

# Towards an integrated rural fire management framework in Portugal

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# **Towards an integrated rural fire management framework in Portugal**

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# Abstract

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This policy paper brings together insights and recommendations from a two-year review of Portugal's wildfire management reforms following the extreme fires of 2017. The review focused on the implementation of Portugal's Integrated Rural Fire Management System, including its regulatory frameworks, funding arrangements, institutional co-ordination, and the use of evidence to support wildfire management decisions. Drawing on lessons from the severe 2024 and 2025 fire seasons and international practices, the paper identifies options to further enhance the effectiveness of these reforms and provides guidance to continue strengthening Portugal's wildfire management.

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## Executive summary

**Following the devastating 2017 wildfires, Portugal embarked on a series of reforms to improve its wildfire management.** With the creation of the Integrated Rural Fire Management System (IRFMS), wildfire management became a policy priority across government and non-government agencies, leading to a sizeable scale-up of resources aimed at limiting wildfire damages.

**The introduction of the IRFMS has improved institutional, regulatory and financing conditions for wildfire management.** The IRFMS developed a unified strategy, clarified responsibilities across national, regional, and municipal levels for fire prevention and response, and created the Agency for Integrated Rural Fire Management (AGIF) to coordinate all involved entities. Fire regulations were strengthened through stricter buffer zones, higher penalties, and improved fire-resistant building standards. New incentives promoted prescribed burning and strategic fuel mosaics, increasingly recognising the role of landscape- and nature-based approaches to reduce wildfire risk. Since 2018, public funding for wildfire management has doubled, with prevention now representing nearly half of total fire-related expenditure.

**The IRFMS also strengthened data and information systems to better ground fire management decisions in evidence.** Portugal has since developed national fire hazard and risk maps covering all the country's fire-prone areas, which enable decision makers to identify the most exposed localities. Tools and technologies to monitor fire behaviour and adapt suppression activities were improved, and a monitoring and evaluation system for all projects funded under the IRFMS was established. These initiatives enhanced transparency and efficiency in resource allocation by improving targeting and prioritisation of measures. Through annual and quarterly progress reports and lessons learned processes, the IRFMS also promotes continuous learning and improvement across all agencies.

**Nevertheless, the scale and damage of the 2024 and 2025 wildfires point to a need to accelerate reform implementation.** In 2024, 35 fires burning over 500 hectares accounted for 84% of the total annual burned area, and the summer of 2025 again saw the occurrence of large fires, whose burned area surpassed that of the 2017 fires that triggered the IRFMS reform. These events revealed several shortcomings:

- *Persistent regulatory weaknesses.* A high number of human-caused ignitions and persistent gaps in meeting fuel management targets indicate challenges in ensuring regulatory compliance. Some regulations are perceived as top-down and misaligned with local realities. Limited enforcement and weak sanctions further reduce compliance.
- *Frequent shifts in institutional arrangements could undermine progress.* Moving AGIF's coordinating function from the Prime Minister's office to a sectoral ministry that developed its own Forest Intervention Plan, which is complementary but sometimes overlapping with the IRFMS' strategy, could weaken clarity, coherence, political leadership, and the very integrated approach built in recent years.
- *Complex and multiple large fires remain difficult to contain.* Increasingly severe fire weather conditions (e.g. temperature increases and prolonged dry periods) and socio-economic changes that reduce active land management practices, combined with the governance challenges mentioned above, make complex fires especially challenging to manage.

- *Fire hazard and risk maps are contested locally.* This delays the adoption of municipal execution plans, which are critical for accessing funding and implementing fire regulations.
- *Public funding arrangements are fragmented and provide limited incentives for private investment* in wildfire prevention. Fragmented funding sources leave actors often unaware of available resources. Ambiguity around government *ex post* compensation for fire losses further weakens incentives for preventive investment, while low and costly insurance coverage in high-risk areas limits financial protection and discourages proactive risk reduction.
- *Incomplete loss and damage accounting.* Data collection on observed forest, infrastructure and building losses and damages is improving, but is not yet systematically compiled or used to guide funding allocation decisions.
- *Monitoring and evaluation efforts have not sufficiently improved transparency, accountability and continuous improvement.* While information on the implementation of wildfire management measures is being collected, existing indicators do not sufficiently capture outcomes such as improvements in wildfire resilience. Equally, evaluation tools are not fully used to track transparency and accountability and inform continuous improvement.

## Key recommendations to strengthen implementation of the IRFMS

### *Build a stronger institutional framework*

- **Maintain commitment to an integrated approach to wildfire management.** Future institutional reforms should preserve and build on the core achievements of the IRFMS' integrated and coordinated approach, ensuring clear responsibilities and accountability in institutional arrangements across all government and non-government actors.

### *Further strengthen prevention*

- **Simplify and tailor regulations to local conditions,** ensuring they account for territorial differences and facilitate compliance for different target groups. Design proportional and enforceable sanctions that can effectively encourage preventative behaviour.
- **Address structural constraints to effective fuel management implementation** by accelerating land registration, prioritising abandoned or highly flammable vegetation, and continuing targeted behavioural prevention to reduce human-caused ignitions.
- **Further integrate active land management and ecosystem-based approaches into fire risk reduction,** including sustainable forest management and conservation of natural assets, and promoting native and broadleaf species where appropriate.

### *Enhance funding efficiency*

- **Develop a long-term comprehensive wildfire funding strategy to increase the efficiency of wildfire management expenditures.** This could shed light on all wildfire funding resources available, clarify *ex ante* and *ex post* cost-sharing mechanisms between government levels and public-private actors, revise fiscal equalisation rules to better support high-risk areas, and create incentives for sustainable land management and ecosystem services.

### *Further anchor wildfire management decisions in evidence*

- **Improve hazard data** by mapping high-value assets to further support planning and prioritisation of fire management measures.
- Continue strengthening monitoring and evaluation of the IRFMS.** Existing indicators could be improved to better evaluate outcomes. Lessons learned processes could be conducted more

regularly. Fostering a strong evaluation culture and linking decisions (including spending) to clear accountability mechanisms can improve performance, and operational efficiency.

*Increase community engagement*

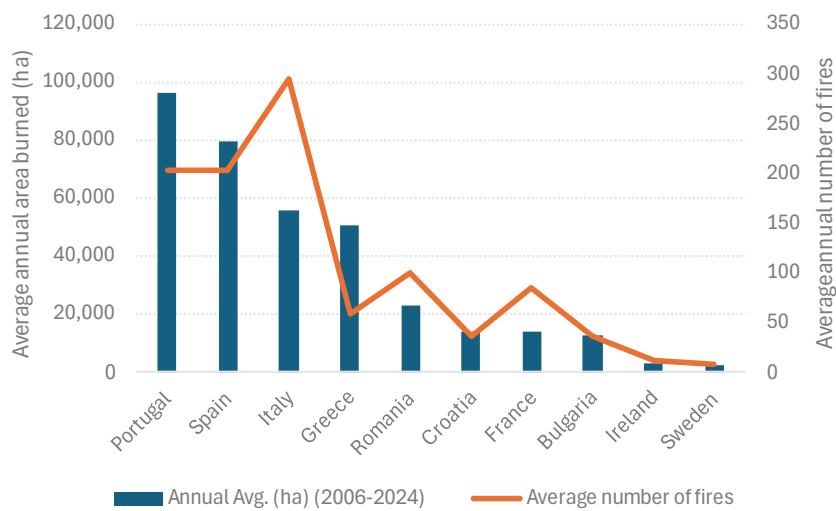
- **Emphasise inclusiveness in developing local hazard maps.** Including local actors in the design of these maps, thereby valuing their knowledge of fire occurrence and spread, can increase the acceptance of fire prevention measures, and compliance with fire regulations.

# 1 Introduction

**Portugal is one of the most wildfire-prone countries in Europe. Large fires in sparsely inhabited areas account for most of the burned area, showing how socio-economic change, land abandonment, and degraded forests have heightened wildfire risk.** Industrial and service-sector growth has reduced dependence on land-based activities, driving migration from rural areas to cities and shrinking the rural population from 60% in the 1960s to just 5% today (AGIF, 2020<sup>[1]</sup>). Inheritance structures and demographic change have fragmented private forest ownership – 93% of forests are privately owned, divided into 6.5 million holdings averaging 0.57 ha – making land management difficult (Schmithüsen and Hirsch, 2010<sup>[2]</sup>) (Fernandes and Simões, 2024<sup>[3]</sup>). Low agricultural and timber profitability, combined with policies favouring large-scale operations, further discourage active use of these parcels (Hatcher, Straka and Greene, 2013<sup>[4]</sup>). As agricultural and forest lands are abandoned, unmanaged, fire-prone vegetation dominates the landscape, while poor forest health and invasive species add to vulnerability (OECD, 2023<sup>[5]</sup>). Finally, climate change further exacerbates this risk by driving extreme weather that fuels fire spread and intensity (OECD, 2023<sup>[6]</sup>) (Figure 1).

**Figure 1. The ten European countries most exposed to forest fires**

Average annual area burned (ha) and average annual number of fires over 2006-2024



Note: The data presented in this figure account only for fires with a burned area exceeding 30 hectares, and thus exclude the numerous smaller fires successfully contained through effective suppression operations.

Source: Author's own, based on European Forest Fire Information System (EFFIS) Estimates for European Union, under the Copernicus Emergency Management Service (European Commission, JRC, 2025).

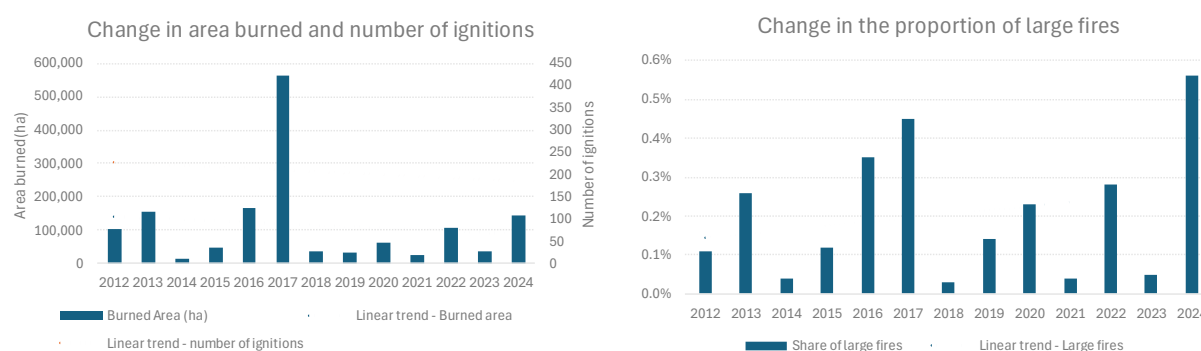
**In 2017, Portugal experienced its deadliest wildfires in recent years.** Over the course of the year, more than 100 people lost their lives, thousands were injured or displaced, and vast areas of forest and agricultural land were destroyed (AGIF, 2020<sup>[1]</sup>). The unprecedented severity of the 2017 fires was driven

by a combination of factors. First, extreme weather conditions, including prolonged drought, record-breaking heatwaves, and strong winds contributed to fire intensity and spread. In addition, a high amount of dead vegetation resulting from decades of land abandonment and insufficient forest management fuelled the fires. Finally, there were underlying structural vulnerabilities stemming from the country's fire prevention and emergency response systems (OECD, 2023<sup>[6]</sup>).

**In the aftermath of the devastating 2017 fires, Portugal faced a pivotal moment in its approach to wildfire management, leading to a paradigm shift toward proactive and risk-based fire management.** The pre-2017 wildfire management system was characterised by a lack of co-ordination and dialogue among key stakeholders, an unclear distribution of roles and responsibilities, the underinvestment in wildfire prevention, and a general lack of awareness of existing levels of risk (Independent Technical Commission, 2018<sup>[7]</sup>) (Independent Technical Commission, 2018<sup>[8]</sup>) (AGIF, 2020<sup>[11]</sup>). To address these gaps, Portugal embarked on a reform path, guided by the objective to reduce severe fire risks, and enhance resilience. This reform led to the establishment of the Integrated Rural Fire Management System (IRFMS) (Presidency of the Council of Ministers, 2019<sup>[9]</sup>) and the elaboration of a 2020–2030 Integrated Rural Fire Management Strategy, which emphasise the greater integration of prevention, emergency response and recovery efforts across all levels and actors.

**The 2024 and 2025 fires demonstrate that significant challenges remain in pursuing the paradigm shift set through the introduction of the IRFMS.** While Portugal has experienced a slight decline in fire ignitions and average annual area burned since 2017, the country faces growing exposure to severe wildfires (Figure 2). The 2024 fires caused the third-largest burned area since 2014 (AGIF, 2025<sup>[10]</sup>). The summer of 2025 again saw exceptionally large fires, with burned area exceeding that of 2017. Climate projections indicate an increase in high-to-extreme wildfire risk days, making intense and frequent fires more likely (OECD, 2023<sup>[5]</sup>) (Ross, Gannon and Steinberg, 2020<sup>[11]</sup>).

**Figure 2. Changes in fire regime over time in Portugal (2012-2024)**



Source: Author's own, based on [ICNF total and regional statistics \(2001-2023\)](#) and (AGIF, 2025<sup>[10]</sup>).

**To support Portugal in furthering the implementation of its ambitious reform programme, the country engaged in a Technical Support Instrument (TSI) project** funded by the European Commission's Secretariat-General for Structural Reform Support (SG REFORM) to address the persistent challenges in wildfire management and strengthening the implementation of the reforms adopted after 2017. This report presents the project's key findings and recommendations.

## 2 Toward a stronger institutional framework

**Before 2017, the Plan for Forest Fire Defence 2006-2018 guided Portugal's wildfire management.** Developed in response to the severe fires of 2003 and 2005, it aimed to improve wildfire prevention and protection structures. It emphasised active forest management and the reduction of wildfire risk through three priority areas: structural prevention, surveillance, and firefighting, each under the responsibility of different national entities (Ministry of Agriculture, 2006<sub>[12]</sub>). Until 2012, the Plan sought to reduce burned area and the number of wildfires. From 2012 to 2018, the focus shifted to limiting the occurrence of prolonged active fires (Independent Technical Observatory, 2019<sub>[13]</sub>).

**Following the 2017 fires, several evaluations revealed major gaps in Portugal's wildfire management system.** An independent technical commission found that the three-pillar system, with separate agencies responsible for prevention, surveillance and firefighting, fostered a siloed approach that lacked a joint operational command, shared objectives and coordinated strategies. In this context, prevention was undervalued and funding and resources primarily concentrated on emergency response and firefighting. This imbalance between prevention and response created a fire paradox: short-term reductions in burned area through suppression allowed fuel to accumulate, increasing the severity of future fires (Independent Technical Commission, 2018<sub>[7]</sub>). The system also lacked a specialised coordinating body with clear authority and responsibility to align actors across local, regional, and national levels, define a common strategy, monitor progress, and ensure accountability (Independent Technical Commission, 2018<sub>[8]</sub>) (Independent Technical Observatory, 2019<sub>[13]</sub>). As a result, no single actor assumed responsibility for managing risk before fires occur. Finally, while fire response teams operated under a three-tier command structure (national, district, and municipal), this hierarchy was insufficiently reflected in planning and prevention efforts, weakening cross-level coordination and preparedness.

### 2.1. Portugal has addressed some coordination gaps identified after 2017

**The Integrated Rural Fire Management System (IRFMS) established in 2018 proposes a new fire management model.** The IRFMS revolves around two axes: (i) managing rural fires and defending forest areas and (ii) protecting communities and assets. In addition, the IRFMS introduces a new process of six stages – planning, preparation, prevention, pre-suppression, suppression, relief, and post-fire – clarifying the responsibilities of each stakeholder in each stage. Incidentally, the Agency for Integrated Rural Fire Management (AGIF) was established to coordinate public authorities involved in the Integrated Rural Fire Management System (IRFMS) and steer fire management planning. AGIF has led the development of the National Plan for Integrated Rural Fire Management (AGIF, 2020<sub>[1]</sub>). Finally, the IRFMS confers greater roles and responsibilities to subnational governments, including stakeholders such as the Regional Development and Coordination Committees (CCDRs), who were not involved in fire management before and are now coordinating the Regional Commissions of the IRFMS.

**The IRFMS promotes an integrated, whole-of-government approach to wildfire management.** With its new process chain, the IRFMS addresses the entire wildfire risk management cycle and defines clear

roles and shared responsibilities across all relevant agencies, rather than assigning exclusive roles and tasks to specific agencies. Its system-wide coordination seeks to ensure that all actors, from civil protection to those responsible for forest policies and management, operate under a coherent strategy that aligns efforts at every stage of fire risk management. In addition, the IRFMS embeds fire management in broader rural and territorial development policies, to respond to the long-term demographic and economic transformations that have reshaped Portugal's rural territories and The IRFMS aims at contributing to addressing land abandonment of agricultural and forest lands, with the objective of limiting fuel accumulation and altered landscapes and hence mitigating fire risks (AGIF, 2020<sup>[1]</sup>).

**The establishment of AGIF addresses the need for a dedicated body to coordinate and steer the reform process.** As an autonomous, cross-sectoral agency initially overseen by the Prime Minister's Office, AGIF has played a central role in the development of a shared wildfire management strategy (Independent Technical Observatory, 2021<sup>[14]</sup>) (Box 1). It has fostered coordination among public authorities by enhancing vertical and horizontal coordination, notably through the creation of national and subnational bodies that plan and guide the implementation of the National Action Programme (NAP). AGIF also monitors the implementation of the NAP, compiling insights from entities into annual consolidated reports. Finally, it leads a lessons-learned system, i.e. a collaborative exercise that analyses selected wildfire management actions to identify opportunities for improvement and best practices worth replicating. These lessons learned analyses are made public and the identified corrective actions are monitored.

**The IRFMS also provides a reference for wildfire management beyond Portugal.** In many countries, responsibilities are fragmented across agencies and coordination gaps are becoming increasingly evident. In Spain, a national evaluation following the 2022 fires highlighted how weak interregional coordination exacerbated fire impacts and called for national guidelines to harmonise wildfire policies (Spanish Ministry of Ecological Transition, 2022<sup>[15]</sup>). In France, recent evaluations pointed to insufficient implementation of wildfire management plans (French Senate, 2022<sup>[16]</sup>), prompting calls for a national coordination body to steer policy implementation, monitor progress, and strengthen accountability in fire management. Similarly, Australia's 2019–2020 bushfires exposed shortcomings in leadership, integrated planning and unified communication despite strong operational capacity, resulting in delays, inefficiencies, and greater impacts (Australia Royal Commission, 2020<sup>[17]</sup>). The IRFMS governance model offers a relevant example for addressing the issues identified in these national assessments.

**Under the IRFMS, subnational authorities have gained a stronger role in prevention planning and implementation.** The five CCDR are tasked with transposing the NAP to the regional scale, including guidelines for subregional and municipal actions. They also coordinate and chair regional committees that bring together all relevant IRFMS stakeholders represented at this administrative scale, as well as identify funding opportunities for the implementation of the NAP (Box 1) at subnational level. Intermunicipal communities, that previously had no role in fire management, are now tasked with planning sub-regional action programmes, in alignment with the regional action programmes to which they contributed. They also have specific responsibilities such as adapting the secondary fuel break network to their territory. Finally, municipalities have taken on broader responsibilities in fuel management, land-use planning, public awareness-raising, and post-fire recovery. They contribute to sub-regional committees to inform the elaboration of the subregional action programmes that are then translated into municipal execution programmes, replacing former municipal forest fire defence plans.

**The transition from a three to a four-tier governance system aligns with the need to increase territorial coherence.** While the previous three-tier framework (national, district, municipal) was lacking an agile operational structure with clear command hierarchy and defined territorial boundaries (Independent Technical Observatory, 2019<sup>[13]</sup>), the establishment of regional, sub-regional, and municipal committees with robust, two-way communication channels has enhanced both alignment with strategic objectives and coordination across all levels. The addition of a regional and sub-regional level of fire management planning is also consistent with the roles and institutional arrangements of the CCDRs and

CIMs. Traditionally, CCDRs are responsible for implementing spatial planning and regional development policies at the regional level, bridging the gap between national priorities and local execution. CCDRs are instrumental in promoting regional development, including managing national and European structural and investment funds (OECD, 2020<sub>[18]</sub>). They facilitate projects that enhance economic, social, and environmental conditions within their jurisdictions, i.e. including rural development or agriculture programmes that are central to the IRFMS. In addition, the appointment of regional coordinators (i.e. representatives of AGIF at regional level) facilitates dialogue and contributes to overcome resistance to change, encouraging greater collaboration among stakeholders (AGIF, 2020<sub>[11]</sub>). It is to be noted, however, that the creation of new planning and coordination structures has increased procedural demands on existing technical staff and is perceived by some agencies as of limited operational value – especially if roles and outputs across levels are not more clearly differentiated.

### Box 1. The National Action Programme for wildfire management

The NAP is designed to meet three main targets: (i) civilian casualties are rare; (ii) fires spanning over 500 hectares account for less than 0.3% of total fires (iii) cumulative burned area by 2030 does not exceed 660 000 ha. To achieve these targets, the NAP is built around four strategic orientations:

- **Valuing rural areas** refers to the implementation of rural economic development, rural land management programmes, and certified forest management.
- **Active management of rural areas** entails projects that contribute to maintain 1.2 million hectares of land through vegetation clearing, pastoralism, controlled fires, or species management. This pillar also aims at reinforcing emergency and recovery planning.
- **Changing behaviours** relies on promoting awareness of wildfire risk, including through educational practices, and establishing regulations to reduce human-induced fire ignitions.
- **Efficient risk management** seeks to strengthen the qualifications and competencies of the stakeholders involved in fire management. It also aims at fostering risk-informed governance practices in wildfire management.

## 2.2. Recent institutional shifts may reduce effectiveness of the 2017 reforms

**Recent shifts in institutional responsibilities have resulted in overlapping strategies for fire management.** After the election of a new government in 2024, forest management responsibilities were transferred exclusively to the Ministry of Agriculture, which since then has overseen AGIF. In 2025, the ministry released the Forest Intervention Plan to 2050, which promotes a sustainable and resilient forest, less vulnerable to climate risks, along the enhancement of the production of goods and services (Ministry of Agriculture, 2025<sub>[19]</sub>). While the plan places greater emphasis on the economic value of forests and on strengthening local capacity for fuel management through new or complementary actions, it often overlaps with the NAP. For instance, the NAP already seeks to address land abandonment by promoting rural economic value through agroforestry, sustainable forest management, biomass-based energy financing models, and improved valuation and remuneration for ecosystem services provided by landowners.

**These overlaps can create confusion among stakeholders and potentially reduce the effective implementation of the NAP.** The Forest Intervention Plan includes an estimated budget for each objective for the period 2025–2050, drawing on the same funding sources earmarked for NAP implementation during 2020–2030. While visibility on potential funding beyond the current period is a positive development, it remains unclear whether projects under the two programmes will compete for the same resources. Furthermore, several actions under the Forest Intervention Plan mirror NAP projects with only minor

adjustments, making prioritisation difficult for entities. Additionally, the proposal to develop an additional monitoring and evaluation platform – parallel to AGIF’s system operating since 2021– further adds to this ambiguity. Instead, overlapping actions could be monitored in an integrated way through AGIF’s existing platform, which is already downscaled to territorial levels and can support both the NAP and the Forest Intervention Plan simultaneously.

**More generally, the Forest Intervention Plan raises concerns about the continuity of a coordinated approach to integrated fire management.** While it aims to strengthen forest resilience to fire, it excludes most aspects related to preparedness and suppression, risking to re-fragment responsibilities among civil protection, forest management, and broader fire prevention. Moreover, the Plan proposes revisiting the number of entities and governance layers involved in the IRFMS, arguing that complexity has hindered implementation (Ministry of Agriculture, 2025<sup>[19]</sup>). As new national fire management plans have been introduced after each major wildfire (2006, 2018, and 2024), stakeholders have grown accustomed to post-crisis shifts in strategic direction. Yet the IRFMS represents a paradigm shift toward integrated and coordinated fire risk management that requires sustained commitment to gain traction. The proposed changes risk slowing down ongoing reforms and reinforcing the *status quo* – especially at the local level, where municipal execution plans and subregional action programmes under the IRFMS have yet to be adopted.

### 2.3. The IRFMS has improved clarity of roles, less so accountability

**The IRFMS has improved clarity of roles.** The detailed process chain introduced by the IRFMS clearly defines the roles and responsibilities of each agency across all stages of the wildfire management cycle. Each action is assigned to specific entities – whether for implementation, approval, coordination, or oversight (Independent Technical Observatory, 2021<sup>[14]</sup>). This structured approach also provides a good entry point for enhancing accountability through identifying stakeholders responsible for defined actions.

**Significant progress has been made as well in strengthening the structure and coherence of suppression efforts.** Before the IRFMS, the national civil protection agency (ANEPC) held primary responsibility for fire suppression, while ICNF focused on forest management and prevention. The reform introduced a new Forest Fighter Force (*Força de Sapadores Bombeiros Florestais*, FSBF) operating under ICNF, whose mission focuses on extended attack and mop-up operations in forest areas where terrain and fire behaviour require more specialised ecological and technical knowledge (Independent Technical Commission, 2018<sup>[8]</sup>). The FSBF operates under the guidance and command of ANEPC and its interventions complement the work of traditional firefighters, who are more focused on protecting communities and built assets. In addition, operational procedures for suppression activities have been refined. The Integrated System of Protection and Relief Operations established by Decree-Law No. 90-A/2022 ensures that all protection and relief operations follow the principle of unity of command, providing clear direction and coordination among entities. Coordination is further strengthened annually through the national operational directive (*Dispositivo Especial de Combate a Incêndios Rurais*, DECIR) and the national plan for wildfire suppression in mainland Portugal, which defines the structure, mobilisation, and operational response for all wildfire-related emergencies. By incorporating lessons learned from all participating entities, the directive promotes continuous improvement and more efficient resource deployment.

**As a result, suppression capacity has improved since the onset of IRFMS reforms.** With accelerated resource dispatch and strengthened suppression capacity 92% of fires were extinguished within 90 minutes in 2024 compared with 79% in 2017 and the 2007–2017 average of 69% (AGIF, 2021<sup>[20]</sup>). This has helped limit fire spread and escalation in recent years.

**However, the most complex fires pose continued coordination challenges on the ground.** During the 2022 season, misinterpretations of operational directives and limited knowledge of terrain occasionally

delayed or compromised suppression effectiveness (Expert Group on Rural Fires, 2023<sup>[21]</sup>). In 2024, weaknesses in coordination during initial attack and pre-suppression phases may have undermined response efforts (AGIF, 2025<sup>[10]</sup>). The *Caranguejeira* fires in the Center region in 2025 also highlighted communication issues between different firefighting forces (Expert Group on Rural Fires, 2023<sup>[21]</sup>). As a result, while most fires are controlled in their early stages, a small proportion continue to escape initial attack and end up accounting for most of the burned area. While increasing firefighting capacity upstream of urban areas was pointed out as necessary (Independent Technical Commission, 2018<sup>[8]</sup>), this additional capacity was underutilised during recent incidents, such as the Serra da Estrela fires in 2022 (National Commission for Integrated Rural Fire Management, 2023<sup>[22]</sup>). Finally, the organisation of the civil protection system retained a different territorial model, with district commissions that do not correspond to the areas of sub-regions. This can pose coordination challenges during complex fires.

**Coordination and operational decision-making are further hampered by the lack of uniform qualifications.** Although a national qualification plan has been in preparation since 2021, its full implementation is still pending, meaning that not all fire operators have the same level of training. In addition, high turnover and unavailability of volunteers have limited the effectiveness of available training. Consequently, hierarchy may be prioritised over expertise, ultimately reducing operational effectiveness (Independent Technical Observatory, 2021<sup>[14]</sup>).

**More generally, accountability remains limited by the absence of enforcement mechanisms, insufficient consequences for underperformance, institutional capacity constraints and lack of transparency.** There are currently no effective mechanisms to hold institutions accountable when they fail to meet NAP objectives, comply with Decree-Law 82/2021 obligations, or implement corrective actions from lessons-learned exercises intended to strengthen fire prevention or suppression. For example, although lessons learned from the 2023 fires were identified, by the September 2024 fires only half of the corrective measures were implemented, despite their potential to significantly improve response capacity (AGIF, 2025<sup>[10]</sup>). No sanctions or consequences exist for such delays, partly because agencies are facing financial and human resource constraints that hinder implementation. In addition, some entities do not submit progress reports on specific projects under the NAP, even when such reporting is mandatory as part of annual monitoring. There is no clear objective or criteria for municipalities to allocate funding to key stakeholders, such as volunteer firefighters. The lack of clear rules has resulted in inconsistent financing, where operational effectiveness depends more on local resources and leadership than on national standards. It also limits accountability of municipal stakeholders as no evaluation of these funds' effectiveness is performed (Court of Account, 2022<sup>[23]</sup>). In California (United States), the Wildfire and Forest Resilience Taskforce (California Wildfire and Forest Resilience, 2025<sup>[24]</sup>) holds quarterly public meetings to review fire management programmes, funding and partnerships. Meeting minutes are published online, enhancing institutional follow-through and accountability.

## 2.4. Looking ahead: maintain an integrated approach to wildfire management

**To strengthen its institutional framework for wildfire management, further clarifying roles and responsibilities, as well as reaffirming support for a whole-of-government approach is needed.** This means, clearly articulating how the IRFMS and the Forest Intervention Plan complement each other and strengthen the coordination between prevention and suppression. It also requires clarifying mandates and coordination roles for fire management to preserve the integrated approach promoted by the IRFMS. Finally, it is also important to reinforce coordination on the ground, to address remaining weaknesses during suppression activities. To support these efforts, it is essential to reinforce the capacity and qualifications of the agencies' resources. Finally, fostering a strong evaluation culture and increasing transparency of decision-making processes (including spending) can further improve accountability and operational efficiency.

# 3 Reinforcing the regulatory framework

## 3.1. Regulations for wildfire prevention have considerably improved since 2017

**Successful wildfire prevention relies on a mix of structural interventions and organisational measures.** Structural measures entail fuel and ecosystem management, which reduce wildfire risk and severity by controlling the quantity and characteristics of combustible materials across the landscape. These include buffer zones, fuel breaks (i.e. strips of non-flammable land near settlements or across the landscape), prescribed fires, and the active use of fire for the disposal of forestry and agricultural residues and for pasture renewal (i.e. waste and extensive burns) (Presidency of the Council of Ministers, 2017<sup>[25]</sup>) (Ministry of Agriculture, 2014<sup>[26]</sup>). In contrast, organisational measures include land-use rules and building codes or standards. Land-use planning can limit new development in fire-prone areas. Building regulations govern the construction of assets such as houses and infrastructure to enhance fire resilience (OECD, 2023<sup>[5]</sup>).

**Following the 2017 fires, evaluations found that regulations for implementing both structural and organisational risk reduction measures were ineffective.** Although buffer zone regulations were already used in Portugal well before 2017, roadside fuel breaks were under-dimensioned and often poorly maintained (Independent Technical Commission, 2018<sup>[7]</sup>). Additionally, compliance with buffer zone regulations around individual structures and population centres was almost inexistent. In addition, fuel breaks were often conceived in silo instead of as part of a comprehensive landscape-scale fuel management plan, reducing their efficiency (Independent Technical Commission, 2018<sup>[8]</sup>). Waste or extensive burns were also used previously, but gaps in enforcement and timing restrictions for agricultural burns were at the source of fire ignitions, including the 2017 fires (Independent Technical Commission, 2018<sup>[8]</sup>). Similarly, landscape-level prescribed fires were already permitted prior to 2017, but their adoption was low especially in areas characterised by high wildfire hazard levels. Building regulations focused on construction materials and equipment used inside of buildings for fires originating with the building's walls.

**Regulations have been strengthened since 2017.** Criteria to impose buffer zone regulations around buildings have been strengthened to clarify priority areas (e.g. within a range of 50 metres around isolated structures and within 100 metres from human settlements including ten or more houses). Penalties for non-compliance have doubled since 2018. Prescribed fires are not allowed in zones characterised by a “very high” or “maximum” hazard level according to the fire danger map or when weather conditions are conducive to fire (Presidency of the Council of Ministers, 2021<sup>[27]</sup>). Finally, while pre-2017 construction standards focused on internal fire resistance, recent code revisions aim to better protect exterior walls from wildfires and extreme heat. However, these requirements currently apply only to new buildings.

**To promote regulatory compliance, Portugal has invested in public awareness campaigns.** The *Portugal Chama* campaign targets both public and private stakeholders, raising awareness on fire prevention measures that can be undertaken at the local level to reduce wildfire risk (OECD, 2023<sup>[5]</sup>). These include, for example, vegetation clearance around properties, moving firewood stacks away from

buildings, installing non-flammable flooring strips around homes to create buffer zones, and requesting permits for controlled and waste burns. The campaign also informs the public about the applicable fines for non-compliance to deter risky behaviours. In addition, the “Safe Village, Safe People” programme, also launched after the 2017 wildfires, seeks to reduce wildfire risk through behavioural change and public education. It combines prevention measures (e.g. fuel management, emergency shelters, evacuation routes) with self-protection measures (e.g. awareness raising, evacuation training) (ANEPC, 2026<sup>[28]</sup>).

**New digital tools facilitate the implementation of preventive regulations.** A digital platform has been created to allow private stakeholders to request municipal authorisation for waste and extensive burns, supported by funding and technical assistance. For extensive burns, the national forest office (ICNF) ensures they are conducted under the supervision of experts. The platform serves as a valuable tool to identify potential ignition sources and anticipate fire spread. Similarly, the platform *SOS Ambiente e Território* enables citizens to report violations of environmental and land-use regulations. An arsonist programme was launched to better understand the drivers of arson, which still accounts for an estimated 40% of ignitions (AGIF, 2025<sup>[10]</sup>), and to develop strategies to reduce recidivism.

**The regulatory framework has been further enhanced through targeted inspections, enforcement and improved monitoring.** Each year, high-risk parishes – subdivisions of a municipality – are identified using data on ignitions, unburned area, and the national hazard map to guide fuel management inspections by the National Republican Guard (GNR) and municipalities. Advanced tools, including satellite imagery and digital mapping are increasingly employed to detect insufficient vegetation management and unauthorised burns, improving enforcement accuracy. Surveillance has been reinforced through more frequent patrols, while the waste and burn registration platform enables near real-time monitoring and targeted interventions. With technical and logistical support from ICNF, the GNR and the Judiciary Police have expanded their workforce of trained fire investigators to identify ignition sources and track behaviours such as arson or accidental burns, informing enforcement strategies. IRFMS entities responsible for fuel breaks and regulatory oversight – ICNF, GNR, and subnational authorities – collect and report compliance data annually, enhancing the effectiveness and accountability of wildfire risk reduction measures.

### 3.2. Compliance remains low due to structural barriers

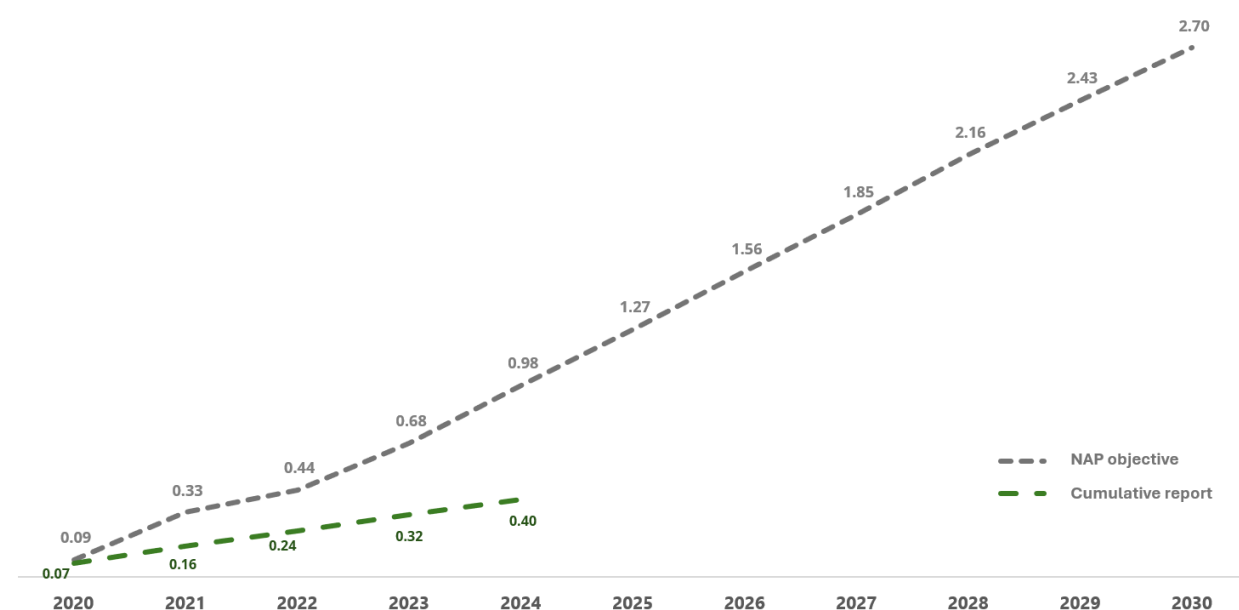
**Although regulatory changes since 2017 have supported wildfire prevention, significant compliance challenges remain.** Voluntary compliance with buffer zone regulations, measured as the share of regularised situations after one inspection, rose from 49% in 2019 to 60% in 2024 (AGIF, 2025<sup>[10]</sup>). However, the severe fires of September 2024 highlighted that arson remains a major issue. Fuel management efforts also fell short in 2024, with only 75,559 hectares treated, i.e. 7% below the annual target set by entities and 60% below the NAP targets (AGIF, 2020<sup>[11]</sup>), marking a decline from 2023. (AGIF, 2025<sup>[10]</sup>) (Figure 3). Yet, data from local authorities and private actors remain scattered across unconnected databases, limiting a comprehensive assessment of implementation progress (AGIF, 2025<sup>[10]</sup>). For this reason, reported figures should be interpreted with caution, as they may underestimate the actual scale of fuel management activities carried out by numerous private actors (e.g. building owners) and local authorities and not systematically captured in monitoring. Some agencies also note that national fuel management targets may need revision to better reflect local conditions and the experience of implementing entities.

**Several structural and operational constraints further hinder effective implementation of fuel management measures.** Enforcing fuel management regulations on private lands is also particularly challenging in a country where only 46% of forest areas are currently covered by a land registry and more than 20% of the forest lands has no or an unknown owner (Portuguese Environment Agency, 2020<sup>[29]</sup>). Regarding waste and extensive burns, the absence of a mechanism for the collection, valorisation, and management of forestry and agricultural residues contributes to the continued use of open burning, which

accounted for 41% of the fire ignitions in 2024 (AGIF, 2025<sup>[10]</sup>). Another concern is the potentially limited ability of rural landowners to comply with existing requirements to conduct such fires and digital procedures to register them, especially given the ageing demographic of Portugal's rural population (AGIF, 2023<sup>[30]</sup>). In addition, the limited availability of contractors to develop and maintain buffer zones hinders implementation – particularly in the designated priority areas, where fuel management machinery must meet strict safety standards. These additional requirements increase costs for contractors, who may opt to operate in less restrictive areas (Regional Committee for integrated rural fire management, 2023<sup>[31]</sup>).

**Figure 3. Cumulative area of fuel management reported as treated compared to NAP objectives**

Million ha



Source: (AGIF, 2025<sup>[10]</sup>).

**Overall, existing regulations for fire management are widely perceived as top-down, which has weakened local buy-in and hindered implementation.** To develop regional and sub-regional action programmes for integrated rural fire management and adapt land use and fuel management activities, regional and sub-regional committees met on average 38 and 24 times respectively between 2021 and 2022 (AGIF, 2025<sup>[32]</sup>). The high frequency of meetings reflects the challenges faced at the local level when trying to define the secondary fuel networks. The aforementioned delays in the rollout of municipal execution plans, of which only 15% have been completed (AGIF, 2025<sup>[10]</sup>) render inspection or enforcement activities difficult. In Spain, the wildfire prevention teams (EPRIF) work directly with rural populations in high-risk areas (Box 2). California has also set up a whole-of-society approach to wildfire management in which local authorities are key decision-makers (Box 2).

**Yet, although subnational authorities have some flexibility to adapt fire prevention regulations, they have not taken advantage of it.** This hesitation is partly rooted in concerns over legal liability. Following the 2017 wildfires, several stakeholders, including private-sector actors, members of fire service or local authorities were taken to court on charges of negligent homicide and bodily harm. Although the defendants were ultimately acquitted – on the grounds that the extreme and irregular meteorological conditions had made firefighting efforts exceptionally difficult - the case has had a chilling effect. Elected officials remain cautious about using the flexibility provided under Decree-Law 82/2021 to adapt fire prevention regulations to reflect their own risk assessment. Instead, they have called for clearer and more

prescriptive guidance on when and how to implement such adaptations (Tedim et al., 2023<sup>[33]</sup>). Specifically, they were awaiting the development of a technical regulation by the national forest office (ICNF), which establishes technical standards for fuel management. This regulation was published in April 2025 (Decree 4223/2025) with no data to evaluate whether this will address existing concerns yet.

### Box 2. International examples of stakeholder engagement for risk prevention

**Spain:** In 1998, the Spanish Forest Fires Service created the Integral Wildfire Prevention Teams (EPRIF). These teams work directly with the rural population in areas where traditional agricultural practices contribute to high wildfire incidence. EPRIF teams engage directly with stakeholders to understand the interests and incentives of different groups and help define specific activities based on the needs of the population and the regulation of the autonomous community. On the one hand, this approach helps build trust and acceptance of the decisions by authorities, and on the other, it helps adjust interventions based on the needs, points of view and experience of local parties. These teams have helped bridge the divide between local communities that use fire as part of their traditions or economic activity and the authorities focusing on wildfire prevention.

**California (United States):** The California Wildfire and Forest Resilience Taskforce coordinates wildfire and forest policies across agencies and levels of government. The Taskforce includes state, federal, and local representatives and is led by the Governor's Office, CAL FIRE, and California's Natural Resources and Environmental Protection Agencies. It hosts quarterly public meetings to review progress, funding, and programmes for fire management. Local governments are active participants in decision-making, contributing to the design, implementation, and monitoring of the Wildfire and Forest Resilience Action Plan. In addition, local feedback and data are used to adapt actions to regional needs, making it a model of integrated vertical governance.

Source: (Ministerio para la Transición Ecológica y el Reto Demográfico, 2024<sup>[34]</sup>) (California Wildfire and Forest Resilience, 2025<sup>[24]</sup>).

**Flexibility is essential to engage stakeholders in effective fire risk management.** For example, primary buffer zones are currently defined based on environmental value, land ownership regime, and hazard levels. However, research on Portugal's fuel break network reveals significant variation in its effectiveness, particularly depending on fire severity. For instance, just 4% of the total length of the fuel break network would reduce the burned area by 30% (Aparício et al., 2022<sup>[35]</sup>). This suggests that adapting the fuel network more closely to actual risk levels could be a cost-effective strategy to help prioritise buffer zones more effectively. Such prioritisation could benefit from greater use of landscape- and nature-based approaches that address fuel continuity at broader spatial scales. This includes strategic fuel mosaics that combine different land uses and vegetation types, such as native and broadleaf vegetation, to reduce fire intensity and spread. At the same time, the effectiveness of more localised fuel treatments, such as fuel strips, has been shown to depend heavily on local conditions such as land use, slope, vegetation, and the density of nearby structures or habitats (Syphard, Brennan and Keeley, 2014<sup>[36]</sup>). In France, flexibility to plan preventive measures exists at the local level, supported by participatory approaches backed by the national government (Box 3).

**Municipalities lack the capacity to fully implement wildfire management regulations.** While they are legally required to intervene when landowners fail to comply with buffer zone rules, this often imposes a heavy and unsustainable financial burden on local authorities. This is exacerbated by cumbersome reimbursement procedures when owners are known. At the same time, land-use regulations restrict building permits and thereby reduce municipal revenues, creating conflicting objectives and distorted compliance incentives – especially in rural areas with limited capacity and complex land ownership. More

broadly, subnational administrations have highlighted the need for greater financial, human and technical resources to meet wildfire prevention obligations effectively (Diário Imobiliário, 2025<sup>[37]</sup>).

### Box 3. France's local risk prevention plans for wildfires

France has taken a decentralised and participatory approach to wildfire risk management through its system of Natural Risk Prevention Plans (NRPPS). France requires local authorities in areas historically affected by fires to develop tailored prevention plans. Each fire risk prevention plan must include:

- A description of known wildfire risks, including a documented history of past events.
- An explanation of wildfire hazards and their probabilities, including uncertainty estimates and justifications for the assumptions used.
- An analysis of vulnerabilities and potential impacts on people, property, and essential activities.
- An assessment of factors that may worsen or mitigate the risks, such as the state and management of protective infrastructure.
- A clear rationale for the zoning decisions and the corresponding regulatory measures.

The development of these plans is highly collaborative, involving consultations between state services, municipal authorities, civil protection agencies, scientific experts, forest managers, economic actors, and civil society representatives. This inclusive process helps foster trust, ensures that local knowledge is incorporated, and supports the creation of accurate, context-specific hazard maps. These maps are then converted into risk maps, which directly inform land-use regulations and urban planning.

Source: (Cerema, 2023<sup>[38]</sup>).

**Faced with limited capacity and resources, entities responsible for inspection and enforcement struggle to set clear priorities to best allocate resources.** Inspection and enforcement responsibilities of all regulations described above are shared primarily between the national republic guard, the national office of forest (ICNF), and municipalities. Inspection and enforcement are prioritised based on a high-risk parishes map, which covers 32% of the mainland territory (AGIF, 2025<sup>[10]</sup>). However, the country's heterogeneous conditions and constrained resources hamper the ability of some entities to effectively prioritise and target their efforts. Another key tool for guiding inspections is the complaint management system operated by the national republic guard, SOS Environment and Territory, which enables citizens to report violations of fuel management or land use regulations. While helpful, this tool does not account for risk severity or urgency, limiting its utility in resource prioritisation. Applying risk-based criteria, with tools such as risk-based scorecards or checklists to assess compliance and guide interventions have the potential to assess citizen complaints and guide interventions where they are most needed. For instance, in Italy, the region of Friuli Venezia Giulia uses environmental checklists to enhance inspection effectiveness (Box 4).

**Inspection and enforcement activities are also hampered by insufficient coordination and data sharing.** Data related to inspections and enforcement are collected independently by each responsible agency and remain fragmented, with limited interoperability and minimal feedback mechanisms across agencies. For example, municipal data on fuel management or burn authorisations are not integrated into a national platform. This lack of data integration weakens overall effectiveness of inspection and enforcement, as no formal data-sharing protocols currently exist to cover the full scope of relevant fuel management regulations and ensure coordination among the different fuel management approaches. One of the NAP's key projects aims to fill this gap by developing an interoperable platform to strengthen coordination and data exchange for wildfire prevention.

#### Box 4. Environmental checklists in Friuli Venezia Giulia, Italy

The Italian region Friuli Venezia Giulia introduced risk-based checklists and scorecards for inspections on wastewater treatment plants. Risk weights are assigned to classify facilities based on their risk level and clear practices were associated to the risk levels. The risk-based method was extended to other administrative processes as part of the environmental inspections reform. This includes the re-engineering of complex administrative processes by introducing digital platforms, an approach that was subsequently applied to health inspections. The digital platforms were adopted by other Italian regions. The toolkit includes risk-based business ratings, checklists and scorecards, interregional working groups, inspector training, non-conformity simulators, self-evaluation tools, relevant guidelines and manuals of good practices.

Source: (OECD, 2025<sup>[39]</sup>).

**Finally, existing sanctions and penalties have shown limited effectiveness, suggesting that regulations alone are insufficient to reduce fire risk.** Existing sanctions are neither gradual nor proportional. They do not account for repeated offences, offender profiles or the reasons for non-compliance, and rely mainly on financial penalties rather than tools such as warnings, notices, or public disclosure of inspection results. Sanctions are also not targeted to offenders' profile, incentives or motivations. As a result, many landowners prefer to internalise the costs of the fine, as non-compliance is often cheaper and easier than complying with existing regulations.

### 3.3. Looking ahead: further enhance regulatory effectiveness

**To better align wildfire prevention policies with local realities, existing regulations could be complemented with targeted policy instruments** that address persistent challenges such as fragmented land ownership, biomass waste collection, or limited technical or financial capacity. In this context, ensuring that interventions promote sustainable forest management and help conserve high-value ecosystems and their services can further support their effectiveness. Strengthening stakeholder engagement in regulatory design would help improve local ownership and implementation, for instance through institutionalised two-way communication mechanisms like multi-level coordination platforms that facilitate regular dialogue between national agencies, municipalities, and landowners.

**Building institutional capacity is also essential for fostering compliance.** This requires clear and accessible technical guidance, well-defined inspection goals, and sufficient staffing, training, and resources. Access to quality data and digital tools can enable risk-based decision-making, while exchanges of lessons learned and best practices between institutions can further strengthen capacity. Given limited resources, activities such as awareness-raising, inspection, and enforcement should be prioritised using risk-based criteria and tools such as compliance checklists or risk scorecards.

**Finally, the sanction framework could be refined to improve deterrence and prevention.** Differentiated penalties, ranging from warnings to prosecution depending on risk level and compliance history, would enhance fairness, while complementary positive incentives, including recognition or financial rewards for compliant practices, could encourage proactive wildfire risk reduction.

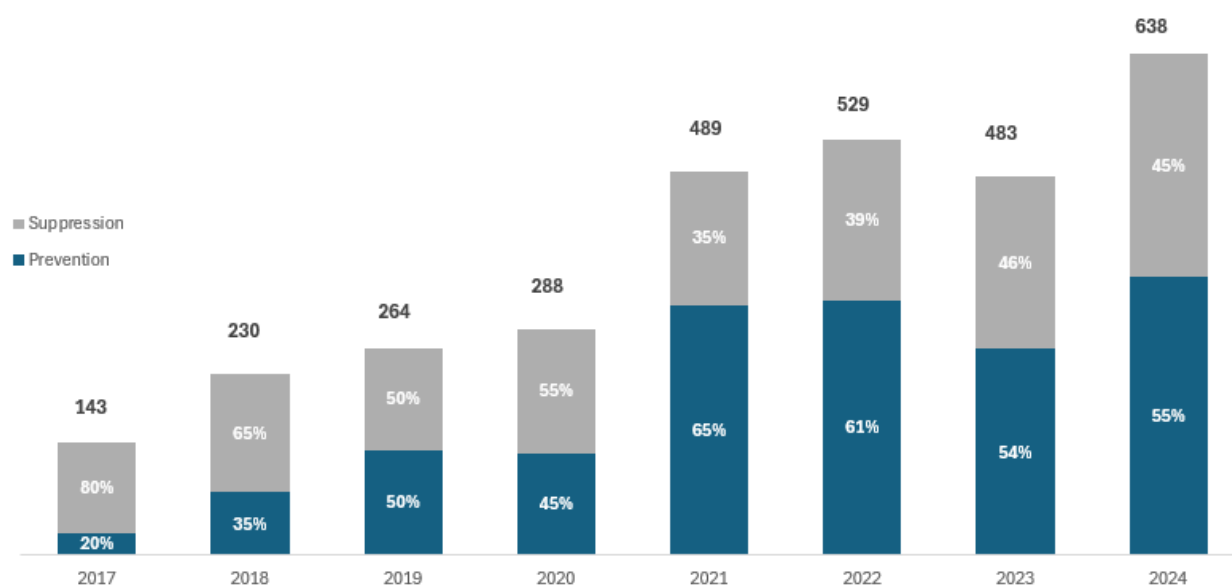
# 4 Strengthening the funding efficiency

## 4.1. The IRFMS has significantly improved the financing framework for wildfire management

**Funding for wildfire management has increased significantly since 2017, with a marked shift towards prevention.** The implementation of the NAP has driven average annual expenditures for wildfire management to EUR 534.7 million between 2021 and 2024. Spending peaked in 2024, with an estimated EUR 638 million allocated, which more than doubles the EUR 264 million spent in 2019, the NAP's baseline year for financial planning. While this level of funding approaches the estimated annual budget required to meet the NAP's objectives (EUR 647 million), it remains an exception rather than the norm in the past years. Since the NAP's adoption, prevention has consistently accounted for approximately 60% of total wildfire management expenditure (AGIF, 2025<sub>[10]</sub>).

Figure 4. Evolution of budget expenditures for fire management since 2017

EUR million



Source: Author's own, based on data from (AGIF, 2025<sub>[10]</sub>).

**Similarly, planning and monitoring wildfire management investments has improved, notably through mapping of funding sources and the introduction of budget tagging mechanisms.** The definition and approval of a provisional multi-annual budget to implement the IRFMS, along with the identification of key financing sources – such as European funds, the Environmental Fund, and the state

budget – have laid the groundwork for a more structured investment framework. The NAP itself has also played a transformative role by not only identifying funding needs for each project but also proposing mechanisms to reduce barriers to accessing fragmented funding, incentivise private sector engagement and enhance coordination across funding streams. Additionally, the introduction of a tag in the state budget since 2021 has enabled central entities to track wildfire-related expenditures under a unified budget code, improving both strategic oversight and transparency in resource allocation.

## 4.2. Information on recorded losses and future risk could enhance funding effectiveness

**Evidence on wildfire damages, losses, and exposure is essential to support a sound and cost-efficient financing strategy.** In Portugal, accounting for fire losses and damages<sup>1</sup> is a condition for obtaining government relief funds. In addition, estimating the potential economic impacts of wildfires *ex ante* is critical to inform cost-benefit analyses of risk prevention and reduction investments. This helps identify high-value investments and ensures the strategic allocation of financial resources. Such an *ex ante* estimation requires not only data on observed losses and damages, but also information on wildfire management expenditures to infer potential future costs. It also requires information about the value of exposed assets. International examples, such as CAL FIRE’s damage database and Victoria’s Rapid Risk Assessment Teams, highlight the importance of standardised classification, consistent reporting, and transparency (Box 5).

### Box 5. International experiences in collecting wildfire loss and damage data

**California (United States):** Since 2013, CAL FIRE’s Damage Inspection Program (DINS) has collected standardised data on structures damaged or destroyed by wildfires in California. Using a consistent inspection process and classification system, inspectors document the type, use, and damage level of structures whether within or just outside fire perimeters. This publicly accessible dataset supports emergency response, recovery planning, insurance claims, and research on wildfire impacts and resilience. Damage levels are codified based on estimated damage percentage: 1–10% is classified as Affected Damage; 10–25% as Minor Damage; 25–50% as Major Damage; 50–100% as Destroyed; and No Damage is used when the structure remains intact.

**Victoria (Australia):** In the State of Victoria, Australia, disaster damage and loss data are collected through a two-phase impact assessment process – initial and secondary impact assessments – coordinated under the Emergency Management Act 2013. These assessments inform response, relief, and long-term recovery planning, and feed into EM-Impact, a centralized platform for real-time data entry and visualisation. EM-Impact uses over 100 predefined metrics across recovery domains (social, economic, built, natural), with a Data Dictionary ensuring consistency, clarity, and data governance throughout the emergency management cycle.

Source: (CALFire, 2025<sup>[40]</sup>) and proceedings from the international peer-learning workshop “Strengthening Damage and Loss Data Collection” with wildfire management authorities from Victoria (Australia), held on 28<sup>th</sup> May 2025.

**Portugal faces several challenges in documenting losses and damages and evaluating future wildfire risk.** One major issue is the limited documentation and standardisation of data on wildfire-related damages and losses. The data collection process involves a wide range of stakeholders, including national authorities, regional directorates, infrastructure managers, municipalities, and private landowners. Yet, limited coordination and the lack of standardised practices hamper the comparability and centralisation of this information. In addition, there is a lack of a detailed inventory of exposed assets. To inform such an

inventory in California, satellite technology is used to map assets, in addition to information collected by inspection teams before fires occur (Box 5). Finally, gaps remain in assessing wildfire-related losses and damages, particularly in relation to ecosystem services.

**To address these challenges, a working group on wildfire damages and losses was created under Portugal's National Commission for Integrated Rural Fire Management** (Presidency of the Council of Ministers, 2021<sup>[27]</sup>). It involves the national civil protection, national forest office and regional authorities and aims to develop a standardised framework and digital platform for identifying, valuing, and reporting wildfire losses and damages across sectors. Its implementation should start in 2026, allowing to evaluate direct impacts. Further work is needed to evaluate the indirect impacts of fires.

### 4.3. Fiscal arrangements could better encourage wildfire prevention investments

**In Portugal, wildfire related contingent liabilities are financed through the regular contingency budget supplemented by international cooperation, or ad-hoc budgets in the case of extreme events.** Between 2015 and 2024, the average annual amount available in the contingency reserve was approximately EUR 510 million, which has been considered adequate so far to cover liabilities arising from wildfire events. Following the 2017 events, Portugal established a special one-time budget to cover implicit liabilities. This one-off budget, totalling almost EUR 190 million, was earmarked for various critical areas: compensation for deaths and serious injuries, restoration of affected areas, cost-sharing arrangements with municipalities to replace public equipment, support for the construction and rehabilitation of damaged housing, and the establishment of a credit line for municipalities to invest in management of secondary fuel break networks (Council of Ministers, 2023<sup>[41]</sup>) (Finance and Territorial Cohesion, 2024<sup>[42]</sup>) (Ministry of Agriculture and Food, 2023<sup>[43]</sup>).

**In the absence of clear cost-sharing arrangements for fire recovery, implicit contingent liabilities by the central government weaken incentives for risk prevention investments among private and subnational government actors.** Past arrangements with the national government lack explicit contractual commitments or clearly defined financial responsibilities for compensation of wildfire losses and restoration costs by subnational and private stakeholders. This can unintentionally discourage proactive fire risk reduction investment by creating expectations of default central government support for incurred losses and damages. Other countries have defined clear cost-sharing arrangements among levels of governments, such as Canada, where those differ depending on the type of support (e.g. response, recovery, and mitigation) but also consider regional risk levels. Hence, provinces and territories receive higher national co-financing rates for risk reduction investments in high-risk areas compared to those in lower-risk zones (Public Safety Canada, 2025<sup>[44]</sup>). Similarly, Australia has defined transparent, well-communicated assistance frameworks with clear eligibility and limits for financial support to private actors (Box 6).

**Growing fiscal constraints at the local level, coupled with limited strategic and financial support from the central government, has contributed to disincentivise fire-resilient land management.** Declining populations in rural areas have eroded municipal tax bases limiting the resources available for the implementation, inspection and enforcement of fuel management regulations. At the same time widespread land abandonment has led to even greater fuel accumulation and increased demand for such management. Hence, while municipal taxes represent 40% of the total revenues across mainland municipalities, this share is only 26% when analysing the fifty-five municipalities affected by the 2017 wildfires, which are in rural, abandoned areas (DGAL, 2019<sup>[45]</sup>). Fiscal equalisation mechanisms neither compensate wildfire-prone municipalities for the public goods they provide, such as carbon storage, water quality, biodiversity, and wildfire mitigation, nor for the relatively higher fire risk they are exposed to. Current transfers are not performance-based and focus mainly on protected areas, excluding many high-risk forested zones. As a result, municipalities that face opportunity costs from adhering to wildfire hazard maps

and safety regulations receive little financial reward in return. This creates a trade-off between generating tax revenue and investing in wildfire prevention and forest conservation. In turn, it can foster rent-seeking behaviours that undermine risk reduction, such as promoting high-risk economic activities or neglecting fire safety measures to attract development.

### Box 6. Examples of cost-sharing arrangements

**Canada’s cost-sharing arrangements between levels of governments:** Canada also uses a cost-sharing model, where the federal government reimburses provinces and territories between 50 and 90% of disaster costs through the Disaster Financial Assistance Arrangements (DFAA). Funding is structured into five streams covering response, recovery, resilient infrastructure, mitigation, and support for individuals and small businesses. Federal support is triggered when disaster costs exceed a per capita threshold. The DFAA also includes a “build back better” provision (+15% for resilience) and a disaster risk reduction incentive, offering up to 40% of the financial threshold for pre-disaster risk reduction efforts.

**Australia’s financial assistance for individuals affected by disasters:** When Australians are impacted by major disasters, two key financial supports are available from the government. The Australian Government Disaster Recovery Payment is a one-off, not means-tested and non-taxable lump sum of AUD 1,000 for eligible adults and AUD 400 for each eligible child. It is designed to help people who have been seriously affected – such as those who were injured, lost their home or major assets, or lost an immediate family member as a direct result of the disaster. In addition, the disaster recovery allowance provides short-term, taxable income support for up to 13 weeks to employees, small business owners, and farmers who have experienced a loss of income due to a disaster.

Source: (Public Safety Canada, 2025<sup>[44]</sup>) (National Emergency Management Agency, 2025<sup>[46]</sup>).

**The absence of market-based incentives such as payment for ecosystem services for private landowners who own 97% of Portugal’s forests further discourages private investments in wildfire resilience.** This increases the financial burden on municipalities and amplifies fiscal risks. Efforts to establish a policy for the provision and compensation of ecosystem services in rural areas in Portugal are, in fact, underway (Santos et al., 2019<sup>[47]</sup>). Initially, the policy will be implemented in two protected areas – the *Tejo* International Natural Park and the *Serra do Açor* Protected Landscape – where landowners who engage in production and conservation activities that promote greater territorial resilience will be compensated for the net income loss that would have been obtained from the most profitable land use allowed by the Regional Forest Management Plans (*Programa Regional de Ordenamento Florestal*, PROF). Revisions of the PROF may be necessary to ensure the proper development of the policy (Independent Technical Observatory, 2021<sup>[14]</sup>). In Spain, these schemes have become increasingly adopted to support wildfire prevention (Box 7).

### Box 7. Examples of Payment for Ecosystem Services schemes in Spain

**Catalonia:** Fire Flocks (*Ramats de Foc*) is a wildfire prevention initiative in Catalonia that promotes targeted grazing in high-risk areas to reduce fuel loads. In coordination with the support group for forest actions of the regional firefighters, strategic zones are mapped where grazing supports fire control. Shepherds are compensated €140 per hectare per year in strategic areas and €70 per hectare per year in complementary zones, with funding from local authorities and private partners like BBVA, a Spanish multinational financial services company.

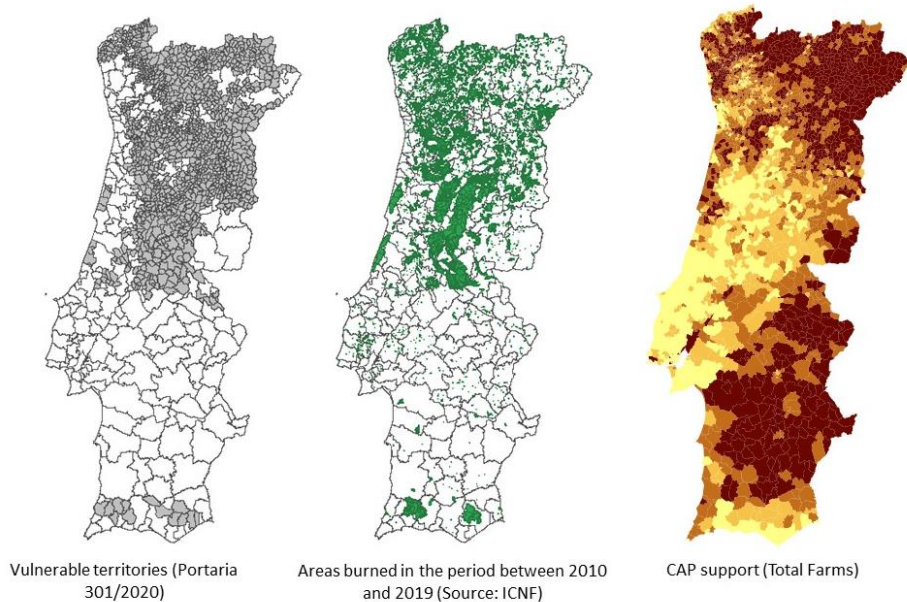
**Andalusia:** The RAPCA programme (*Red de Áreas Pasto-Cortafuegos de Andalucía*), launched in 2005 by the Government of Andalusia, integrates extensive grazing into wildfire prevention. It engages 220 shepherds to manage nearly 6,000 hectares of firebreaks on public land, reducing biomass and fire risk while promoting land stewardship. Operated through annual contracts or pasture rights, RAPCA is supported by technical staff from the regional environment agency. Participants receive a fixed payment of €300 and variable compensation between €42 and €90 per hectare, depending on terrain. The programme is one of Spain's most established models for using grazing in fire risk management.

Source: (Ascoli et al., 2023<sup>[48]</sup>).

**Finally, fragmented funding sources, weak coordination, and limited expenditure tracking hinder effective public finance management and evaluation.** Sources for wildfire funding under the NAP are spread across multiple programmes and institutions without a centralised mechanism to coordinate, prioritise, or evaluate spending. This institutional fragmentation limits the ability to align funding with strategic objectives, creating inefficiencies and gaps in implementation. For instance, despite substantial EU Common Agriculture Policy (CAP) funding for forest development and improving economic competitiveness of the forestry sector, resources have been disproportionately directed toward the country's most prosperous regions, neglecting more vulnerable areas with greater forest cover and higher wildfire risk (Viegas, Batista and Cordovil, 2023<sup>[49]</sup>) (Figure 5). In addition, subnational governments' expenditures on wildfire management are difficult to monitor, as they are often financed through broader thematic programmes – such as EU regional agricultural funds – where wildfire prevention is not the primary objective. Although these expenditures may contribute to implementing the NAP, they are not recorded as wildfire-related due to the absence of dedicated budget tags. This lack of tagging hampers effective monitoring and evaluation and limits the ability to allocate resources where they are most needed. The fragmentation challenge is compounded by the decreased reliance on the central government budget to fund wildfire management initiatives – falling from 70% of total expenditures in the baseline year to just over 50% in recent years (AGIF, 2025<sup>[10]</sup>) – as the system shifts toward more diverse funding sources.

### Figure 5. Comparison of vulnerable territories, burned areas and Common Agriculture Policy support

Most of the CAP resources have been allocated to the least vulnerable territories



Source: (Viegas, Batista and Cordovil, 2023<sup>[49]</sup>).

#### 4.4. Rural property taxes disincentivise private investment in risk reduction

**Portugal's rural areas face significant fiscal and structural disincentives that hinder land management and wildfire risk reduction.** High land fragmentation – driven by undivided inheritance, unclear property titles, and costly legal procedures – makes many rural properties economically unviable and prone to abandonment, especially in the centre and north regions (AGIF, 2020<sup>[11]</sup>). This situation is exacerbated by the rural property tax system<sup>2</sup>, which indirectly penalises active land management by taxing productive land more heavily and often letting abandoned plots go untaxed. As a result, landowners who maintain their properties face higher costs and lack incentives to manage fuel loads or formally register their land.

**Additionally, the Property Transfer Tax (IMT) acts as a disincentive for rural land transactions that could promote more effective land management.** By generating revenue primarily from land sales linked to construction, the tax has unintentionally encouraged development in wildfire-prone areas. Although the 2025 state budget introduces provisions for tax exemptions related to rural land consolidation – including an expanded scope covering mixed or residential-use properties with a predominantly rural function – these exemptions remain temporary. The lack of long-term fiscal incentives for land aggregation contributes to the persistence of numerous small, unproductive plots, undermining the NAP's objective to enhance the attractiveness and viability of rural areas (Florestas.pt, 2022<sup>[50]</sup>). In France, a Forest Investment Tax Incentive Scheme (DEFI) offers income tax credits for land consolidation, eligible forest management activities, or wildfire insurance premiums – none of which are currently available in Portugal, although landowners who voluntarily consolidate adjacent rural parcels may benefit from Property Transfer Tax exemptions.

## 4.5. Wildfire insurance uptake is low

**While standard property insurance in Portugal typically includes fire coverage, uptake remains low in high-risk rural areas.** In 2022, about 55% of households had property insurance covering fire risk, though take-up is often significantly lower in districts exposed to high or very high wildfire risk (ASF, 2024<sup>[51]</sup>) (ASF, 2024<sup>[52]</sup>). Limited coverage reflects both low demand and restricted availability, as insurers are hesitant to cover older buildings made with flammable materials or located near dense vegetation (Almeida et al., 2021<sup>[53]</sup>). In the United States, state-level programs help ensure insurance availability for properties with high wildfire risk and limited private coverage. The Fair Access to Insurance Requirements (FAIR) plans are public-private schemes providing basic coverage for high-risk properties, with minimal direct government funding. Premiums under FAIR plans are higher than standard market rates but generally lower than what private insurers would charge for similar risks (National Association of Insurance Commissioners, 2025<sup>[54]</sup>). These plans typically purchase reinsurance and can levy assessments on insurers if claims exceed capacity. Community-based insurance offers another model, organising coverage at the community level rather than individually. A municipal or district government may purchase insurance for the entire community, using funds collected from members to pay premiums, and distributes payouts in case of loss (Box 8). Variations include the community acting as a facilitator, helping members access coverage, or as an aggregator, collecting premiums on behalf of insurers while claims remain the insurer's responsibility. Such approaches can expand access, reduce individual costs, and strengthen resilience in high-risk rural areas.

### Box 8. Community-based catastrophe insurance

Community-based insurance provides a mechanism to organise insurance coverage at the community-level, rather than at the level of individual households or businesses. The community-based insurance coverage can be designed to make payments based on the occurrence of a wildfire in the covered community (i.e. a parametric trigger) which should reduce the cost of coverage.

Pilot programmes in the United States illustrate this model: in New York City, a housing-focused organisation can receive up to USD 1.1 million after major precipitation to provide emergency grants to residents; in Isleton, California, a municipal authority can access up to USD 2.5 million in parametric flood coverage, with funds channelled through a regional body to support affected residents. This approach enhances affordability, speeds up recovery, and enables collective risk management.

Source: (CDI, 2024<sup>[55]</sup>) (Insurance for Good, 2025<sup>[56]</sup>) (Becker, 2023<sup>[57]</sup>).

**Insurance for agriculture, horticulture, and forestry assets, including protection against fire-related losses, exists but remains underutilised.** The government provides premium subsidies for certain agricultural products, such as crops and vineyards, and has established a loss-sharing mechanism to help insurers manage extreme production losses (IFAP, 2016<sup>[58]</sup>). Despite these measures, insurance penetration is low: only about 6% of the insurable market value of gross crop production is covered by subsidised insurance (Aggarwal, 2023<sup>[59]</sup>) (Swiss Re Institute, 2023<sup>[60]</sup>). Coverage for forestry assets is even more limited, as no subsidies or cost-sharing arrangements are available. This is particularly pronounced among small producers in the Centre and North, where insurance costs often exceed the potential value of forest products (Berenguer et al., 2023<sup>[61]</sup>). Low insurance uptake among households, agriculture, and forestry in high-risk areas constrains the sector's role in wildfire risk reduction and climate adaptation. Expanding cost-sharing arrangements could increase support, either through higher government contributions to shared losses or by lowering the threshold for triggering these arrangements. However, greater government responsibility could create fiscal risks and weaken insurers' underwriting

discipline, potentially fostering moral hazard. In some countries, forestry losses are integrated into agricultural insurance programs and loss-sharing mechanisms. For example, Spain's agricultural insurance program covers forestry products (Agroseguros, n.d.<sup>[62]</sup>) and benefits from reinsurance via the state-owned *Consortio de Compensación* (CCS, n.d.<sup>[63]</sup>), illustrating a model where broader coverage and shared risk management can enhance resilience.

#### 4.6. Poor coordination and uneven local capacity hinder access to fragmented funding resources

**Accessing funding for wildfire prevention and rural resilience in Portugal is hampered by a fragmented, complex system and inefficient tendering.** Key institutions such as AGIF and CCDRs are insufficiently involved in designing funding calls, resulting in overly complex or poorly adapted requirements. This disadvantages municipalities and associations with limited administrative capacity. European thematic and regional funding processes often fail to reflect local needs, favouring well-resourced applicants over those with greater need. Responsibilities are scattered across multiple funding streams (e.g. Resilience, Cohesion, Agriculture Funds), each with distinct procedures and priorities. This dispersion creates confusion and limits access, especially for integrated projects linking fire prevention with broader rural development.

**While Portugal has worked towards a multi-fund approach, gaps remain in achieving a clear, one-stop-shop funding model.** Access to wildfire management funding has improved through several initiatives led by the development and cohesion agency under Portugal 2030. These include the funds portal (*Portal dos Fundos*), which centralises information on calls, news, and application procedures; the funds desk (*Balcão dos Fundos*), a single-access point where users can apply and track submissions with one ID; and the funds hotline (*Linha dos Fundos*), a call centre providing applicant support. While these mechanisms streamline access, they do not resolve the structural issue of siloed funding calls. Persistent disparities in local technical capacity, especially in low-density and fire-prone areas, further hinder municipalities' ability to access and manage funds, perpetuating regional inequalities. In response, AGIF established a permanent working group in 2024 to align investment priorities and improve coordination between ministries, agencies, and funding instruments. This platform marks a positive step towards a more coherent funding strategy but remains at an early stage.

#### 4.7. Looking ahead, defining a comprehensive funding strategy can enhance efficiency

**Portugal's growing exposure to wildfires underscores the need for a more integrated and transparent financing strategy for wildfire management.** To make wildfire funding more effective and sustainable, data on losses, damages, and evaluation of future risks is needed. Reliable data are essential to guide funding priorities, design cost-sharing mechanisms, and align financial instruments with the country's evolving risk profile.

**A second priority is to improve public finance management to incentivise risk reduction and mitigate future financial losses.** This includes defining clear *ex post* cost-sharing mechanisms across levels of government and between public and private actors. These mechanisms should reflect regional disparities in land ownership, economic viability, and administrative capacity, ensuring adequate support for the most vulnerable municipalities. At the same time, fiscal equalisation and market-based solutions can help wildfire-prone municipalities strengthen their capacity for risk reduction. Adjusting the Local Finance Law or introducing performance-based grants would reward prevention and resilience outcomes. Complementary market-based tools, such as Payments for Ecosystem Services (PES), could further

incentivise fire-reducing land practices, recognising the environmental value of rural landscapes and supporting ecosystem conservation objectives.

**A more systematic use of cost-benefit analysis (CBA) in project design and tenders would improve the targeting of investments.** By integrating CBA and fire risk assessments, Portugal can ensure that public spending (beyond EU-funded programmes) prioritises prevention measures in the most fire-prone territories. In parallel, integrating fiscal risk into national budget planning can help absorb residual financial shocks. Establishing climate fiscal buffers with clear governance, costing, and allocation rules would enable faster and more transparent post-fire recovery.

**Public finance management could also be improved through better financial tagging and tracking.** Introducing sub-tags for prevention, suppression, and recovery, and linking these to the National Action Programme (NAP) reporting – based on funding authorities rather than beneficiaries – would enhance transparency, accountability, and strategic decision-making.

**Rethinking fiscal incentives for private stakeholders could promote sustainable land management and further reduce wildfire risk.** Reforming rural property taxation would help eliminate disincentives for active land use and prevention. Aligning land valuation with productivity and offering tax breaks for properties meeting fire prevention standards would encourage stewardship. In parallel, remunerating the ecosystem services provided by landscape managers such as farmers or herders can effectively support the maintenance of agroforestry mosaic landscapes and contribute to wildfire resilience in vulnerable territories. Sustaining and expanding transaction tax exemptions under the 2025 fiscal reform could also accelerate land consolidation, reducing fuel loads and improving landscape resilience. Expanding the scope of the Legal Framework for Land Structuring would reinforce these efforts.

**Improving insurance coverage in high-risk areas can also strengthen financial resilience.** Portugal could explore Public-Private Insurance Programmes, risk pooling across multiple hazards, or community-based insurance schemes managed locally. Expanding agricultural and forestry insurance, with tax incentives or state-backed reinsurance, would help close existing coverage gaps. Forest owner associations could play a key role by linking insurance premiums to risk-reduction actions such as vegetation management.

**Finally, better coordination and information sharing are needed to overcome funding fragmentation.** AGIF could play a stronger role in the design of tenders and investment calls, ensuring alignment with NAP priorities. Creating a single online platform to consolidate all wildfire-related funding opportunities would further improve accessibility. Strengthening the existing wildfire working group and maintaining coordination beyond PRR funding cycles will be essential to align PEPAC, InvestEU, and other instruments with Portugal's long-term wildfire resilience objectives.

# 5 Anchoring decisions in evidence

**The IRFMS prioritises evidence-based decision-making.** By mandating probabilistic risk assessments, establishing detailed hazard and risk maps, and developing performance indicators tied to project and strategic outcomes, the NAP ensures actions are guided by robust data. Through regular progress reports, barometers, and lessons learned processes, the NAP promotes iterative learning and continuous improvement, solidifying the role of evidence-based practices.

## 5.1. Wildfire hazard assessment has significantly improved

**Portugal reviewed its national fire hazard map in 2022 to inform prevention measures.** Produced by the national forest office (ICNF), the map provides an overview of wildfire likelihood and potential severity across mainland Portugal. It combines data on rural land cover, slope, elevation, and historical wildfire occurrences to classify the national territory into five hazard levels (Presidency of the Council of Ministers, 2021<sup>[27]</sup>) (Figure 6).

**Portugal’s recent methodological updates in wildfire hazard mapping enhances its predictive accuracy.** An earlier hazard map classified mainland Portugal using arbitrary quantiles, assigning equal land portions to each hazard class without reflecting actual fire occurrence (Ministry of Agriculture, 2012<sup>[64]</sup>). The 2022 hazard map adopts a new methodology, considering terrain and vegetation, including fuel accumulation and combining it with fire probability derived from decades of historical records. Hazard levels are now defined using performance-based thresholds, ensuring that the “high” and “very high” classes cover most historically burned areas while representing a smaller share of the territory (ICNF, 2020<sup>[65]</sup>). This shift makes the classification more aligned with actual wildfire patterns, increasing its value for prevention and planning (Oliveira S, 2021<sup>[66]</sup>).

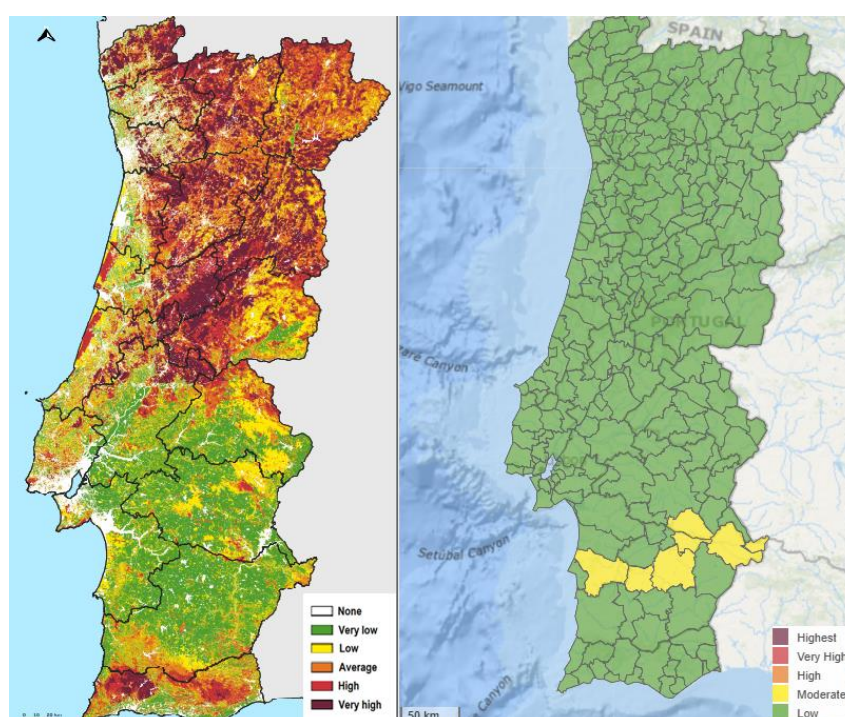
**The other key tool to assess wildfire hazard in Portugal is the rural fire danger map.** This map uses the same danger categories of the national hazard map and has a resolution of one kilometre. By integrating near-real-time meteorological information with other hazard information, it provides a snapshot of likely daily hazard levels and is the main tool to inform short-term risk reduction and emergency preparedness and response decisions. For example, it is used to determine daily bans and restrictions on potentially hazardous activities in rural areas – such as for example waste burning, the use of barbecues, the ignition of bonfires, and the use of forest machinery – and to inform the allocation of resources for fire monitoring and firefighting (Presidency of the Council of Ministers, 2022<sup>[67]</sup>) (IPMA, 2025<sup>[68]</sup>) (Figure 6).

**Beyond these maps, Portugal has developed a wide set of advanced technologies and analytical systems to strengthen fire pre-suppression and suppression.** These include the establishment of a dedicated decision-support unit to analyse rural fire behaviour, forecast its evolution, and guide tactical priorities (*Núcleo de Apoio à Decisão – Análise de Incêndios Rurais*, NAD-AIR); a monitoring platform providing real-time geographic and operational data; the expansion of the video-surveillance network and improved satellite capability; the systematic use of Copernicus and other satellite data for fire mapping and tracking; and a National Fire Progression Database to support evidence-based operations. Together, these developments significantly improve situational awareness, operational readiness, and decision-making during fire events (AGIF, 2025<sup>[10]</sup>).

## 5.2. Data gaps make comprehensive fire risk assessment difficult

**While hazard assessment is essential to assess fire risks, relevant data are limited.** Beyond appreciating the hazard, risk assessment allows to integrate information of exposure and vulnerability of social, economic and environmental assets. Despite progress in developing a digital land registry, Portugal's national cadastral system remains largely incomplete,<sup>3</sup> limiting the creation of a comprehensive inventory of assets exposed to wildfire risk. Public authorities also face challenges obtaining information on asset values from private owners, hindering accurate risk and potential loss estimations. While detailed demographic data on population density, age, and other vulnerability indicators exist, they are not fully used to feed into wildfire risk assessments. Some intermunicipal communities have developed partial risk maps combining the national hazard map with local data on vegetation types or infrastructure locations. However, these maps are rarely comparable, and infrequent updates limit their reliability. The national forest agency (ICNF) is working to create a nationwide wildfire risk map that integrates asset exposure, economic value, and vulnerability into existing hazard assessments (OECD, 2023<sup>[5]</sup>).

**Figure 6. The National Wildfire Hazard Map and the Rural Fire Danger Map**



Note: The National Wildfire Hazard Map elaborated in 2022 is shown on the left, while the Rural Fire Danger Map for 12 November 2025 is shown on the right. These maps represent different dimensions of the same hazard: the left-hand map reflects structural risk, while the right-hand one provides a daily snapshot of expected fire danger levels.

Source: Adapted from (ICNF, 2022<sup>[69]</sup>) and (IPMA, 2025<sup>[70]</sup>).

**Currently, climate change projections are not integrated in national wildfire hazard maps.** Data on projected wildfire hazard levels under different climate scenarios are available, including projected number of days with a significant fire hazard index (OECD, 2023<sup>[5]</sup>) (IPMA and University of Lisbon, 2025<sup>[71]</sup>). The Portuguese Environmental Agency has already conducted work to project forest fire hazards under the national roadmap for adaptation 2100. This includes tools like the enhanced Fire Weather Index and downscaled climate data that can inform fire hazard maps and help assess projected fire risks when combined with data on exposure and vulnerability (Portuguese Environment Agency, 2024<sup>[72]</sup>).

### 5.3. The national hazard map has limited acceptance among stakeholders

**The national hazard map is intended to guide most fire prevention regulations and activities, but it has been criticised.** This map helps identify priority areas for fire risk reduction efforts, including fuel management obligations or building permitting requirements, besides being used to inform inspections, surveillance activities, and awareness-raising campaigns. However, local stakeholders note that the map lacks sufficient detail to effectively prioritise local actions (Tedim et al., 2023<sup>[33]</sup>). This limitation has contributed to delays in the adoption of municipal fire management plans, which must be based on the national map for planning and prioritisation purposes (AGIF, 2023<sup>[30]</sup>) (AGIF, 2025<sup>[10]</sup>). Although subnational authorities in Portugal have some flexibility to assess local fire risks and adapt regulations accordingly, this flexibility is rarely used in practice. In contrast, other countries have developed tools to enable municipalities to assess wildfire risk at a finer spatial scale, as seen in Chile (Box 9). Collaborative approaches have also proven effective, such as local natural risk prevention plans in France (Box 3) and in Victoria, Australia, where local risk maps are updated twice yearly to reflect changes in vulnerability.

**While municipalities were initially required to integrate the national wildfire hazard map into their spatial planning instruments regardless of their wildfire hazard level (OECD, 2023<sup>[6]</sup>), a 2023 amendment to Decree-Law No. 82/2021 removed this obligation.** In practice, today, the integration of wildfire hazard considerations into local spatial planning now takes place through the designation of priority prevention and safety areas (*Áreas Prioritárias de Prevenção e Segurança*, APPS). These areas are approved at the sub-regional level, with the direct involvement of municipalities.

#### Box 9. Chile's climate risk assessment platform

Chile's Climate Risk Atlas (ARClim) is a national platform that maps current and projected climate threats and assesses 80 climate risks at the communal level under the IPCC's worst-case scenario. It is being expanded into a comprehensive adaptation information system, integrating indicators on subnational and sectoral adaptation progress, as well as links to research and citizen engagement platforms to support informed decision-making. Chile is developing subnational indicators for use in regional adaptation plans and environmental assessments. ARClim includes impact indicators – such as effects on transmission lines or crop productivity – and aims to build a cross-sectoral climate risk framework to better understand interdependencies and prevent maladaptation. It identifies 36 different climate hazards, for a baseline period of 1980–2010 and future hazard projections for 2035–2065, under a RCP8.5 scenario. Fires are not considered as projected climate hazard but as risks that will be suffered by specific sectors. The projected risks suggest a strong correlation between an increase in temperature and fire spread. Other drivers such as vegetation cover or latitude are used to forecast the sensitivity to fires, backed by machine learning algorithms.

Note: The extract of ARClim shows the hazard level, exposure and vulnerability assessment for various Chilean cities (forward-looking risk index on the right), taking into account dimensions such as distance to a road, forest cover, population density or elevation.

### 5.4. The IRFMS strengthened implementation monitoring and impact assessment

**The implementation of the NAP has been monitored since its inception.** The objective is to monitor progress in fund allocation as well as in the implementation of measures defined in the NAP. Monitoring and evaluation are carried out quarterly, with results consolidated annually by AGIF in collaboration with all relevant stakeholders (Government of Portugal, 2018<sup>[73]</sup>). An interim evaluation is scheduled for 2025 to assess the NAPs overall relevance, effectiveness, efficiency, and sustainability, allowing for adjustments

to be made before 2030. The NAP monitoring system is based on a coordinated approach, with a dedicated online reporting platform, clear indicator tracking, annual reporting and scheduled evaluations. This shift creates a transparent, interoperable and evidence-based monitoring culture, enabling better planning, prioritisation and accountability across all levels of fire management.

**In addition, opinion surveys and lessons learned processes help improve performance management.** AGIF conducted two national barometers in 2019 and 2021 to assess public perceptions of wildfire management and the effectiveness of awareness campaigns (GfK, 2021<sup>[74]</sup>). Overall, citizens acknowledged the importance of these campaigns, particularly for understanding preventive measures and improving wildfire management (60%), and for feeling more involved in fire management compared to previous years (50%). While these surveys help monitor awareness, they do not necessarily provide evidence on which methods are most effective to communicate about fire risk and conducive behaviour to reduce risks (AGIF, 2021<sup>[75]</sup>). In parallel, AGIF's collaborative lessons-learned process allows agencies to share information, analyse activities, and implement improvements. Since 2018, two such exercises were conducted after major fires, highlighting operational gaps in resource allocation, fuel management, and local response capacity. These resulted in 11 lessons and 29 corrective actions, each with clear responsibilities and timelines.

## 5.5. The quality and completeness of the monitoring information could be further improved

**Some NAP indicators lack clear definitions and ambition, limiting their usefulness to evaluating progress.** Some NAP indicators being collected look at the share of “strategic decisions” that are risk-based (target: 100%) or the share of the population adopting best practices (target: 70), without there being a definition of what constitutes either “strategic decisions” or “best practices.” This makes it difficult to ensure consistent measurement across the country and raises questions about the reliability of the evidence produced to demonstrate improved risk management. Moreover, not all national targets established to achieve wildfire resilience represent an ambitious shift such as limiting the share of fires exceeding 500 hectares to 0.3% of total fires. Historical data shows that only two years between 2006 and 2018 exceeded this level, with an average of 0.18% between 2012 and 2023 (AGIF, 2025<sup>[10]</sup>). In contrast, the State of Victoria (Australia) sets a more outcome-oriented target: maintaining fuel-driven bushfire risk at or below 70% of maximum potential levels – defined by worst-case fuel build-up and extreme fire conditions (Forest Fire Danger Index of 130). Tracking this indicator can provide a more meaningful measure of wildfire risk reduction (Victoria State Government, 2022<sup>[76]</sup>).

**NAP indicators fall short of assessing impact.** Several NAP's outcome indicators – such as “managing 1.2 million hectares of fuel until 2030” – reflect outputs more than outcomes in terms of actual wildfire risk reduction. Assessing the effectiveness of fuel management requires *ex post* analysis of how interventions influence fire behaviour, as done in California's fuels treatment effectiveness dashboard (Box 10). Similarly, AGIF tracks outreach of awareness raising campaigns (e.g. number of people or municipalities reached) but not how this translates into behavioural change (AGIF, 2023<sup>[30]</sup>). Although it reports that 35% of the population has adopted best practices, the underlying methodology is unclear (AGIF, 2025<sup>[10]</sup>). Finally, some indicators aim to measure project impacts that cannot be directly attributed to the projects themselves – for example, rural development initiatives often neglect key social drivers like access to services. As a result, observed outcomes may not reflect the actual effectiveness of the projects, and thus cannot provide robust evidence for continuous improvement.

**Finally, evidence produced by the lessons learned process could more strongly foster continuous improvement, beyond for operational management of fires.** The lessons-learned process remains largely focused on post-fire response, with limited engagement from local authorities and few evaluations of prevention measures. Additionally, implementing corrective actions has proven challenging, as they

often require reallocating resources or changing established practices, which can face institutional resistance. Consequently, although the process is useful, it has not driven systemic change.

#### Box 10. Assessing effectiveness of fuel management: the case of California (United States)

California's Fuels Treatment Effectiveness Reporting (FTER) Dashboard is an interactive tool developed by CAL FIRE to evaluate and visualise the impact of vegetation management treatments on wildfire behaviour across California. It compiles data from Fuels Treatment Effectiveness Reports, which assess how various fuel reduction activities – such as prescribed burns, mechanical thinning, and fuel breaks – affect fire dynamics, including spread rate and intensity *ex post*. These reports also document how treatments assist in fire containment, provide access for firefighting personnel, and protect life, property, and natural resources. The dashboard integrates information from CAL FIRE's incident database (CAL FIRS) and the CalMAPPER geospatial system to identify wildfires that occur within a quarter mile of fuel treatment areas. When such proximity is detected, local CAL FIRE units are required to complete a survey within seven days of the fire being controlled, detailing the treatment's effectiveness. This systematic approach ensures that the benefits of fuel treatments are documented and analysed, providing valuable insights for future wildfire mitigation strategies.

Source: [Impact Details | Fuels Treatment Effectiveness Reporting Dashboard](#).

### 5.6. Further efforts are needed to anchor decision-making in evidence

**To enhance wildfire management, additional data are needed.** This includes a comprehensive inventory of exposed assets, detailed vulnerability assessments using up-to-date spatial and socio-economic data, infrastructure characteristics, critical facilities, and climate projections to evaluate future risks. Improved public access to data and digital tools can strengthen risk assessment. Collaborative, multi-level approaches engaging local authorities, scientists, citizens, and forest associations in co-developing risk maps and land-use planning foster shared understanding and local buy-in.

**In addition, progress could be better monitored using SMART (specific, measurable, achievable, relevant, and time-bound) indicators** under the NAP, with clear responsibilities for data collection and attention to data reliability and comparability. Finally, establishing a more regular lessons-learned process, led by AGIF, would evaluate the Integrated Rural Fire Management System, identify gaps, and guide continuous improvement.

## Annex A. Stakeholder mapping

**Table A A.1. Key roles and responsibilities in Portugal's process chain of wildfire management from the planning stage to post-fire recovery**

	Planning	Preparation	Prevention	Pre-suppression	Suppression and relief	Post-fire
Agency for the Integrated Management of Rural Fires (AGIF)	x	x	x			x
National Authority for Emergency and Civil Protection (ANEPC)	x	x	x	x	x	x
Institute for Nature Conservation and Forests (ICNF)	x	x	x	x	x	x
National Republican Guard (GNR)	x		x	x		
Commissions for Regional Coordination and Development (CCDR)	x		x			x
Intermunicipal Communities (CIM)	x		x			x
Ministry of Finance (MF)	x					x
Ministry of Agriculture and Fisheries	x	x	x			x

Note: The stakeholders in this table are those, whose role has changed since 2017. Mainland Portugal relies on three subnational levels of government: the regional level represented by five Regional Development and Coordination Committees (CCDRs), the sub-regional level represented by 23 Intermunicipal Communities (CIMs), and the municipal level represented by 278 municipalities.

Source: Author's own, based on (AGIF, 2020<sup>[11]</sup>).

## Annex B. Stakeholder consultations

The OECD consulted Portuguese stakeholders on several occasions over the project period 2024-2025. Findings and recommendations of this report reflect discussions and inputs received during national and regional focus group meetings. The following institutions were consulted:

### National stakeholders

<ul style="list-style-type: none"> <li>• Agency for the Integrated Management of Rural Fires</li> <li>• Ministry of Finance</li> <li>• Ministry of Agriculture and Fisheries</li> <li>• Court of Accounts</li> <li>• Agency for Development and Cohesion</li> <li>• Portuguese Insurance and Pension Funds Supervisory Authority</li> <li>• Institute for Nature Conservation and Forests (ICNF)</li> <li>• Portuguese Insurance Association</li> <li>• Environmental Protection Agency</li> </ul>	<ul style="list-style-type: none"> <li>• National Agency for Civil Protection (ANEPC)</li> <li>• Environmental Fund</li> <li>• Judiciary Police</li> <li>• Infraestruturas de Portugal</li> <li>• League of Firefighters</li> <li>• Ministry of Interior</li> <li>• Ministry of Environment</li> <li>• Ministry of Economy and Territorial Cohesion</li> <li>• General Directory for Territories (DGT)</li> <li>• National Meteorological Agency (IPMA)</li> <li>• National Republican Guard (GNR)</li> </ul>
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### Regional and municipal authorities

<ul style="list-style-type: none"> <li>• Regional Coordination and Development Commission Centro</li> <li>• Regional Coordination and Development Commission North</li> <li>• Regional Coordination and Development Commission Algarve</li> </ul>	<ul style="list-style-type: none"> <li>• CIM LVT Porto</li> <li>• CIM Viseu Dão Lafoes</li> <li>• National municipalities association representatives</li> <li>• Regional representatives from ICNF, ANEPC, GNR, Baladi of the various regions</li> </ul>
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### Research and academia

- ForestWISE
- ADAI
- Center for Environmental and Sustainability Research

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## Notes

<sup>1</sup> Damage refers to the replacement value of totally or partially destroyed physical assets considering the same standards that prevailed prior to the event. Losses refer to the foregone economic flows resulting from the temporary absence of the damaged assets and/or due to any other disruption of economic activity caused by the disaster (GFDRR, 2010<sup>[77]</sup>; OECD/The World Bank, 2019<sup>[78]</sup>).

<sup>2</sup> Municipal taxes are levied on property (IMI), property transactions (IMT), and vehicles (IUC). Additionally, local authorities collect a surtax on corporate profits, known as *Derrama*, and can impose fines, fees and specific taxes. On average, the Municipal Property Tax represents the largest share of tax revenue in the country.

<sup>3</sup> In 2024, the Digital Land Registry platform covered approximately 58% of mainland Portugal (AGIF, 2025<sup>[10]</sup>).


# Towards an integrated rural fire management framework in Portugal

This policy paper brings together insights and recommendations from a two-year review of Portugal's wildfire management reforms following the extreme fires of 2017. The review focused on the implementation of Portugal's Integrated Rural Fire Management System, including its regulatory frameworks, funding arrangements, institutional co-ordination, and the use of evidence to support wildfire management decisions. Drawing on lessons from the severe 2024 and 2025 fire seasons and international practices, the paper identifies options to further enhance the effectiveness of these reforms and provides guidance to continue strengthening Portugal's wildfire management.

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