, logistical support and specialised operational teams increasingly occur within a broader European structure rather than exclusively through bilateral channels.

Still, the Iberian relationship retains particular operational importance because Portugal and Spain share similar climatic conditions, vegetation patterns, and fire-behaviour challenges.

Cross-border cooperation became especially visible after the severe fire seasons of the 2000s and again following 2017. Joint exercises, operational simulations and communication protocols gained greater relevance as both countries recognised the growing complexity of extreme wildfire events. In some border regions, operational coordination now includes shared monitoring efforts, pre-positioning strategies and direct communication channels between emergency structures.

Even so, practical difficulties persist. Differences in administrative organisation, command structures and communication systems occasionally complicate interoperability during large-scale incidents. Terminology, operational doctrine and institutional cultures are not always perfectly aligned. These issues rarely prevent cooperation altogether, but they can create difficulties under rapidly evolving fire conditions.

According to the European Forest Fire Information System (EFFIS), Spain is the country with the largest forest area affected by wildfires (393,079 hectares), followed by Portugal (278,917 hectares) and Romania (129,443 hectares). In terms of the percentage of national territory affected, Portugal ranks first (3.04%), followed by Cyprus (2.37%) and Spain (0.78%).

- Scientific and technical cooperation

Scientific cooperation between Portugal and Spain expanded considerably in recent years, particularly through European research projects focused on wildfire risk, climate change and landscape resilience. Institutions from both countries increasingly work within a shared Mediterranean context shaped by similar territorial and climatic challenges. Projects such as FirEURisk, VESPRA, VERA, WUIView, FIREPOCTEP and CILIFO helped consolidate networks linking universities, operational agencies and technical organisations across the Iberian Peninsula. These initiatives combined research with practical applications involving fire modelling, fuel management, risk mapping and operational training.

Much of this Portuguese-Spanish cooperation has been financed through European programmes rather than purely bilateral instruments. Horizon 2020 and Horizon Europe were particularly important in supporting projects such as FirEURisk, FIRE-RES and Firelogue, while Interreg played a central role in cross-border initiatives focused more directly on the Iberian space, including FIREPOCTEP, FIREPOCTEP+ and CILIFO. The DG-ECHO project also funded relevant projects, such as VESPRA, VERA, or WUIView, providing a special opportunity for projects addressing transboundary risks, including the wildfire risk management on the border between Portugal and Spain.

This funding architecture mattered because it helped move cooperation beyond occasional project-based contact and towards more stable technical networks, shared datasets, pilot areas and common methodological frameworks. Even so, the capitalisation of these projects remains uneven. Some results were absorbed into national and European debates on risk governance, prevention and resilience, but the transformation of project outputs into routine institutional practice has generally been slower, especially where administrative fragmentation, short funding cycles or weak implementation capacity limited long-term uptake.

- Shared challenges and political limits

Despite increasing cooperation, Portugal and Spain continue to approach wildfire governance through somewhat different institutional models. The Spanish system is more decentralised, with substantial responsibilities held by autonomous communities, while Portugal maintains a comparatively centralised structure. These differences occasionally complicate coordination, particularly in operational procedures and decision-making. Even so, the broader trajectory clearly points towards greater integration, largely because both countries increasingly face similar wildfire risks.

Heatwaves, fuel accumulation, rural abandonment, and extreme fire behaviour now simultaneously affect large parts of the Iberian Peninsula. As a result, cooperation has gradually moved beyond emergency assistance alone and now includes broader discussions around adaptation, landscape resilience and long-term territorial management. Even so, cooperation cannot fully offset the structural vulnerabilities present on both sides of the border. Many of the conditions driving large fires – demographic decline, fragmented landscapes and worsening climatic conditions – continue evolving faster than governance systems are able to adapt.

MAIN ACTORS, EXPERT NETWORKS AND COMPETING INTERESTS

Wildfire governance in Portugal involves a dense group of actors. Public agencies, operational structures, law enforcement authorities, military, scientific institutions, forestry interests, environmental organisations and expert networks, among others, do not occupy the same position within the system, nor do they always share the same diagnosis of the problem. Understanding these actors matters because wildfire policy is shaped not only by technical knowledge, but also by institutional coordination, mandates and competing interests.



- Scientific institutions and technical expertise

Scientific institutions became increasingly influential in Portuguese wildfire governance, particularly after the severe fire seasons of the last two decades. The fires of 2003, 2005 and, especially, 2017 exposed limitations in existing operational approaches and reinforced the need for stronger scientific support in understanding extreme fire behaviour, fuel dynamics and vulnerability. Research centres such as ADAI (Association for the Development of Industrial Aerodynamics), together with several Portuguese universities, gained greater visibility within both public debate and policy development. Their work contributed to advances in fire behaviour analysis, risk modelling, and discussions on landscape resilience and wildfire governance.

A relevant development was the creation of the ForestWISE Collaborative Laboratory, which helped strengthen the connection between scientific research, technological innovation and operational practice. ForestWISE brought together universities, public institutions and private actors within a more interdisciplinary framework focused on knowledge transfer and applied wildfire management.

Another relevant development was the creation of the NADAIR (Centre for Decision Support and Integrated Risk Analysis) within ANEPC (National Emergency and Civil Protection Authority), which brought scientific and technical support closer to operational decision-making during complex fire events.

- Operational actors and emergency structures

Wildfire management in Portugal continues to depend heavily on operational response structures, particularly the volunteer fire brigades, which retain a strong social and symbolic role across much of the country.

Over time, **the system became increasingly complex**, involving civil protection authorities, law enforcement forces, specialised units, aerial resources and military support during severe fire seasons. Entities such as ANEPC, ICNF (Institute for Nature Conservation and Forests) and GNR (National Republican Guard) progressively assumed more specialised responsibilities in areas including operational coordination, fuel management, surveillance and law enforcement. The UEPS (Emergency Protection and Relief Unit) of GNR also gained increasing relevance, particularly in initial attack and specialised intervention under difficult conditions.

Unlike operational entities directly involved in specific components of fire risk management, AGIF was designed as an integrative structure focused on strategic coordination across the entire rural fire management system. Its role connects prevention, operational preparedness, fuel management, recovery and long-term territorial planning within a single governance framework. This integrative function became particularly relevant because wildfire management in Portugal had historically evolved through relatively separate institutional cultures, often working in parallel rather than together.

- Expert forums and transnational networks rurais

The growing complexity of wildfire risk contributed to the emergence of a broader ecosystem of expert forums, research platforms and transnational cooperation networks. In Portugal, this process accelerated markedly after 2017, when the scale of the disasters exposed the limits of purely operational approaches and created a stronger demand for independent technical analysis.

One of the most relevant initiatives during this period was the Independent Technical Observatory (OTI), established by the Portuguese Parliament at the end of 2018 as part of the post-2017 reform process. Its importance was not limited to the reports it produced. The Observatory created continuity in independent technical scrutiny outside the operational chain of command and helped compare reform commitments with what was actually being implemented over time. That continuity was effectively lost after 2023, when its activity ended.

What disappeared with it was therefore more than an advisory structure. **Portugal lost a stable external forum able to monitor reforms over time and to point out, with technical autonomy, implementation gaps that are often less visible once the immediate aftermath of disaster has passed.** Other institutions continue to produce valuable technical assessments, but none has occupied the same place of independent, regular and public oversight.

At the same time, Portuguese institutions became increasingly integrated into wider European networks focused on wildfire risk, climate adaptation and landscape resilience. Initiatives linked to Firelogue and Fire-Res, among others, contributed to strengthening exchanges among researchers, operational actors and policymakers. These networks increasingly frame wildfires not as isolated national emergencies, but as part of a broader territorial and climatic transformation.

LESSONS LEARNED AND FUTURE CHALLENGES

Adaptation to wildfire risk remains an ongoing process.

The lessons drawn from recent fire seasons in Portugal go well beyond operational response. They concern the organisation of the territory, the resilience of rural communities, the place of prevention in public policy and the capacity of institutions to learn under pressure. Recent years, therefore, do not represent a closed cycle of reform, but an unfinished process of adaptation to fire conditions that are likely to remain severe. In this section, the main lessons since 2017 and the challenges that remain unresolved are discussed.

- After 2017

The fires of 2017 marked a turning point in how wildfire risk was understood in Portugal. Previous severe fire seasons had already exposed important weaknesses, but the scale of civilian fatalities in Pedrógão Grande and the October fires profoundly altered public and political perceptions of the problem.

Several vulnerabilities became impossible to ignore, including dispersed settlements surrounded by unmanaged vegetation, limited evacuation and shelter-in-place capacity, communication failures, and difficulty controlling extreme fires under severe atmospheric conditions. The events also reinforced the perception that suppression alone could not compensate for decades of landscape accumulation and territorial abandonment.

After 2017, scientific analysis gained greater influence within public debate and wildfire governance. The discussion gradually shifted from emergency response alone towards broader questions involving prevention, fuel management and long-term territorial resilience. Fire risk management shifted from isolated functions provided by different entities toward an integrated view provided by AGIF.

- The 2025 season and the persistence of extreme fire conditions



The years following 2017 did not eliminate the structural conditions that favour large fires. The 2025 fire season once again demonstrated how quickly severe fires can develop under extreme weather conditions, even within a system that had undergone significant reforms after 2017.

The fire in Piódão in August 2025, which burned more than 60,000 hectares, became the largest wildfire ever registered in Portugal, revealing persistent structural vulnerabilities that lead to failure under the most severe weather conditions.

This fire event also raised important questions about community protection, exposure and the real capacity of existing protection measures under extreme conditions, even when impacts on buildings and settlements may have been relatively lower than the size of the burned area might initially suggest.

Operational coordination improved in several areas, but broader territorial vulnerabilities remained largely unresolved. Many inland regions continue to face demographic decline, fragmented ownership and limited capacity for sustained landscape management. The consolidation of cadastral information remains one of the structural conditions explicitly recognised in the post-2017 reform agenda, including the PNA objective of building a National Cadastral Information System. At the same time, prolonged droughts and heatwaves are becoming increasingly recurrent across the Iberian Peninsula.

This has reinforced a point that is now difficult to avoid: operational improvements matter, but they cannot, on their own, solve a problem rooted in long-term climatic, territorial and demographic change.

- Long-term governance challenges

The main challenges facing Portuguese wildfire governance are increasingly linked to landscape transformation and climate adaptation. Fuel management around settlements may reduce local exposure, but maintaining resilient landscapes across large rural areas is far more difficult under conditions of ageing populations, weak economic activity and continuing abandonment. Another challenge concerns the balance between emergency response and long-term prevention. Large fire seasons still generate political pressure for immediate operational reinforcement, while prevention measures tend to yield slower and less visible results.

At the same time, extreme wildfire behaviour increasingly calls into question assumptions that most fires can always be suppressed safely and effectively under severe conditions. Discussions around coexistence with fire-prone landscapes, community preparedness and territorial adaptation are therefore becoming more central to wildfire policy in Portugal. Much of the difficulty lies in the fact that wildfire governance depends not only on firefighting systems, but also on broader demographic, economic and climatic processes that evolve over decades rather than political cycles.

05

CONCLUSION

Portugal has been, over the past decades, one of the European countries most affected by wildfires, as measured by annual burned area relative to the country's area, and in some years, it was even the country with the largest area in all of Europe. There are several factors that contribute to this situation, as was illustrated in this report: the climatic conditions, the organisation of the forest landscape and its lack of management. Despite improved management of the fire suppression system and a reduction in the number of fires, very large fires became more frequent. Since 2000, the years 2003, 2005, 2017 and 2025 were outstanding in terms of burned area and number of victims.

In Portugal, the majority of the forest land belongs to private owners. In large parts of the north and centre of the country, property is highly fragmented, rendering the economic exploitation of very small plots ineffective. In the south, although the climate is warmer, the vegetation cover and better management of larger properties help reduce the risk of wildfires. The abandonment of agriculture and the displacement of the rural population to large cities over the past decades have left fewer people available to respond to the initial attack, facilitating the spread of the fires. To overcome this lack of human resources to prevent and suppress wildfires, Portugal organised several agencies and services that attempt to do it. In recent years, these agencies have worked with the population to increase awareness and have managed to reduce the number of fire ignitions and mitigate their impact, while maintaining the use of fire in the landscape. Some programs, such as “safe villages and safe citizens” and “village condominiums”, help improve the preparedness of citizens and their settlements to face fires.

In spite of these efforts and benefits, unfortunately, we cannot expect that the problem of wildfires will be excluded or even significantly reduced in Portugal, in the future years. The pace of climate change may outpace the collective effort to modify the forest landscape and better prepare citizens for future challenges, unless a higher national priority is given to the management of fire risk.

Preventing large wildfires requires acting on climate, landscape, and territory management.

06

DEMANDS: ACTIONS TOWARDS A SAFER FUTURE

01: AMBITIOUS CLIMATE ACTION: EXIT FROM FOSSIL FUELS

Portugal must align its environmental goals with the 2040 climate neutrality target . This requires planning for the complete phase-out of fossil fuels, as global warming is accelerating the extreme heatwaves and droughts that fuel "new generation" fires . Implementing a fair taxation system on major polluters should fund these adaptation and resilience policies.

02: STRATEGIC LANDSCAPE MANAGEMENT

Portugal must commit to the annual management of at least 1% of its total forest area. This commitment focuses on Strategic Fuel Management Zones that break landscape continuity and act as a protection against high-intensity fires.

- **Monoculture limitations:** Strictly enforce restrictions on the expansion of fast-growing monocultures, particularly *Eucalyptus globulus*, while actively promoting native, fire-resilient species like cork oak (*Quercus suber*) and holm oak (*Quercus rotundifolia*).
- **Agroforestry mosaics:** Foster multifunctional landscapes by promoting traditional agroforestry systems and "village condominiums" to create natural firebreaks.



The current governance model remains overly focused on suppression. While Portugal achieves an initial attack success rate of over 90%, fires that escape under extreme conditions become Extreme Wildfire Events that overwhelm all control capacities. Since we cannot change topography or the extreme weather intensified by climate change, fuel management is the only controllable factor.

03: STRUCTURAL LAND REFORM AND PRIVATE SECTOR MOBILIZATION

Since approximately 90% of Portugal's forest land is privately owned and highly fragmented, managing individual plots is often economically ineffective, leading to abandonment.

- **Land registry completion:** Accelerate the conclusion of the Simplified National Cadastral Information System. Without clear property boundaries, fuel reduction measures remain impossible to enforce.
- **Mandatory collective management:** Implement a national strategy for the mandatory grouped management of smallholdings (minifúndios).
- **The State as an "Exemplary Manager":** The State must use its public holdings as model areas for active management to demonstrate safety and economic benefits to private owners.

04: TRANSPARENT, CLEAR AND INCLUSIVE GOVERNANCE

Create a public platform detailing municipal-level execution of forest management and prevention budgets, rather than just general combat investment. This would make prevention more visible and measurable. Empirical evidence demonstrates that shifting from the "suppression strategy" (majority of budget to combat) to proactive management is a very effective measure.

Currently, data on prevention is scarce, non-standardized, and difficult to access, which hinders public oversight and the measurement of policy effectiveness. Strengthening the mandates of AGIF and ICNF regarding data centralization would allow this to be achieved in the short term with sufficient political will.

Additionally, fire management must move from administrative theory to terrain reality by continuing valuing local knowledge.

- **Local consultation forums:** Legally mandate the participation of farmers, shepherds, and rural associations in designing regional fire plans.
- **Continue to support technical fire:** Shift from prohibiting fire to supporting traditional practices. Provide technical assistance for legal pasture renewal burns to reduce the illegal ignitions that cause the majority of fires.
- **Interoperable data:** Create a public platform that maps all fuel reduction actions in real-time, allowing citizens to monitor progress.

05: FIGHTING LAND ABANDONMENT THROUGH ECONOMIC REVITALIZATION

To fight land abandonment and demographic decline, Portugal must make rural management a rational economic choice. Rewarding landowners with payments for “positive externalities” such as carbon sequestration and fire resilience could be funded from a fair taxation system on major polluters.

06: TOWARD AN IBERIAN FIRE RESILIENCE PACT

Wildfire risk does not recognize administrative borders. Portugal and Spain share identical vulnerabilities, including extreme heatwaves, prolonged droughts, and rural depopulation.

PILLARS OF THE IBERIAN PACT:

- 1. Cross-border landscape management:** Strategic alignment to create low-fuel corridors along the border, preventing large fires from crossing between countries.
- 2. Shared resources and operational doctrine:** Harmonizing terminology and protocols so that the 13,000 Portuguese personnel and their Spanish counterparts can operate as a single force during EWEs.
- 3. Joint research and shared data:** Capitalizing on projects like FIREPOCTEP and CILIFO to create a stable Iberian database of fuel models and fire behavior, enhancing predictive risk mapping.
- 4. Unified demographic advocacy:** Portugal and Spain should act as a single diplomatic bloc within the EU to demand that fire resilience and rural depopulation be treated as a unified European security priority, securing long-term structural funding.

This pact is highly feasible as scientific and operational networks are already established. The challenge is to elevate this from a series of isolated projects into a permanent, cross-border state policy that is resilient to political cycles in both nations.



07

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