STUDY

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European Parliament

Forest Fires of Summer 2022

Lessons to Draw from the Cohesion Policy Response

Regional Development

Policy Department for Structural and Cohesion Policies
Directorate-General for Internal Policies
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RESEARCH FOR REGI COMMITTEE

Forest Fires of Summer 2022

Lessons to Draw from the Cohesion Policy Response

Abstract
Europe is grappling with increased wildfires due to climate extremes, with protected areas especially vulnerable and fires in contaminated lands presenting distinctive challenges. European response mechanisms are constructive, but they require enhanced comprehensive management strategies, including community involvement and preventive measures. The Cohesion Policy does fund aids against wildfires, yet issues with governance, focus, and funds distribution limit its effectiveness. More emphasis on prevention, improved coordination, and integrated funding access, alongside enhanced information exchange and alignment with global initiatives, is crucial.

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DISCLAIMER

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LIST OF ABBREVIATIONS

AGIF	Portuguese Agency for Integrated Rural Fire Management
AGRI	Agriculture and Rural Development Committee
ARDF	Agricultural Regional Development Fund
BSNP	Bohemia Switzerland National Park – Czech Republic
CAP	Common Agricultural Policy
CF	Cohesion Funds
DGSCGC	Direction générale de la sécurité civile et de la gestion des crises - France
EAFRD	European Agricultural Fund for Rural Development
EC	European Commission
ECHO	European Civil Protection and Humanitarian Aid Operations
ECMWF	European Centre for Medium-Range Weather Forecasts
EFFIS	European Forest Fire Information System
EP	European Parliament
EUSF	European Union Solidarity Fund
ERCC	Emergency Response Coordination Center
ERDF	European Regional Development Fund
FAO	Food and Agriculture Organisation of the United Nations
FWI	Fire Weather Index
GDP	Gross Domestic Product
GFFF	EU- Module: Ground Forest Fire Fighting
GFFF-V	EU- Module: Ground Forest Fire Fighting using Vehicles
GFMC	Global Fire Monitoring Center
GWIS	Global Wildfire Information System

HZSCR	Hasičský záchranný sbor České republiky - Czech Republic
IFM	Integrated Fire Management
Interreg	European Territorial Cooperation Programme
JRC	Joint Research Center
LIFE	L'instrument Financier Pour L'environnement Programme
MS	Member State(s)
OSCE	Organization for Security and Co-operation in Europe
OP	Operational Programmes
PCF	Pau Costa Foundation
REA	European Research Executive Agency
RescEU	EU fleet of firefighting planes and helicopters, among other
SFM	Sustainable Forest Management
UCPM	Union Civil Protection Mechanism
UNEP	United Nations Environment Programme
UXO	Unexploded Ordnance
WUI	Wildland Urban Interface

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EXECUTIVE SUMMARY

The year 2022 marked a significant increase in wildfire activity across Europe, with particular emphasis on nations such as France, Spain, Romania, Germany, Czechia, and Slovenia. In some instances, burnt area was 5-13 times higher than the past decade's average, accumulating to a total surface area more than three times the size of Luxembourg. This surge in wildfires was exacerbated by prolonged heatwaves, droughts especially in early spring, and strong or unusual wind patterns. Dry conditions led to the lowest recorded soil moisture in fifty years and 63% of rivers registering far below-average discharge, emphasizing 2022 as the driest year in recent history. Some indicators of these conditions included increased fire activity in the alpine region and increased incidence of extreme fire behavior and pyrocumulonimbus formations in the Mediterranean region. Countries and regions traditionally considered low-risk for wildfires, found themselves grappling with large-scale fires and extreme fire behaviour.

The lack of experience, preparedness, and adequate resources in these areas significantly hindered containment efforts. Additionally, effective wildfire management in regions with unexploded ordinances (UXO) has emerged as a crucial concern, especially given the incidents in Slovenia, Germany, and the heightened risks in conflict zones like Ukraine, which was the second most burned country in Europe in 2022. Europe's protected zones, notably the Natura2000 sites, also reported a surge in wildfire occurrences and burned area, highlighting a critical absence of comprehensive fire management strategies.

The Cohesion Policy framework, including the Cohesion Fund, European Regional Development Fund, Interreg programme, and Solidarity Fund, supports wildfire risk management. Investments from previous cycles have contributed to reducing the risk of extreme wildfires and enhancing response systems, landscape management, and risk awareness. However, challenges in fund allocation, governance and lacking wildfire expertise within ministries have resulted in fund underutilization or reallocation, thereby undermining the sustainability of their impact. Notably, investments have leaned heavily towards detection and response, with insufficient attention to long-term resilience building, nature preservation, and prevention.

Research indicates that a focus on preventive measures yields cost-effective outcomes. An estimated €1 investment in prevention could save €4 to €7 in response and recovery expenses. There is a pressing need to bolster investment in training and capability enhancement, as only a handful of countries believe their firefighting personnel are prepared for the intensifying wildfire threats. Key actors call for increased investment in training, capacity building, and proactive measures such as fuel management, prescribed fire application, and forest health.

The potential of climate-smart sustainable forest management (SFM) and the alignment of funding instruments with global wildfire initiatives like the Landscape Fire Governance Framework or the FAO-UNEP Global Fire Management Hub could better serve the global wildland fire community's needs, leverage international expertise, and promote effective capacity development in fire management. Further recommendations include enhanced coordination across funding mechanisms, establishment of EU-wide legal frameworks, addressing funding shortcomings, promoting multi-stakeholder approaches, creating a centralized platform for wildfire investment, ensuring adequate funding and capacity for DG ECHO, in particular for the Wildfire Peer Review Assessment Framework, and forming an EU-coordinated wildfire expertise team. In terms of practical application, the need for clear guidelines on prescribed fire use, guidance for new fire-prone countries, strategy consolidation, expanding the

scope of the Expert Exchange Programme, supporting a unified communication strategy and risk culture, promoting international collaboration and best practices, investing in training and standardization, reviewing management plans for protected areas, promoting research and innovation, and establishing a European Wildfire and Mitigation Fund is emphasised. These recommendations highlighted in this study aim to also enhance integrated wildfire management, funding accessibility and impact, and risk reduction across Europe.

Policy Recommendations can be grouped as follows:

Increasing Cohesion Policy Funding Impact on Fire Management

- **Ensure access to wildfire expertise** for ministries and national agencies to facilitate impactful and sustainable investments in wildfire risk reduction and support integrated fire management at landscape level across diverse stakeholder groups.
- **Facilitate access,** enhance transparency, and simplify Cohesion Policy funding schemes to provide more information and improve accessibility.
- **Assemble and incentivise an EU-coordinated wildfire expert pool** to evaluate/assess Cohesion Policy funding investments based on risk and regional needs and support /link to the DG-ECHO Wildfire Peer Review Assessment (Framework) program.
- **Enhance and improve databases** for better traceability and analysis of contributions to wildfire risk reduction via the various programmes and funding schemes.
- **Prioritise mid- and long-term risk reduction** investments and strategies over emphasizing preparedness and response capabilities mostly in the form of equipment.
- **The "Build Back Better Approach"** of the Sendai Framework must be adopted to enhance resilience against future disasters (i.e., in the rules of the EU Solidarity Fund).

Governance of Wildfire Funding Instruments

- **Enhance coordination** among funding mechanisms and with other EU instruments related to wildfire management.
- **Support / develop** EU-level legal frameworks for wildfire management.
- **Rectify funding shortcomings,** promote expertise, and address bottlenecks.
- **Promote multi-stakeholder approaches** by funding cross-cutting initiatives in integrated wildfire management (IFM).
- **Create a centralized platform** for information on funding available for integrated wildfire management-related projects or initiatives ("one-stop wildfire investment shop")
- **Ensure adequate funding** for wildfire governance support provided through DG-ECHO.

Practical Application of Wildfire-related Funding Mechanisms

- **Guidelines** for safe and effective prescribed and tactical fire use must be developed.
- **Tailored guidance** is needed for new fire-prone countries facing new wildfire risks.
- **Expand the scope of the DG-ECHO Expert Exchange Programme** to include important fire management stakeholders outside of only civil protection authorities.
- **Adopt** a common EU-wide wildfire risk awareness and communication strategy.
- **Promote international collaboration** and highlight good practices; collaborate with relevant organizations and support global initiatives like the Global Fire Management Hub
- **Invest in/develop training and standardization** frameworks for safe operations.
- **Conduct comprehensive reviews** of management plans for wildfire-adaptive strategies.
- **Further promote research and innovation** for prevention and suppression technologies.
- **Establish a European Wildfire Mitigation Fund** as a dedicated sustainable fund for capacity development (trainings, exchange of experts, study tours, workshops, etc.) focussed on civil society actors, NGOs, institutions, and networks addressing integrated fire management at the landscape level.

1. OVERVIEW OF THE SEVERITY AND AMPLITUDE OF THE SUMMER 2022 FOREST FIRES IN THE EU.

KEY FINDINGS

- In 2022, Europe witnessed a significant increase in wildfire activity, particularly in countries like France, Spain, Romania, Germany, Czechia, and Slovenia, some of which experience burned area 5-13 times their past 10-year average. The total burned surface area across Europe was equivalent to more than three times the size of Luxembourg.
- Prolonged heatwaves, droughts, strong or unusual wind patterns, heightened wildfire risks. Early spring droughts prompted unusual alpine fires, strong winds affected the Mediterranean, and the Iberian Peninsula saw increased pyrocumulonimbus formations. Dry spring conditions led to historically low waterway levels and the lowest soil moisture in half a century exacerbated fire risk. 2022 was also the driest year on record in terms of area affected, with 63% of rivers having below-average discharge.
- Traditionally non-fire prone environments (i.e., the alpine region) and countries (e.g., Germany and Czechia) experienced not only large fires, but also extreme fire behaviour which posed significant containment challenges exacerbated by lack of experience and preparedness, inadequate command and control structures, lacking resources, etc.
- Effective wildfire management in regions with unexploded ordinances (UXO) is crucial, with significant concerns raised by incidents in Slovenia, Germany, and heightened risks in conflict zones like Ukraine which was the 2nd most burned country in Europe in 2022.
- Europe's protected areas, especially the Natura2000 sites, face heightened wildfire risks, with the 2022 data showing a significant increase in burnt regions. These areas lack comprehensive fire management strategies and face fire suppression limitations due to their protected status.

1.1. Overview of 2022 fire season

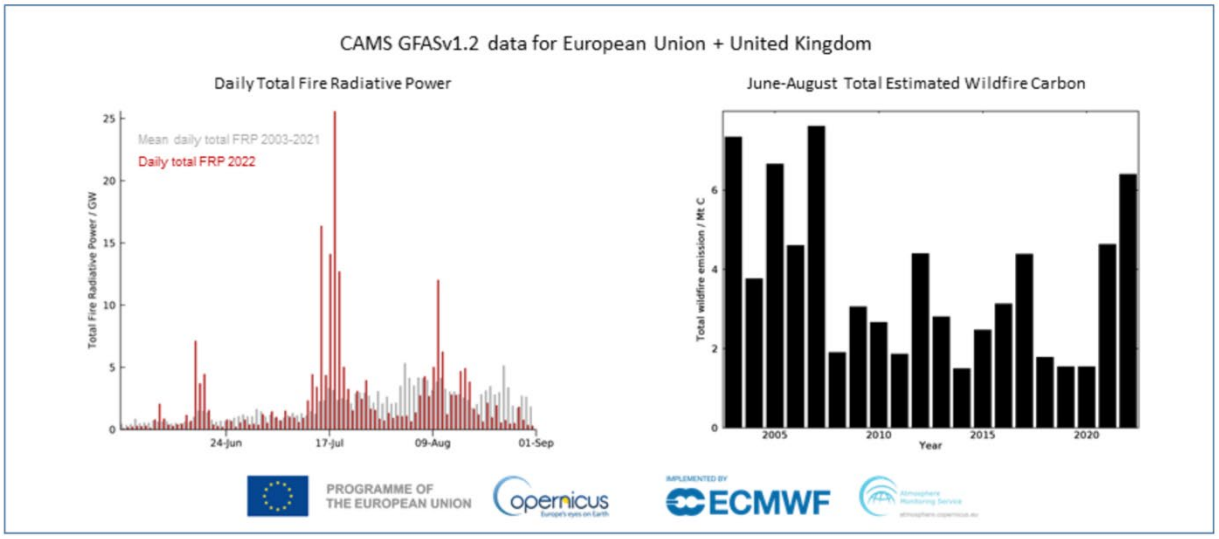
In 2022, Europe experienced increased wildfire activity and intensity during the spring and summer months, particularly in France and Spain, due to prolonged dry conditions and heatwaves. According to data from the European Forest Fire Information System (EFFIS), the total cumulative burnt area in the EU between June and September 2022 was over 508,260 hectares, compared to an average of just over 215,548 hectares in the same period between 2006-2021. The estimated burned area across Europe was about 881,275 hectares in 2022, compared to an average of just over 260,000 hectares in the years between 2006- 2021 (San-Miguel-Ayanz et al., 2023).

According to the CAMS Global Fire Assimilation System[1], smoke emissions from wildfires were also higher, with total wildfire emissions in the EU and the United Kingdom estimated at 6.4 megatonnes of carbon between 1 June and 31 August 2022, the highest level since 2007. Other countries including

[1] The CAMS Global Fire Assimilation System (GFAS) is a component of the Copernicus Atmosphere Monitoring Service that assimilates satellite observations to compute daily estimates of emissions from wildfires and biomass burning globally.

Slovenia, Czechia, Hungary, and Germany also saw significant wildfire activity. The changing climate has increased the flammability of vegetation in these regions, leading to the concern of wildfire experts.[2]

Figure 1: Daily radiative power and wildfire emissions



Source: Copernicus Atmosphere Monitoring Service.
Left: CAMS Fire Radiative Power estimations for the European Union and the United Kingdom. Right: CAMS GFAS system showing wildfire carbon emissions for the same countries between June and 11 August.

1.1.1. 2022 Wildfire Impacts: Countries supported through the Cohesion Fund

The countries supported through the European Cohesion Fund for the period of 2021-2027 include Bulgaria, Czechia, Estonia, Greece, Croatia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Portugal, Romania, Slovakia, and Slovenia. In looking how these countries were impacted by wildfires in terms of burnt area and fire occurrence in 2022, some conclusions can be drawn from the EFFIS data. Of the Cohesion Fund recipient nations, Estonia, Greece, Latvia, Lithuania, Poland, and Portugal experienced normal or below average fire occurrence and burned area. Bulgaria and Cyprus experienced slightly above average burned area[3]. The supported countries which saw **far above average** burned area and fire activity were Czechia, Croatia, Hungary, Romania, Slovakia, and Slovenia[4]:

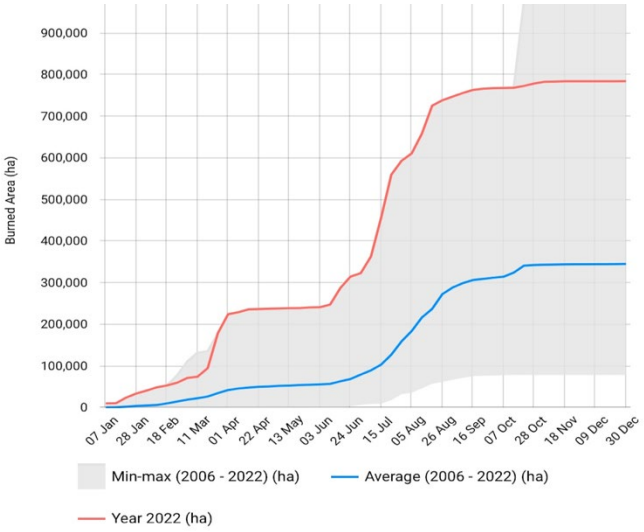
- Burned area in the Czechia amounted to ca. 11-times the past 10-yr average, however this was attributed to one single large fire (which also crossed into Germany) which burned 1,436 ha.
- Burned area in Croatia was ca. 3-times the past 10-yr average and included several larger fires and over 16,000 ha burned in mid-March; the total area burned in 2022 was nearly 33,000 ha.
- Burned area in Hungary was ca. 7-times the past 10-yr average with significantly above average spikes in burned area between January and August; the total area burned in 2022 was 7,287 ha.
- Romania experienced ca. 5-times its past 10-yr average with several larger fires between January and April with one very large spike in fire activity in March accounting for over 57,000 ha; the total area burned in 2022 was 153,155 ha.

[2] https://atmosphere.copernicus.eu/europes-summer-wildfire-emissions-highest-15-years
[3] No fire data was available for Malta.
[4] https://effis.jrc.ec.europa.eu/apps/effis.statistics/estimates

- Slovakia had one smaller fire and one larger fire for a total of 317 ha burned which resulted in approximately 6-times the 10-yr average for total area burned.
- Slovenia had one major fire in 2022 which burned 4,388 ha; however, this amount of burned area constituted approximately 13-times the 10-yr average for annual area burned.

It is important to note that while some countries experienced fire activity and total burned area far above their 10-yr annual average, the total affected area is still relatively small in comparison to others (e.g., comparing Romania and Hungary where in 2022, Hungary had burned area approximately seven-times their 10-yr average, but still only a fraction of the area burned in Romania, whose burned area was approximately five-times the 10- yr average). Another important factor is the number of fires. Both the Czech Republic and Slovenia had burned area 11 and 13-times, respectively of their 10-year annual average but in both cases, these were associated with a single severe incident. Once again contrasted to Romania, which saw a total of 719 recorded fires. Finally, land management policies and cultural practices can significantly influence the fire incidences and burned area as recorded by EFFIS where the 719 fires recorded in Romania were largely associated to crop burning.

Figure 2: EFFIS cumulative weekly area burned



Source: EFFIS[5]

In countries like Croatia or Portugal which are very fire-prone and have also more advanced fire prevention and suppression capabilities, there is nevertheless heightened public messaging, awareness, and care (and often sharper penalties for negligence). On the other hand, northwestern, central, northern, and eastern Europe are becoming more fire-prone, largely due to climate change. Here for instance, cultural practices like crop-burning which has been practiced for generations, has become a high-risk activity with the onset of more frequent and severe droughts or other extreme weather events which have secondary implications for fire management. A similar trend is observed in the alpine region where traditional fire use has resulted in escaped fires and separately with the increased incidence of dry lightning. Though not recipients of cohesion funds, countries/regions like Austria, the Italian alps and the German alps are experiencing increased fire activity (especially between February and April) in non-fire prone environments which present unique challenges (like access), threaten sensitive high- elevation ecosystems, or pose threats for cascading and secondary impacts such as avalanches or erosion (Müller et al., 2020). A recent study has also shown a doubling of lightning strikes in the Eastern Alpine region in the last 40 years, which when combined with other factors have significant implications for increased fire activity in the Alps (Simon et al., 2023).

[5] Data show only fires greater or equal to 30 ha to allow for comparison with previous years.

Context is important for gauging the severity of wildfire incidents – in the examples above, the average size and severity of fires are very small compared with those in more fire-prone contexts like Spain or Greece. The significance is rather less on the burned area, amount of people killed, or homes lost but impacts on less fire adapted ecosystems, the overall trend away from historical fire regimes (if any), and their magnified impact when occurring in context where age demographics, availability of fire suppression resources, or the level of training and experience result in fire containment challenges. Similarly, disaster relief measures or post fire recovery assistance at local level is more developed in contexts accustomed to wildfire impacts or disasters; in non-fire prone countries, even relatively small fires pose significant control challenges for response resources and the local people may be left fending for themselves after being severely impacted (e.g., crop loss).

The European Cohesion Policy funds – aimed at reducing regional disparities, promoting economic growth and social cohesion in the EU—is intended to be a critical mitigating factor. These funds are primarily invested in wildfire prevention and preparedness (among other disturbances and disasters), but usually as a part of wider funding schemes addressing generally capacity development and climate or infrastructure or resilience projects. Measures which are supported include equipment and vehicles for civil protection units (e.g., fire engines, helicopters), infrastructure improvements, forest management initiatives (e.g., removal of combustible materials), ecosystem-based solutions, awareness-raising, monitoring systems, training, and cross-border coordination. In terms of wildfire prevention, these funds can be used to support the development and implementation of measures aimed at reducing the risk of wildfires including technologies and equipment that help detect, prevent, and extinguish wildfires. Additionally, they can be used to support the development of forest management plans and to provide training and education for forest owners and managers on how to prevent and manage wildfires.[6]

Aside from Romania, and to a degree Croatia, and the two severe fires in both Slovenia and Czechia, the countries receiving cohesion funds were not severely impacted or otherwise 'devastated' by wildfires (as was certainly the case in Portugal in 2017 and Greece in 2018) in 2022. The majority of wildfires which had severe social, environmental and economic impacts during the 2022 fire season occurred in Spain, France and Germany. The northern and north-eastern European countries experienced little to no fire activity in 2022. Therefore, minimal analysis could be conducted for the 2022 fire season based on the criteria of being both highly impacted by fires AND receiving Cohesion Funds.

1.1.2. Meteorological and atmospheric variables contributing to fire weather

Meteorological conditions, particularly extended heatwaves, drought, and irregular wind patterns were consistent drivers of forest fire activity and severity in most countries. In 2022 (and even more accentuated in 2023), the influence of the branch of the anticyclone from the north and northwest of the continent was present with the simultaneous presence of low-pressure systems further south, which led to increased gradients in the pressure field and to moderate and even strong gales and north-westerly winds. Such synoptic conditions, i.e., weather types, have been detected as particularly conducive for potentially dangerous and unusual fire behaviour since this configuration brings strong dry winds and low relative humidity. Several more localized or regional fire weather factors were cited among surveyed countries and include:

[6] https://research-and-innovation.ec.europa.eu/system/files/2018-11/cohesion_policy_support_related_to_forest_fires.pdf

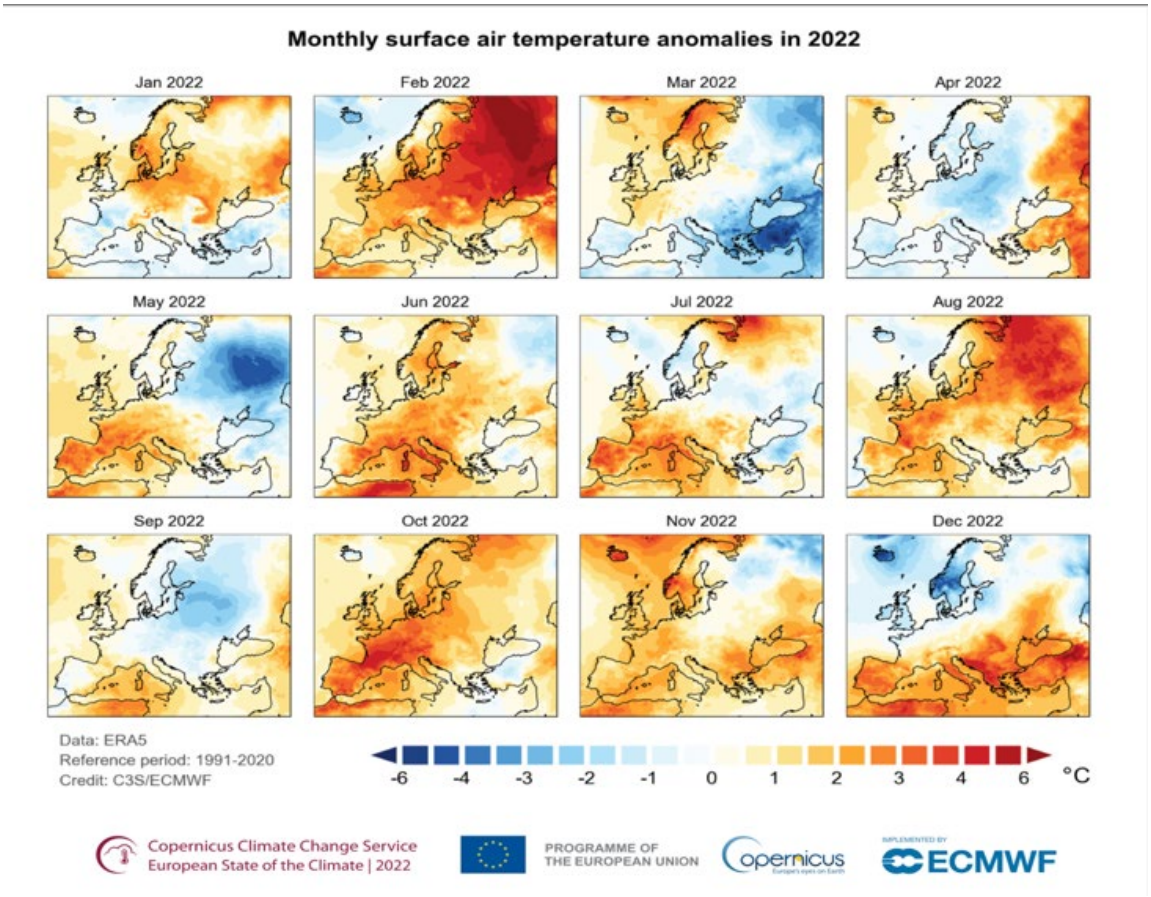
- Early spring drought and heatwaves (i.e., fire weather conditions outside of the normal "fire season"; several alpine fires broke out in February and March 2022 which in part exhibited extreme fire behaviour in Austria. A similar event was observed in Switzerland in 2023).
- Uncharacteristically strong winds and or atypical wind patterns contributed to extreme fire behaviour especially in the Mediterranean Basin and on islands (e.g., Croatia).
- Drought conditions and dry lightning (or lightning hold-over) has been more regularly observed in the alpine region, as well as in the Nordic countries (e.g., Norway)
- The Iberian Peninsula has experienced a new trend of intensified, plume-driven fires and a growing trend on the development of pyrocumulonimbus clouds – "pyroCbs" due to an increase of the amount and flammability of forest fuels and a warmer and more unstable atmosphere that allows more plume dominated fires (more typically associated with extreme fires in North America and Australia)[7].

A particularly influential factor for the 2022 fire season, was the exceptionally dry Spring before the actual start of the traditional fire season (June-September) – this was also the case for the alpine region (low snowpack) and for traditionally non-fire-prone countries like Germany and the Netherlands.

The downstream effects were exceptionally, even historically low water levels in important waterways like the Rhine River which also impacted overall water tables. In the south of Germany for instance, water had to be imported by trucks to farms in the Black Forest and elsewhere water shortages were even a limiting factor for fighting structure fires. According to the Copernicus Climate Change Service, river discharge in 2022 was the second lowest on record across Europe and marked the sixth consecutive year of below-average flows; 2022 was also the driest year on record in terms of area affected, with 63% of rivers having below-average discharge (see Figure 4).[8] Similarly, the soil moisture anomaly was the second lowest in the last 50 years with only isolated areas seeing wetter-than-average soil moisture conditions[9]; low soil moisture means less available water for vegetation which drives down the fuel moisture content of both live and dead fuels thereby increasing their flammability.

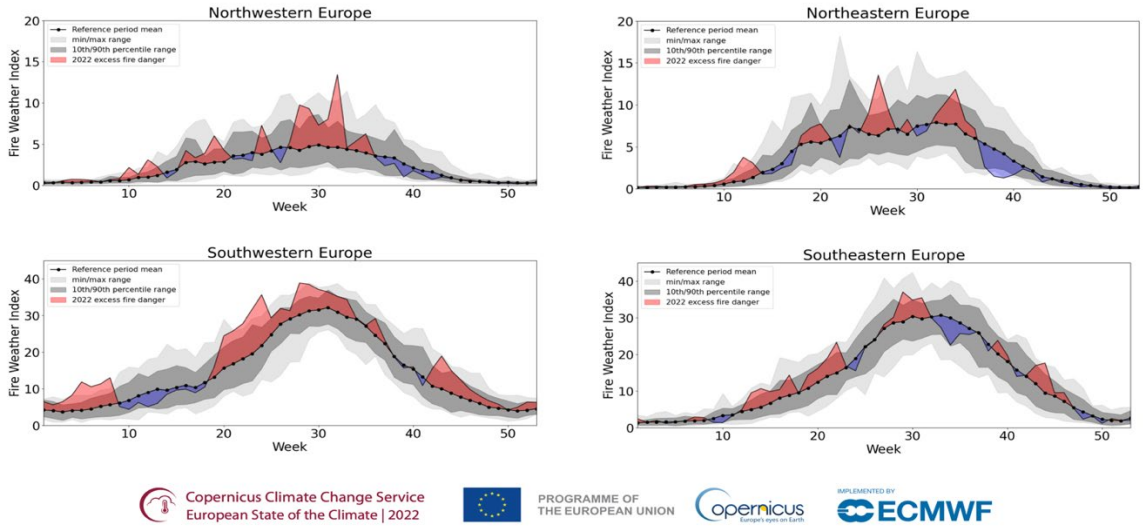
[7] A cumulonimbus cloud (a.k.a. thunderstorm) which forms over a heat source like a wildfire. Pyrocumulonimbus formations are associated with extreme convective energy release from extreme fire behavior and cause their own weather such as lightning and/or precipitation.
[8] https://climate.copernicus.eu/esotc/2022/river-discharge
[9] https://climate.copernicus.eu/extreme-heat-widespread-drought-typify-european-climate-2022

Figure 3: Month surface air temperature anomalies in 2022



Source: ERA5. Credit: C3S/ECMWF.[10]
Note: Average surface air temperature anomalies for each month of 2022, relative to the respective monthly average for the 1991–2020 reference period.

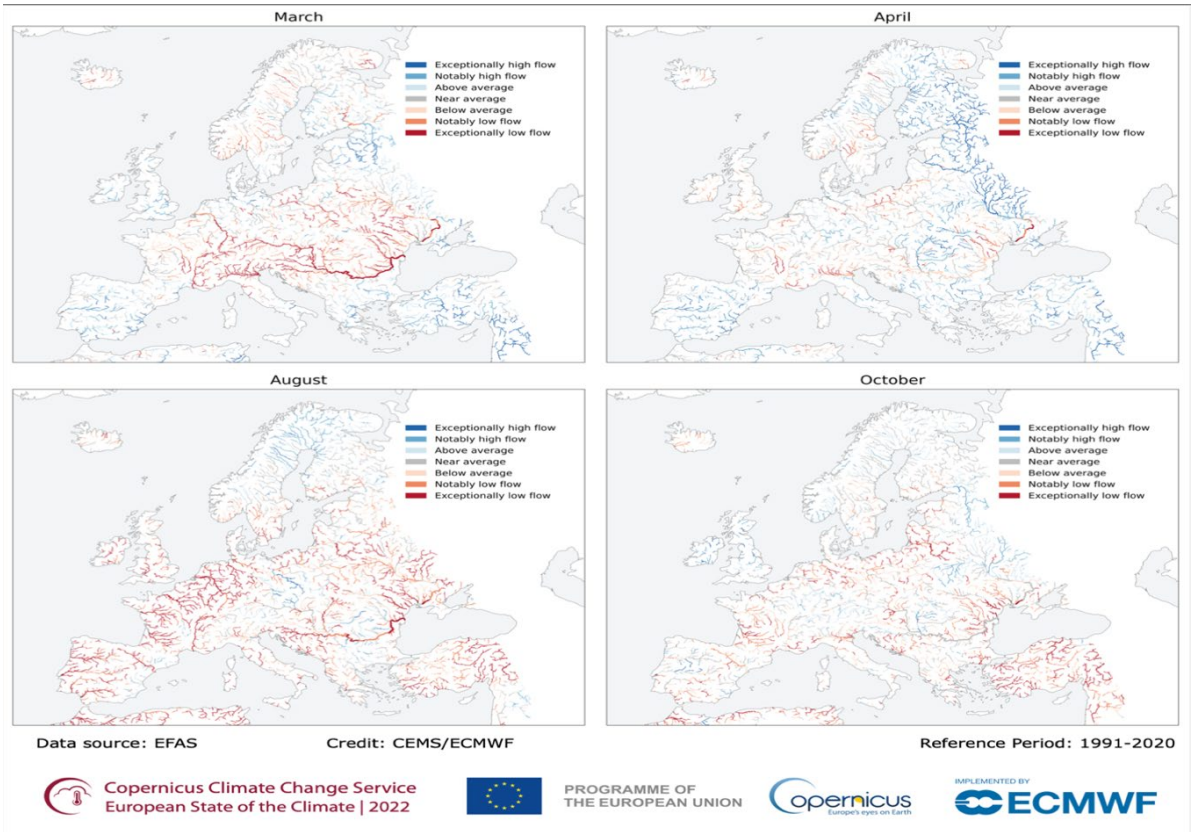
Figure 4: Fire Weather Index weekly average anomalies for European regions in 2022



Source: FWI based on ERA5. Credit: Copernicus EMS/ECMWF.
Note: Positive values in red and negative in blue; data relative to the average for the 1991–2020 reference period (dotted black line; minimum and maximum – light grey shading; 10th to 90th percentile – dark grey shading). Note the different vertical scale for northern and southern European regions.

[10] https://climate.copernicus.eu/esotc/2022/temperature

Figure 5: Monthly average river discharge anomalies for March, April, August, October 2022



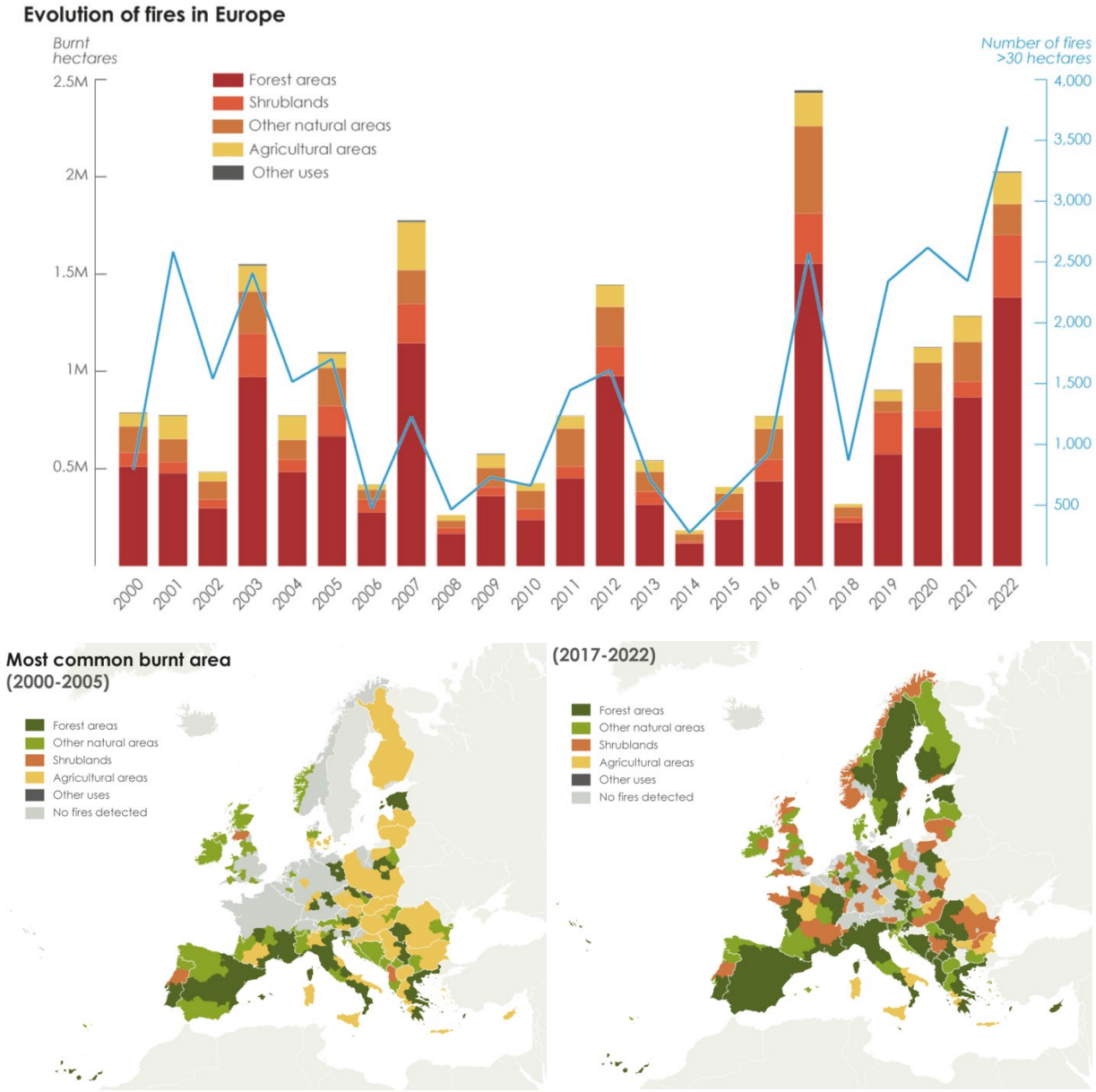
Source: EFAS. Credit: Copernicus EMS/ECMWF.[11]
The categories 'exceptionally high (low)', 'notably high (low)', 'above (below) average' and 'near average' relate to the percentile ranges >90 (<10), 75–90 (10–25), 60–75 (25–40) and 40–60 for the 1991–2020 reference period. Shades of blue indicate higher, and shades of red indicate lower discharge than normal, respectively. Grey indicates near-average discharge. Only rivers with drainage areas greater than 1,000 km2 are shown.

1.1.3. Other main drivers of wildfire ignitions and spread

The availability of burnable vegetation (fuel) is the primary driving factor of fire size and severity. For centuries human activity (and associated ignitions) in the landscape have influenced fire regimes in Europe. Rural depopulation in recent decades has caused a shift in the vegetation cover type impacted by fires, resulting in a steady rise of more forested areas becoming more severely impacted.

[11] https://climate.copernicus.eu/esotc/2022/river-discharge

Figure 6: Evolution of fire-affected land cover type in Europe



Source: Fire-Res Project with data from EFFIS.
Note: Wildfires in forested areas have become dominant in most regions of Europe, especially in the South and the Baltic. In Spain, for example, they have increased from 27% of the total burned area in the period 2000-2005 to 42% between 2017 and 2022, and in Finland from 25% to 40%. In Eastern Europe, crop and pastureland used to be the most frequently burned areas; land abandonment in the last two decades has resulted in vegetation cover change to shrubland. For example, in Romania agricultural fires have gone from 37% of the burned area to 14% and shrub fires from 2% to 42%.[12]

Other key factors highlighted by MS which complicated wildfire containment objectives or otherwise contributed to fire ignitions, spread or severity included:

- Excessive biomass accumulation because of past fire exclusion/overly aggressive fire suppression
- Excessive biomass accumulation on public lands with public access (public access is also a prerequisite for increased ignition sources)
- Increasing incidence of criminal arson (e.g., Italy, Poland, Germany, Greece)

[12] https://www.europeandatajournalism.eu/cp_data_news/depopulation-is-changing-the-fire-map-of-europe/

- Increasing challenges associated with the Wildland-Urban Interface (WUI); partly prevalent in newly fire-prone contexts like Germany and the Netherlands
- Dangerous and inaccessible areas due to topographic features (i.e., mountainous regions), areas badly affected by fallen or standing-dead beetle-kill trees (e.g., Czechia), or due to suspected unexploded ordnance (UXO) (e.g., Germany, Slovenia)
- Unpredictable, rapid, and non-linear fire spread combined with untrained firefighters (lacking competency for anticipating fire behaviour, especially influence of fuels, weather, and terrain)
- Poor practice or insufficient precautions by landowners in connection with (legal) fire-use, especially agricultural residue burning
- The presence of tourists in many southern EU countries during the high peak of the fire season without a risk culture around forest fires.

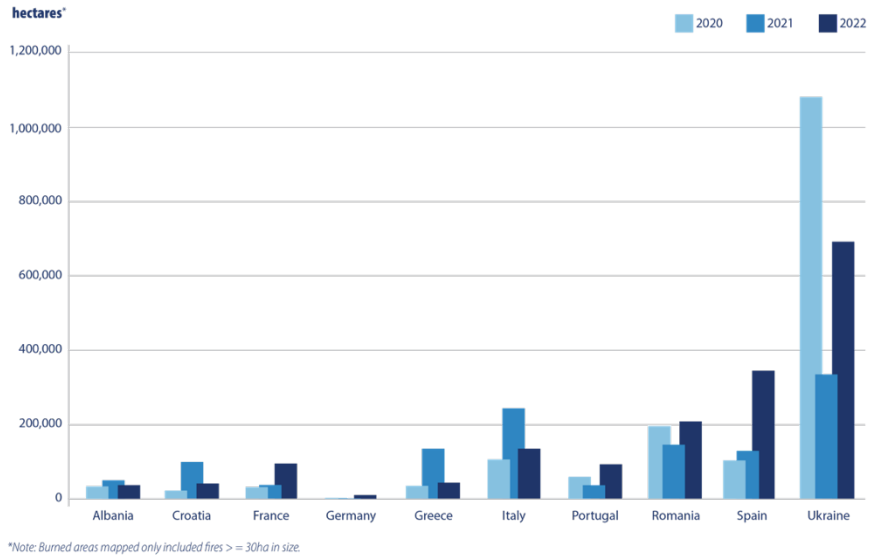
1.1.4. Of special concern: Conflict and contaminated areas

Both the fires in Slovenia and Germany highlighted a continued lack of safe and effective fire suppression capabilities for combatting wildfires burning on areas contaminated with unexploded ordnance (UXO). The fire in Slovenia set off hundreds of detonations of WWI-era bombs. This is a challenge regularly experienced by other Balkan states with firefighter injuries and fatalities recorded in Croatia, Bosnia and Herzegovina, among others. With approximately 2% of Germany's land area being contaminated by UXO (which also happens to be the most fire-prone areas), safety restrictions are even codified by law – firefighters must maintain a minimum 500-meter safety distance from UXO-designated areas. This past summer (and in 2020) firefighting efforts against major fast-moving wildfires were severely hampered because firefighters could not directly suppress them due to the threat of UXO.

The Russian aggression towards Ukraine has even further highlighted that fire management on contaminated areas has become a critical area of concern. The recent addition of Ukraine to the Union Civil Protection Mechanism family, while a great development in terms of European solidarity, has set off alarm bells among some experts in the wildfire management community. A relatively wet summer spared Ukraine widespread devastating wildfires considering the ongoing war as a source of countless ignitions sources – this is expected to change. Nevertheless, area burned in 2022 in relation to landmass, made Ukraine the 2nd most burned country in Europe behind Portugal. In a more striking comparison, the combined burned area in Ukraine was slightly less than the total burned area of the 27 European Union MS states combined[13]. The probability for a UCPM mobilization for wildfire assistance in Ukraine in the coming years is high – yet with the current wildfire suppression techniques and methods, the safely of firefighters responding in areas heavily contaminated with mines and other UXOs is virtually impossible to guarantee. Additionally, Chernobyl for instance, has long been a wildfire hotspot with significant international investments in wildfire mitigation and response measures as wildfires burning in these areas pose a risk of transport of radioactive smoke and subsequent fallout across Europe.

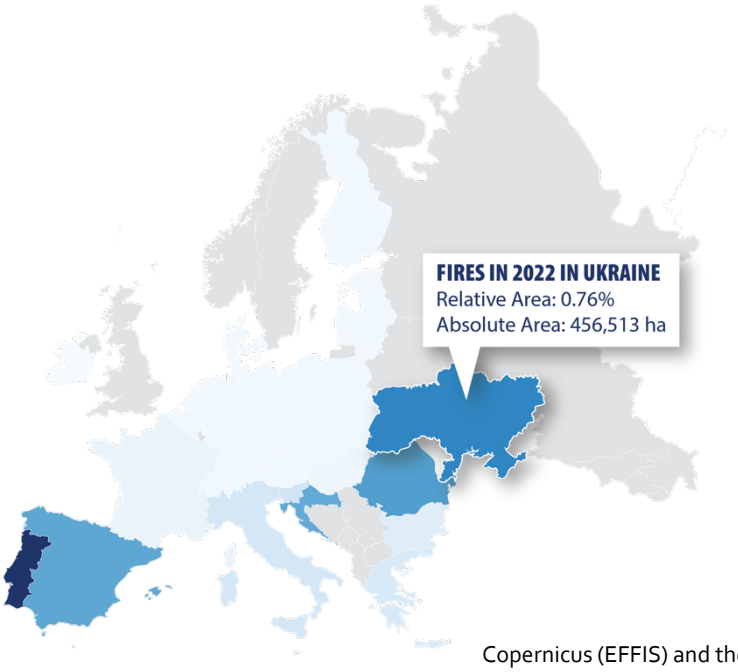
[13] Depending on whether EFFIS or GWIS data is applied.

Figure 7: Burned area in Ukraine 2020-2022 in relation to other European countries



Source: PCF with data from GWIS.
Note: Ukraine has far more burned area than any other European country. Important to note is the connection between conflict and burned area in the Eastern Ukraine pre-dating the 2022 Russian invasion. Note: there are major discrepancies between burned area data obtained by GWIS and EFFIS (especially for the year 2020) likely due to differences in burned area detection and mapping methodologies.

Figure 8: Burned area in the EU and Ukraine as a percentage of the overall area of the country



Source: PCF, Copernicus (EFFIS) and the FIRE-RES project.
Note: Fires in the EU and Ukraine in 2022, measured in percentage of burned land to the overall area of the country: Ukraine the second most burned country in Europe behind Portugal. Note: Burned area calculated by EFFIS is significantly less than that calculated by GWIS (Figure 7) likely due to differences in burned area detection and mapping methodologies.

1.1.5. Of special concern: Protected areas

In recent years and again in 2022, wildfires burning across Europe have disproportionately affected protected areas, in particular, Natura2000 sites. In 2022, burnt areas mapped within the Natura2000 network of protected sites amounted to 365,308 ha, which corresponds to approximately 44% of the

total burnt areas in the EU and is triple the previous 10-year average. One recent study evaluating 2022 burned area in France, Spain, and Portugal only, estimated that of the total burned area in those 3 countries (up to September 2022) amounted to 444,417 ha of which 173,638 ha was in protected areas. Overall, the study estimated approximately 47% of total area burned in those three countries were in protected areas, suggesting spatial fuel connectivity in protected areas played an important role in fire spread (Rodrigues et al., 2023)[14]. While fire plays an integral part of many ecosystems within the designation of protected areas, it requires well-developed prescribed fire programs with clear

Table 1: Total burned area and number of fires in Natura2000 sites

Country	Area (Ha)	% of Natura2000 Area	Number of fires
Austria	1 033	0.06752	7
Belgium	430	0.17938	7
Bulgaria	6 135	0.01745	80
Croatia	12 014	0.02607	125
Cyprus	92	0.09443	6
Czechia	1 436	0.06888	1
Denmark	476	0.03286	26
France	23 527	0.00324	583
Germany	4 065	0.00914	103
Greece	9 778	0.01424	133
Finland	11	0.01957	3
Hungary	4 297	0.03888	46
Ireland	1 352	0.04507	31
Italy	17 914	0.01094	453
Latvia	155	0.08727	11
Lithuania	2	0.07612	1
The Netherlands	329	0.03858	15
Poland	543	0.01143	15
Portugal	41 089	0.01478	441
Romania	102 659	0.01211	686
Slovakia	112	0.05362	4
Slovenia	4 396	0.08816	5
Spain	133 329	0.00377	532
Sweden	135	0.01307	9
EU27 Total	**365 308**		**3 324**

Source: PCF with data from the JRC.

objectives to maintain an ecological equilibrium between intentional fire-use implemented to meet resource/ conservation objectives, and so-called destructive or unwanted fire. Very few protected areas across Europe have such a plan in place. Furthermore, when wildfires do break out in protected areas, fire suppression efforts face a wide array of limitations. Examples include restrictions on the use of aerial firefighting resources or heavy equipment on the ground which could prove more destructive to the

[14] https://www.sciencedirect.com/science/article/abs/pii/S0048969722074204#ab0005

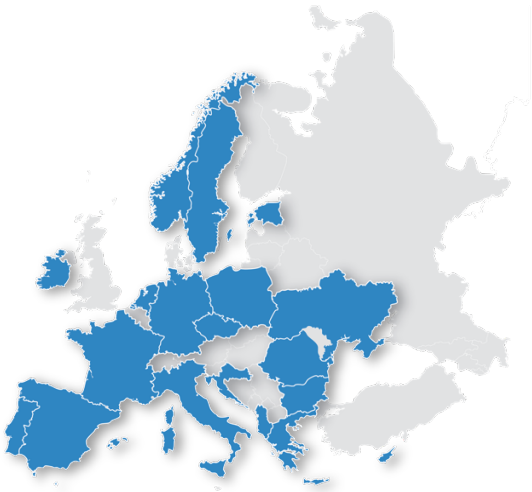
ecosystem than the fire itself. A common challenge of fire suppression in protected areas is the lack of access and road systems for firefighters; further complications include, e.g., tourism or protected areas that stretch across country borders, like the 2022 wildfire which crossed from Bohemia Switzerland National Park in Czechia into the Saxon-Switzerland Mountains National Park in Germany.

The lack of fire management and response plans for protected and remote areas in Europe is a recognized gap among experts and one that should be urgently addressed considering the disproportionate impact recent fire seasons have had on these important and sensitive environments.

1.1.6. Study methodology, surveyed countries, limitations, and challenges

Assessing the effectiveness of European funding and the 2022 fire season outcomes involved a survey of 17 EU member states and Albania, with nine receiving Cohesion Funds. The survey gathered diverse data representing various contexts, ecosystems, and fire regimes. A geographic gap in the alpine region was partly addressed through the study team's regional expertise and data from alpine countries like France, Germany, and Italy. The study involved desk research, an online survey, and informal expert interviews through various communication channels. The study team's expertise and insights from relevant publications were integrated into the study. Generative AI (i.e., Chat GPT-4) was utilized for editing and clarifying text, aiding in key findings formulation, and reference formatting, but was not used for creating original content or evaluating survey responses or other information sources.

Figure 9: Countries represented by the survey



Source: PCF

The study's limitation was the feedback from only 17 EU countries and one accession country, preventing a complete European overview. Additionally, consulting a limited number of experts per country may not fully represent each country's perspective. Despite these constraints and the complex nature of Cohesion Policy funding distribution, the study endeavoured to provide a thorough analysis based on available information, particularly for the Cohesion Policy framework, including most countries that have invested in wildfire risk reduction.

The survey process faced significant challenges, including the unavailability of key experts due to the record-breaking peak fire season, summer holidays and other ongoing major disasters (e.g., fires and floods in Greece, floods in Slovenia, major assistance to Ukraine, Canada, Libya, etc.). This led to difficulties in getting responses from busy national authorities and experts out of office. A notable issue was the gap between experts knowledgeable in fire management and those familiar with Cohesion Policy funding administration, leading to two distinct expert profiles with limited overlap in expertise. The study's high-level nature, focusing on evaluating government use of European financial instruments and disaster responses, we perceived caused some reluctance in cooperation. Responses from several countries were lacking, and many redirected inquiries across multiple departments, complicating the

data collection process due to the fragmented distribution of responsibilities among various ministries and agencies—some of which could not further assist because e.g., one ministry would distribute the funds to other ministries who further divided responsibilities between more ministries and agencies – one responsible for prevention, another for preparedness and response, another for restoration, another for infrastructure… and so on.

The following case studies were collected directly from the regions and from experts intimately familiar with the locations and incidents as well as the governance structures. Each of the case studies loosely follow criteria established by the Wildfire Peer-Review Assessment Framework (DG ECHO).

1.2. Case Study: Gironde and Landes, France

1.2.1. Introduction to region

In Gironde, the forest covers 520,000 hectares, or half (50.2%) of the area of the department (Observatoire des Risques Nouvelle-Aquitaine, 2022). This forest area is essentially made up of private forests (93%). In the department, 159 municipalities are considered particularly sensitive to forest fire risk. They are classified as dominantly forest municipalities and listed in the annex to the interdepartmental regulation for the protection of the forest against fires. However, sensitivity to forest fires is not the same everywhere in Gironde. In addition to the forest of the Landes de Gascogne massif itself, the vulnerabilities of the department include **(i)** peri-urban forests, along roads and railways (more exposed to human activities); **(ii)** coastal dune forests which are very busy in the summer, making interventions difficult; and **(iii)** military grounds (difficult to intervene, particularly due to presence of unexploded ordnance).

Since the 1970s, Gironde has on average been the most fire-prone French department (province); for example, 640 fires broke out in 2022, with 28,833.19 hectares of land burned. Between 10 and 15% of SDIS (Departmental Fire and Rescue Service) expenditure is devoted to managing this risk. Gironde, Landes and Lot-et-Garonne face the same challenges and the same risks regarding forest fires and have therefore harmonized the regulations in their department to better protect the forest against fires. Since April 20, 2016, these three departments have had a single regulation: the interdepartmental regulation for the protection of the forest against fires (SERVICE DÉPARTEMENTAL D'INCENDIE ET DE SECOURS DE LA GIRONDE, 2022).

1.2.2. Governance of wilfire risk management in the region

The mission of the emergency services is to ensure the safety of people threatened by a forest fire, protect inhabited or developed areas, and the forest. The speed of intervention of firefighters strongly influences the potential extent of a fire. As part of the ORSEC system (Contingency plan at departmental level), specific forest fire provisions are developed and tested in the departments exposed to this risk. To attack the fire, firefighters have land resources which can be supplemented by aerial means including planes or helicopters. The departmental forest fire operation order, drawn up each year by the SDIS and approved by the Prefect, sets the rules of engagement for the surveillance and fire suppression fighting system, including the organization of command, the contacts, and the role of each actor in crisis management via task sheets. The strategy for fighting forest fires is based on the following principles:

I. A level of mobilization of emergency services proportional to the fire risk;

II. A territorial network allowing surveillance/patrolling of risk sectors and a reduction in intervention times;
III. The earliest possible initial attack on new fires starts.

Direct response to wildfires is carried out by local fire stations throughout the department who are equipped to fight wildfires but also depend on departmental fire and rescue services. Fire suppression is mainly carried out with ground means, but can be supported with aerial assets. Fire prevention and control missions, although organized separately, are very complementary. The collaboration of personnel from Authorized Trade Union Associations (ASA) dedicated to the Defense of Forests Against Fire (DFCI), as "resource" persons, is necessary to help guide firefighting assets in the field.

1.2.3. Wildfire risk assessment

The departmental report on major risks (DDRM) identifies essential information on the major natural and anthropogenic risks in the department as prescribed in article R.125-11 of the environmental code. To this end, the DDRM (i) describes the major risks and their foreseeable consequences on people, property, and the environment; and (ii) indicates the prevention and protection measures planned to limit their effects. It constitutes a fundamental tool for preventive information because it contributes to the awareness and action of citizens who, since the civil security modernization law of August 13, 2004, must be an actor of his own security. At the municipal level, the DDRM is presented in the form of the municipal information document on major risks (DICRIM) (Préfecture de la Gironde, 2021).

1.2.4. Wildfire risk management planning, prevention and preparedness

The national forest fire prevention strategy falls under the jurisdiction of the Ministry of Ecological Transition and Territorial Cohesion and is available through the following plans[15]. Each department has a **regulation for protecting the forest against fires**. This regularly updated regulation (the latest version dating from July 7, 2023) aims to better prevent forest fires, facilitate service interventions, and limit the consequences, whether through clearing, limiting the fire ignitions or the regulation of forest activities. In parallel with the departmental regulation for protecting the forest against fires, the State implemented **Forest Fire Risk Prevention Plans (PPRIF)** in 2002.

These plans, implemented for areas with major challenges, make it possible to limit the exposure to risks of people and property. Their main objective is to establish a map of risk zones and to regulate these zones, by prohibiting new settlements in the most dangerous zones and by limiting them in other zones and by prescribing measures to reduce the vulnerability of installations and constructions, including some for existing ones. Today, 13 PPRiF are in force in the following municipalities: Grayan and the hospital, Naujac sur Mer, Saint Laurent Médoc, Saint Médard en Jalle, Lacanau, Carcans, Hourtin, Lanton, Biganos, Andernos les Bains, Martignas sur Jalle, Saint Jean d'Illac and Vensac. Of these 13 PPRIFs, only one is currently being revised and concerns the commune of Saint Jean d'Illac.

[15] https://www.ecologie.gouv.fr/prevention-des-feux-foret

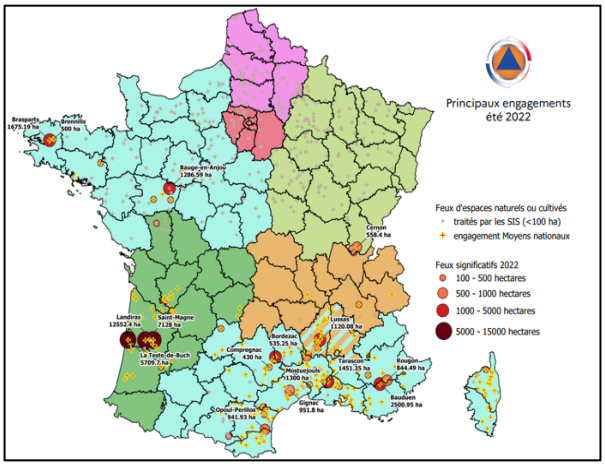
Figure 10: Example of wildfire risk awareness campaign in France

Source: Departmental operation order for forest fires and natural areas, 2022, SDIS 33[16]

Wildfire risk awareness campaign and prohibited activities including the five increasing levels of awareness codified by colors ranging from green (access authorized) to black (traffic prohibited), make it possible, depending on the time of year and the territories, to understand the level of risk.

1.2.5. Overview of 2022 large incidents and UCPM response

Figure 11: Overview of local and national resources and wildfires in 2022



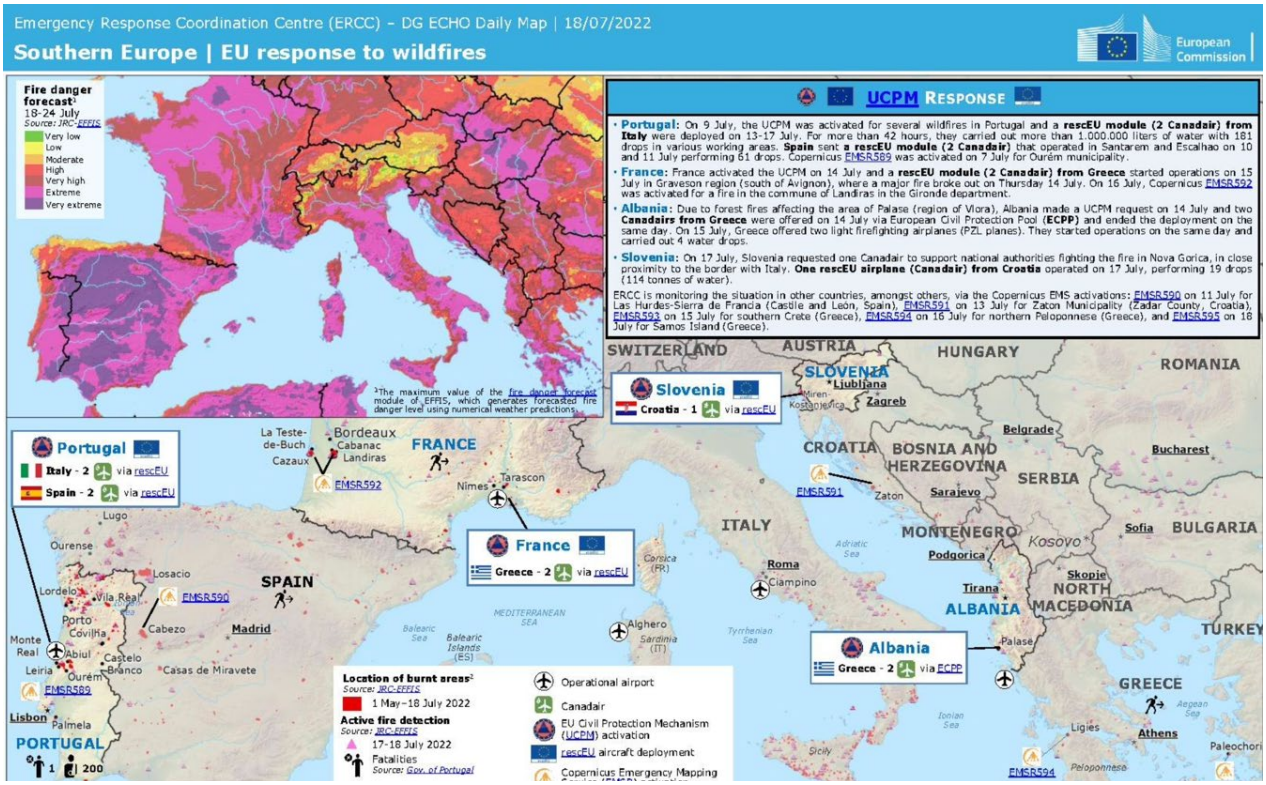
Source: DGSCGC, France

Clear examples of the impact of climate change can be seen in the chronic droughts and intense heatwaves that affected metropolitan regions during the summer of 2022. These factors exacerbated the challenges in battling forest fires and protecting natural spaces. Gironde experienced three significant fires that consumed 25,000 ha, pushing the year's total well beyond the ten-year average; 25,000 ha were burnt in the summer of 2022, compared to the usual 10,000 ha. These figures are reminiscent of years like 2003, 1989, and 1976, though the specific characteristics of each season differ. Remarkably, even with the displacement of over 60,000 individuals, no fatalities were recorded.

[16] https://www.gironde.gouv.fr/contenu/telechargement/60653/404992/file/OODFFEN_2022_SDIS33%281%29.pdf

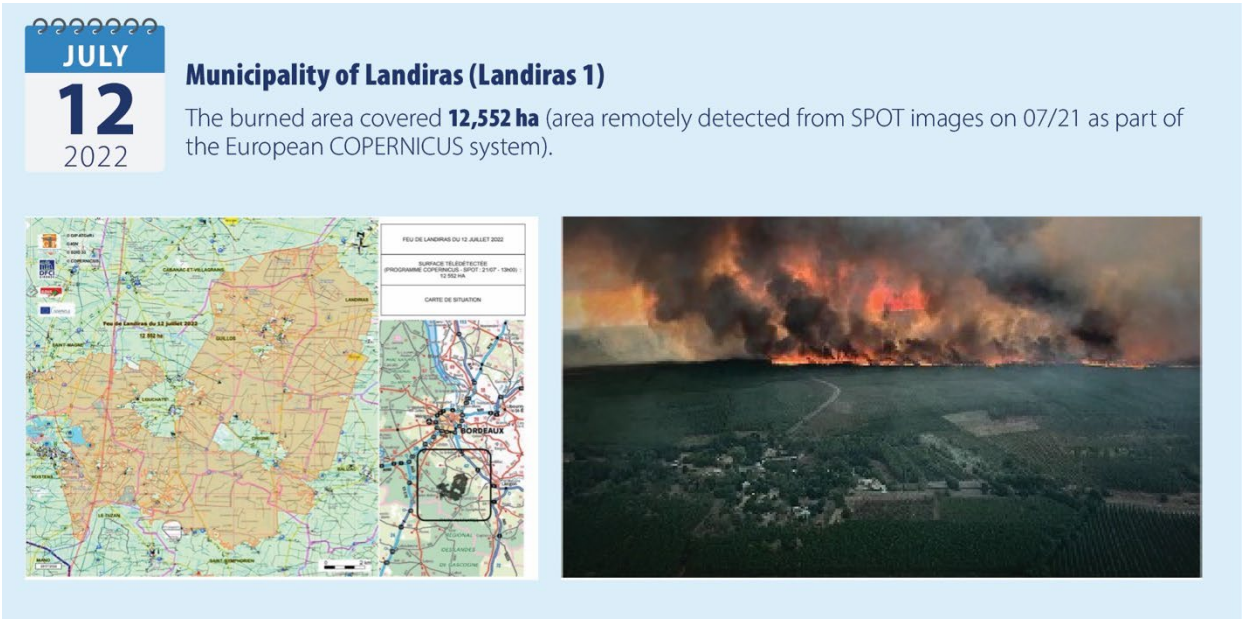
The intensity of the summer fires also matched the broader European context. Spain reported over 7,000 fires that destroyed 170,000 ha, while Portugal saw 8,500 fires ravaging close to 93,000 ha.

Figure 12: European Union response to wildfires in the Southern Europe, 18 July 2022



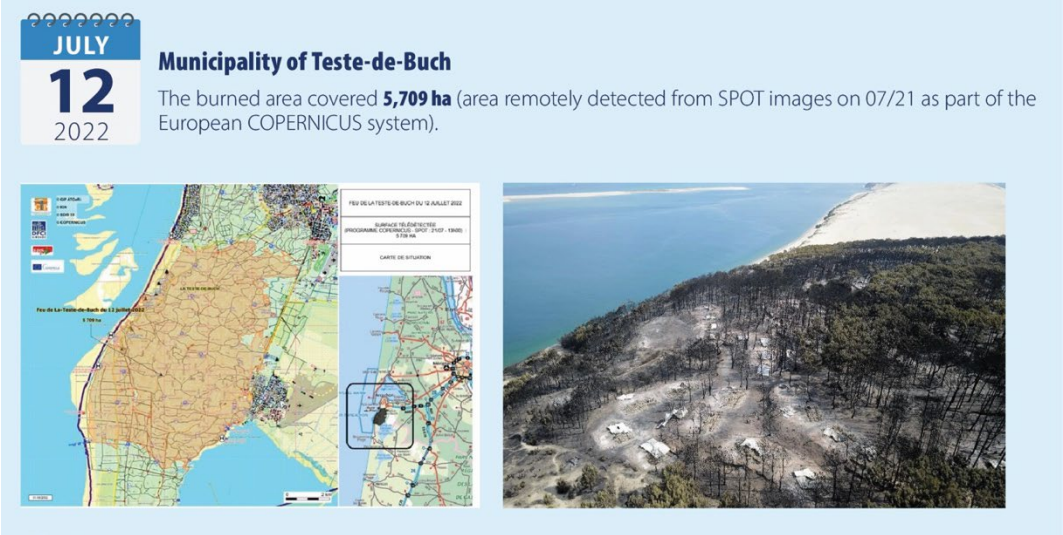
Source: European Commission, DG ECHO

Box 1: Landiras France wildfire, 12 July 2022



Source: PCF, Copernicus, and Observatoire des Risques Nouvelle-Aquitaine, 2022

Box 2: Teste-de-Buch France wildfire, 12 July 2022

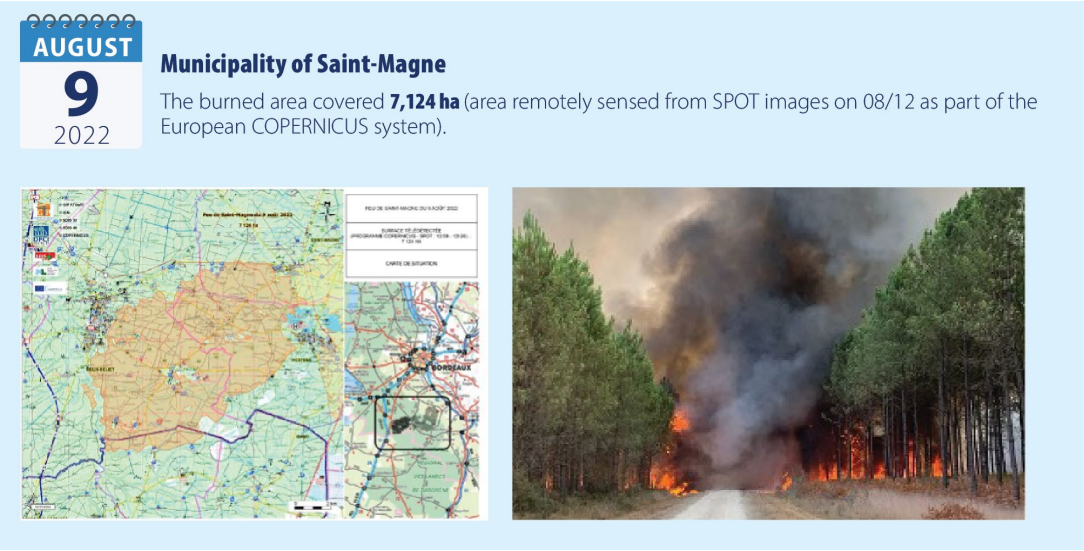


Source: PCF, Copernicus, and Observatoire des Risques Nouvelle-Aquitaine, 2022

Box 3: Landiras France wildfire, 09 August 2022

Source: PCF, Copernicus, and Observatoire des Risques Nouvelle-Aquitaine, 2022

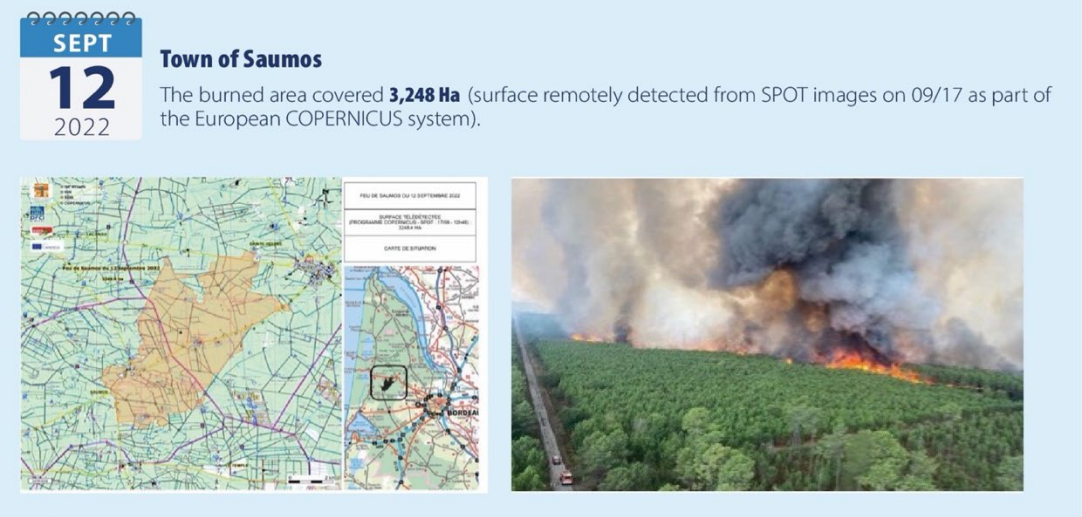
Box 4: Saint-Magne France wildfire, 09 August 2022



Source: PCF, Copernicus, and Observatoire des Risques Nouvelle-Aquitaine, 2022

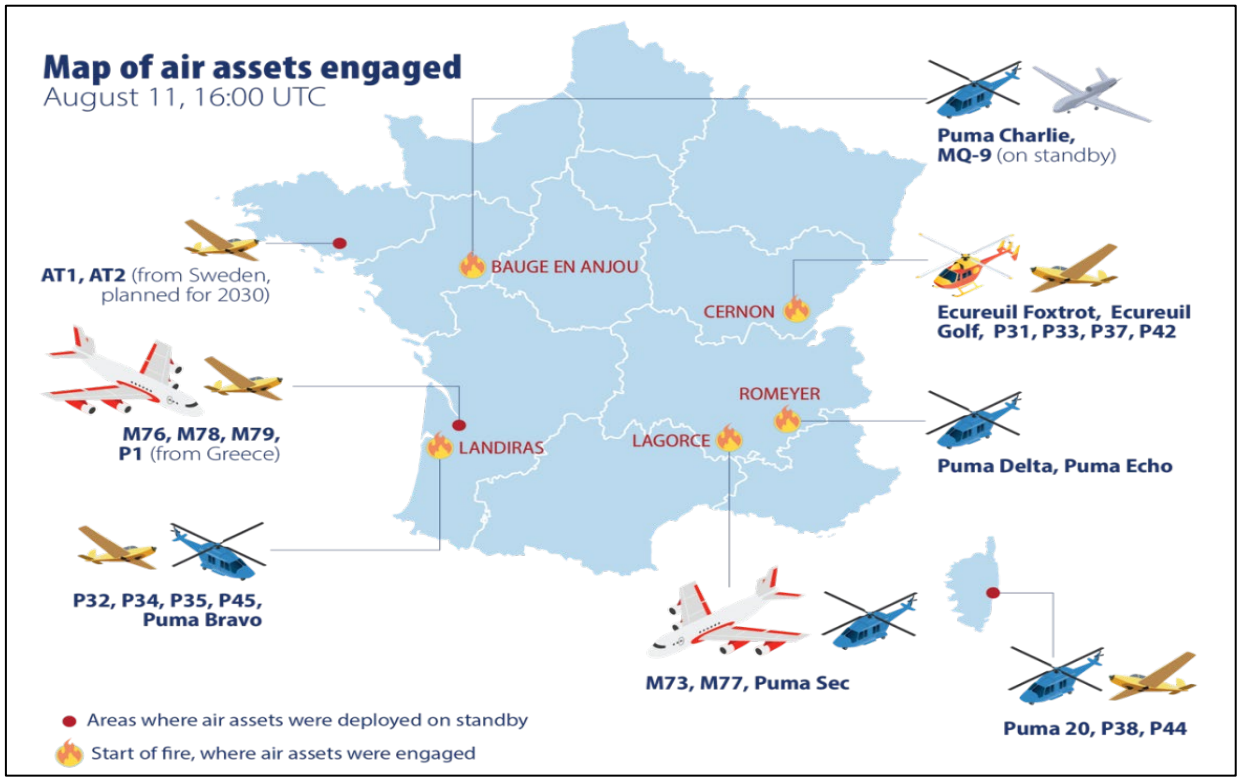
The DGSCGC (Directorate General on Civil Security and Crisis Management) requested the activation of the UCPM twice during the season. Once on Thursday July 14, receiving two Canadair planes from Greece. Another request was sent Wednesday August 10 to obtain both air and land resources. The following European resources were engaged on the Landiras 2 fire: From Germany, 64 firefighters and 21 vehicles; from Greece two Canadairs; from Italy two further Canadairs; from Poland 146 firefighters and 49 vehicles; from Austria 73 firefighters and 14 vehicles; and from Romania 77 firefighters and 14 vehicles. Two Swedish Air Tractors were also assigned to the departments of Morbihan and Finistère.

Box 5: Saumos France wildfire, 12 September 2022



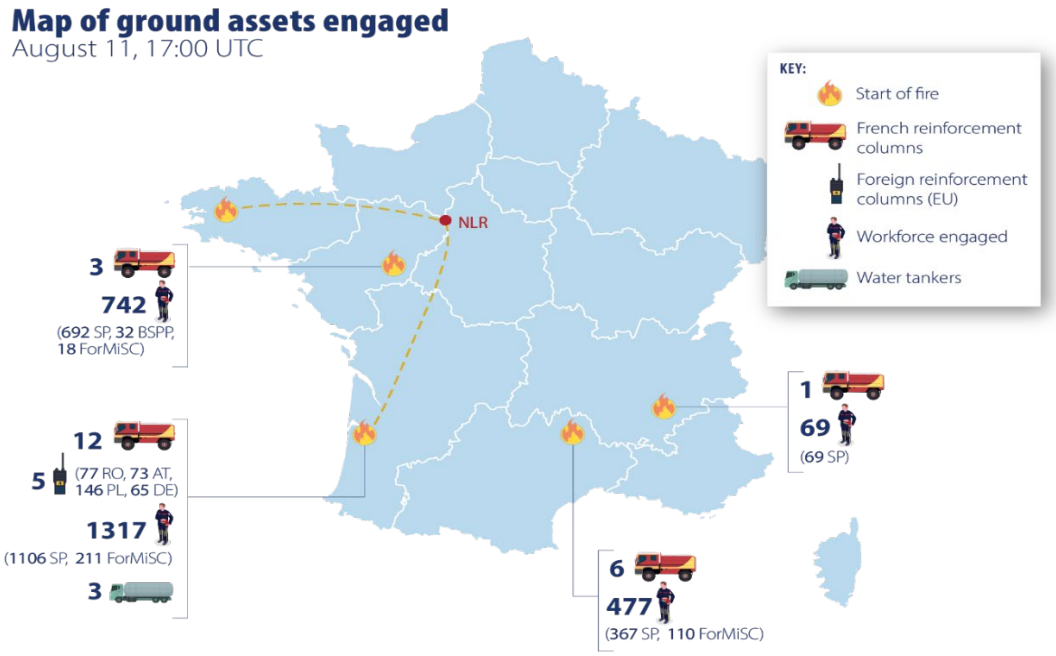
Source: PCF, Copernicus, and Observatoire des Risques Nouvelle-Aquitaine, 2022

Figure 13: Overview of engaged aerial assets on 11 August 2022



Source: PCF and DGSCGC (France)

Figure 14: Overview of engaged ground assets on 11 August 2022



Source: PCF and DGSCGC (France)

1.2.6. Lessons learned and proposed actions

Summer 2022 was marked by large, simultaneous fires affecting both rural and metropolitan areas, notably on the Mediterranean coast. Regions such as Finistère and Indre-et-Loire faced fires exceeding 1,200 hectares, while Morbihan, Jura, Isère, Loire-Atlantique, Sarthe, and others experienced some of their largest fires. To better adapt civil security measures to climate change, a focus on key areas is needed.

1. **Aggressive initial attack of new fires**

At the core of civil security's strategy against forest fires is a pre-emptive and aggressive initial attack on new fires. In summer 2022, this approach mobilized 20,000 firefighters, 25% of the operational force, with substantial reinforcements, continuing a practice effective since the mid-90s that has cut down the extent of burn areas by two-thirds and controlled 95% of fires within 5 hectares. Key to this strategy is the "armed aerial surveillance" by water bombers, a method that needs to be maintained and expanded for wider coverage. Prioritizing aggressive initial attack is essential to reduce and avoid prolonged firefighting efforts. During the peak of the 2022 season, many fires were quickly extinguished through local and national resources, especially because of aggressive, early, aerial support. Nevertheless, capacity limits were likely reached on multiple occasions which highlights the need to diversify and amplify technical means for firefighting, adapting to regional challenges while ensuring interoperability and maintaining national preparedness. It's crucial that these initial responses are not solely reliant on national resources but are supported by a planned deployment of local land resources for a swift, collective response to any fire. Improvements in this coordinated approach are necessary.

2. **Increase operational capacity of massifs**

Mediterranean areas are experienced in air-to-ground coordinated responses and invest nearly €20 million each year to equip themselves with departmental fleets of water bombers and ample land-based resources. However, there's a lack of familiarity with forest fire risks in the southwest quarter and

northern half of the country. The national forest fire suppression doctrine, established in 2020, is yet to be uniformly applied, indicating a need for improvement. With climate change expanding fire risks beyond the Mediterranean, it's essential to view these risks as a widespread issue in departmental risk plans, especially in the southern half. Enhancing weather and drought indicators, along with their precision, is crucial for anticipating hazards. This involves close collaboration with public and private sectors. Improved daily indicators will allow for better-tailored deployment of land and aerial resources. Additionally, technological advancements like thermal cameras, tethered balloons, and drones should be utilized to improve firefighting responsiveness and efficiency.

3. Increase capacity and modernize SDIS regions

To enhance fire response, a multi-tiered approach leveraging local, regional, and national resources is needed, with a clear understanding and integration of their capabilities. It's not just about more resources, but also on complementing the existing arsenal with specialized capacity for addressing fires in the Wildland Urban Interface, use of retardants, hydraulic power, heavy machinery, operational accommodations, and more. Initiatives such as 11,000-liter control trucks and public works equipment should also be included. Such advancements would allow for better specialization of conventional means. A national equipment programme addressing capacity needs should be launched, aligning with the National Plan for Climate Change Adaptation (PNACC).

Moreover, increasing volunteer firefighter numbers is critical. To attract volunteers, offering better compensation, employer incentives, state requisitions, and pension benefits should be considered.

4. Broadening the range of air resources and augmenting capacity

The deployment of aerial firefighting resources should be strategic, matching the topography, fire behavior, and type, and should coordinate well with ground operations. Since 2020, heavy helicopters hired by the DGSCGC have been valuable in supplementing both departmental and national fleets. Beyond the already initiated expansion of the national fleet (5 additional DASH in 3 years and up to 9 more helicopters in 2022), diversifying in terms of capacity (medium and large) and type (airplane, helicopter, amphibious or not) will enhance the DGSCGC's operational efficacy. With fire incidents rising, aerial resource strategies should consider both purchasing and leasing options. For better preparedness, a comprehensive mapping of all available aerial assets will be conducted. This database, coupled with the option of pre-booking contracts, will enable quicker, more informed decisions during crises, streamlining the deployment of resources best suited for the situation.

5. An Inter-ministerial platform

While the efforts of firefighters are crucial, forest fire prevention is a year-round endeavour, necessitating collaboration across various stakeholders. Solely bolstering firefighting resources won't suffice to enhance the national strategy's efficacy which is why an inter-ministerial platform is needed to address integrated fire management, collaboration, and communication amongst the relevant stakeholders.

6. Fire prevention is paramount

Emphasizing prevention and raising public awareness are critical due to the human origins of over 90% of fires and their frequent occurrence near residences (80% of fires start within 50 m of residences). Urban expansion into high-risk Wildland-Urban Interface zones increases the potential for damage and complicates fire suppression by spreading resources thin across multiple vulnerable points. Furthermore, adherence to vegetation clearing mandates is low, at around 30%, exacerbating fire

spread and endangering responders who are obligated to shift priorities. To combat this, insurance incentives and stronger enforcement of local authority regulations are recommended. Additionally, forest protection facilities are unevenly distributed, impacting response times. In high-risk areas, especially some silvicultural practices that neglect fire prevention / protections measures need attention (Préfète de Nouvelle-Aquitaine, 2022).

7. A territorial approach is needed

The challenges detailed above became more pronounced during the summer of 2022, necessitating regulatory adjustments tailored to the unique risks posed by forest fires in different territories. If local awareness doesn't result in tangible measures, stricter enforcement, like heftier fines for non-compliance with brush-clearing laws or leveraging insurance policies to increase penalties for proven non-adherence, might be required.

Effective change mandates an inter-ministerial approach, involving at least the ministries of Interior, Ecological Transition, and Agriculture. Within a collaborative national structure, the foundational principles of the national strategy should facilitate local application, eliminating silos among authorities responsible for prevention services and activities. At the central level, the Ministry of the Interior should stand as the anchor of the national strategy, which is currently fragmented across four ministries. Such a consolidation, recommended by numerous parliamentary reports, is imperative. Highlighted by the Minister of Prefects and Territories, the forest fire trends further underline that territorial considerations (including agricultural / land abandonment) are integral to understanding and mitigating the escalating risks, chiefly forest fires.

1.3. Case Study: Castilla-La Mancha, Spain

1.3.1. Introduction to region

In 2022, forest fires affected large areas of Spain. Although it was an extraordinary season throughout the country, some regions such as Castilla-La Mancha were less severely affected, and it is worth analysing the factors that can lead to minimising the impact of fire in such anomalous circumstances.

Figure 15: Autonomous region of Castilla-La Mancha

Source: PCF

Castilla-La Mancha is an autonomous community located in the middle of Spain, it has 79,463 km² of total surface area of which 45% is forest and wildland areas. In general terms, the region has a central flat area dedicated to agriculture, called La Mancha and an important and heterogeneous forestry area surrounding it.

According to the official national statistics, in 2022 Spain had 267,946 ha of forestry area burned in 10,507 wildfires (not including the fires affecting exclusively agricultural land). Castilla-La Mancha represents 15.7% of the national territory and in 2022 some 14,033 ha of forestry area burned (well below the 15.7% share) in 633 wildfires. On average, the region has 804 wildfires every year affecting to 5,318 ha; so, in 2022, despite having fewer fires than average, they affected a much wider extent. This is an indication of how difficult the 2022 season for all fire prone countries was. The most important wildfires are shown below in Table 2.

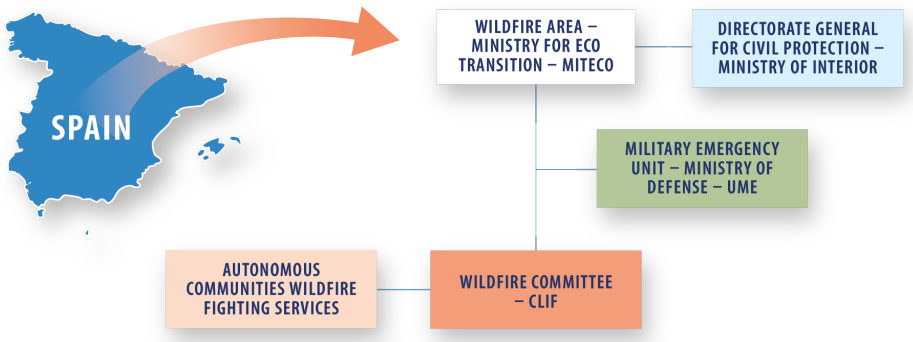
1.3.2. Governance and assessment of wildfire risk management in the region

In Spain, the competences in firefighting fall on the Autonomous Communities. The National government plays a role of coordination and has resources for reinforcement of the Autonomous Communities. The different Ministries involved in the emergency are coordinated in the CECOD following the National Civil Protection Plan for Wildfires Emergencies. There is also a national committee where the different wildfire fighting services and the Ministry for Eco Transition (MITECO) get together, discuss and find agreements on common problems, it is called the CLIF (Figure 16).

The National Civil Protection Plan for Wildfires Emergencies has 2 objectives:

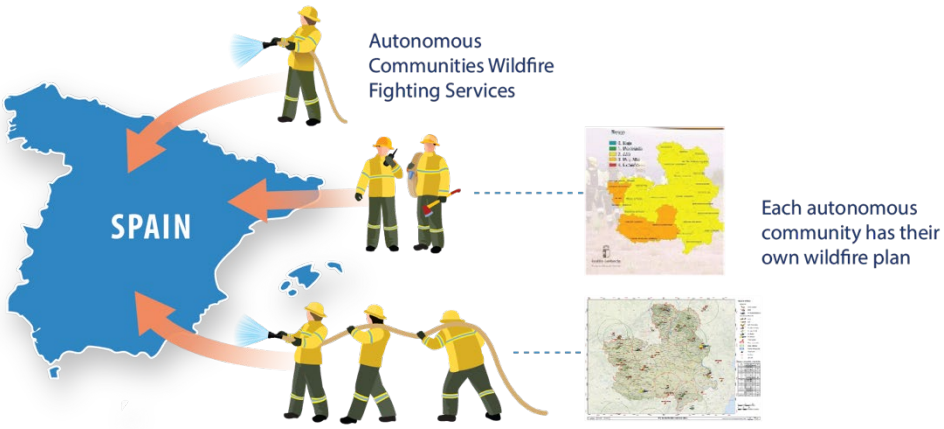
1. Provide the necessary support to Wildfire Plans of the Autonomous Communities when they require it, including the collaboration of the Autonomous Communities' plans with each other.
2. Establish the organization and procedures for action to ensure an effective response from all Public Administrations in cases of emergency due to forest fires in which the national interest is present.

Figure 16: Organisation of responsible agencies for wildfire management in Spain



Source: PCF

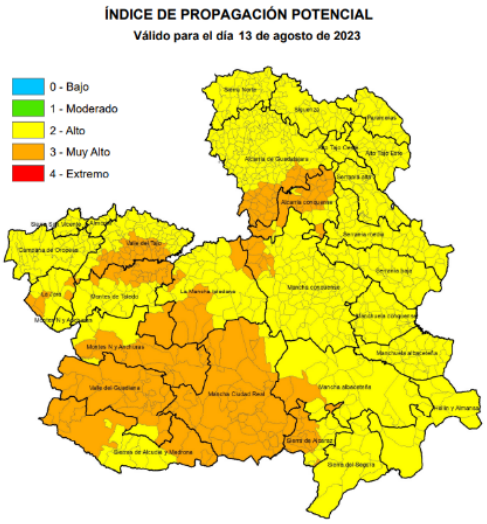
Figure 17: Wildfire plans and firefighting resources of autonomous communities



Source: PCF

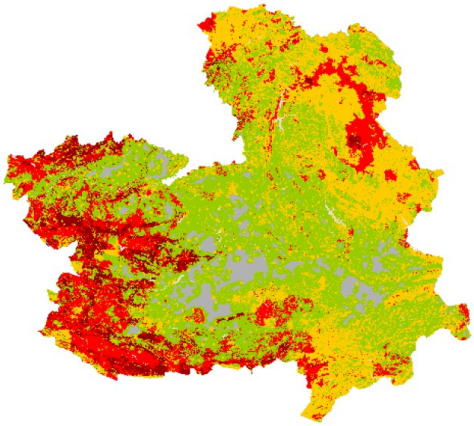
Each Autonomous Community also has its own early warning system and its own risk assessment. Castilla-La Mancha have a unique early warning system called the IPP (Potential Propagation Index). The index is composed of a climatic and a meteorological part based on a conceptual model of the fire regime in the region. The climatic part is based on the identification of anomalies in average temperature conditions and drought conditions. The meteorological part has an architecture based on the Canadian Fire Weather Index and is based on data from weather forecasting (Figure 18). Two factors have been analysed for risk assessment: hazard and vulnerability. The hazard refers to the probability of a forest fire occurring or acquiring a certain magnitude, and vulnerability refers to the susceptibility of an element to be affected and the existence of values at risk. Risk is defined by the integration of both factors.

Figure 18: Potential fire propagation index and severity in Castilla-La Mancha



The risk assessment is carried out from 3 points of view:

- The environmental risk: in which physiographic and climatological factors are analysed.
- The risk of the existing forest fuel: in which the existing fuel models are analysed.
- Statistical risk: in which the frequency, severity and causality of fires are analysed.



The vulnerability analysis considers another 3 elements:

- The presence of humans: analysing the existence of population centres, dispersed buildings, or areas of possible human concentration in forest land (recreational areas, peri-urban parks, etc.).
- The environmental value: in which the existing protected areas are analysed.
- The efficiency of fire defence: in which the time elapsed from the detection of an outbreak to the arrival of the first fire-fighting force (based on statistical data) and the existence of accesses are analysed.

In accordance with this risk analysis, high and extreme risk areas have been grouped together to form High Forest Fire Risk Zones (ZAR). The rest of the forest area has been designated as Medium Forest Fire Risk Zones (ZRM).

In this way, two prioritisation criteria are established for the definition of preventive measures of high impact on the territory: firstly, on all land within the ZARs, whether forest, agricultural or urban, and secondly, in the rest of the forest lands, thus completing a strategy of prevention, including support for fire suppression, for all the forests in the region.

1.3.3. Wildfire prevention and response

The current legislation about wildfire prevention in Castilla-La Mancha is solely based on the Potential Propagation Index (IPP). Every day this index is calculated in each municipality and depending on this index, the use of fire or other high-risk activities than might cause a wildfire is regulated.

In Castilla-La Mancha the non-commissioned officers' functions are carried out by the forest rangers who also have other forestry functions, which generates a rotating system that implies a high number of personnel. If more rangers are specialised in fire prevention duties, then fewer patrols are needed. All personnel are employed year-round, out of the wildfire season, ground and helicopter firefighters carry out fuel breaks in the forests and various training activities.

During the 'off-season', normally during 8 months per year, the forest firefighters work on forest fire prevention projects like fuel treatments and fire breaks. Every year, between 11,000-12,000 ha are managed only by the people dedicated to fire suppression during the fire season. These prevention activities are carried out thanks to EAFRD funds.

Figure 19: Overview of fire suppression resources in Castilla-La Mancha

Source: PCF

A voluntary firefighter system is not developed in this part of the country. Some volunteers might have logistics and auxiliary tasks for sheltering the people in big emergencies, but they are not involved in firefighting.

1.3.4. Wildfire risk planning and preparedness

The National Civil Protection Plan for Wildfire Emergencies establishes different wildfire preparedness levels:

- **Situation 0**: One or several wildfires that, in their foreseeable evolution, can be controlled with the means and resources of the Autonomous Community plans.
- **Situation 1**: One or several wildfires that, in their foreseeable evolution, may slightly affect the population and non-forest assets and can be controlled with the means and resources of the Autonomous Community plans.
- **Situation 2**: One or several forest fires that, in their foreseeable evolution, may seriously affect the population and non-forest assets, requiring the immediate adoption of protection and relief measures; and it may be necessary that, at the request of the competent body of the Autonomous Community, extraordinary National resources are incorporated.
- **Situation 3**: Wildfire emergency declared of National Interest by the Minister of Interior.

In 2022, four different wildfires reached the *situation 2* (Valdepeñas de la Sierra, Malagón, Humanes and Sevilleja de la Jara and none of them reached *situation 3*). Notably, on 25 July 2022, the region suffered an episode of simultaneous wildfires where 15 fires broke out; four of them were in the same province and three of reached more than 1,000 ha in size. In this episode 6,354 ha were affected that represent more than 30% of the annual burned area.

Table 2: Overview of large fires in Castilla-La Mancha in 2022

Wildfire location	Date	Forestry surface affected (ha)
VALDEPEÑAS DE LA SIERRA	19/07/2022	3,010
MALAGON	25/07/2022	2,271
TOLEDO	17/06/2022	1,804
ALMADEN	25/07/2022	2,041
HUMANES	25/07/2022	1,380
MONTIEL	15/07/2022	970
SEVILLEJA DE LA JARA	29/07/2022	542
HELLIN	13/08/2022	444

1.3.5. Key lessons identified from 2022 and proposed remedies

As an example, the lessons learned in the biggest forest fire in Castilla-La Mancha in 2022 are analysed: Valdepeñas de la Sierra, where around 3,000 ha were affected.

Key lessons identified and proposed actions

a) The fire showed extreme rates of spread in the first hours. A person dedicated to take pictures and send them to the command post in the coordination airplane were crucial to keep track of the development of the situation and to anticipate evacuations and the progression of the fire.

b) The fire caused the evacuation of 500 people, however the activation of the Emergency Director assuming the overall coordination of the emergency as a whole and supervising the job of the Incident Commander, focused fire suppression, worked well. This Emergency Director is also trained by INFOCAM and highlighted the benefits of one agency commanding the whole emergency.

Figure 20: Location of Valdepeñas de la Sierra fire

Training is usually carried out by the autonomous communities, but there is no certification or standardization. There are no specific training schools for forest fires with the necessary requirements for current emergencies.

Proposed action: It is necessary to have a forest fire training school in accordance with current emergencies and a homogeneous system to accredit to the worker and their different roles.

c) The proximity of the fire to the Madrid region showed the need for a common emergency management system that allows for better integration of both agencies and a compatible command structure.

Proposed action: Joint exercises between Madrid and Castilla-La Mancha agencies to identify the gaps and agree on a common system to address joint emergencies. This measure can be extended to the rest of the autonomous communities.

d) Aerial coordination can be a bottleneck when too many aircrafts are assigned to operate on a single fire. Castilla-La Mancha dispatched more the 25 aerial assets, while Madrid also dispatched several helicopters which caused a coordination problem for the Aerial Coordinator.

Proposed action: Improve the communication in cross-border emergencies to keep the span of control regarding the number of aerial means working at the same time and to avoid security and communication problems.

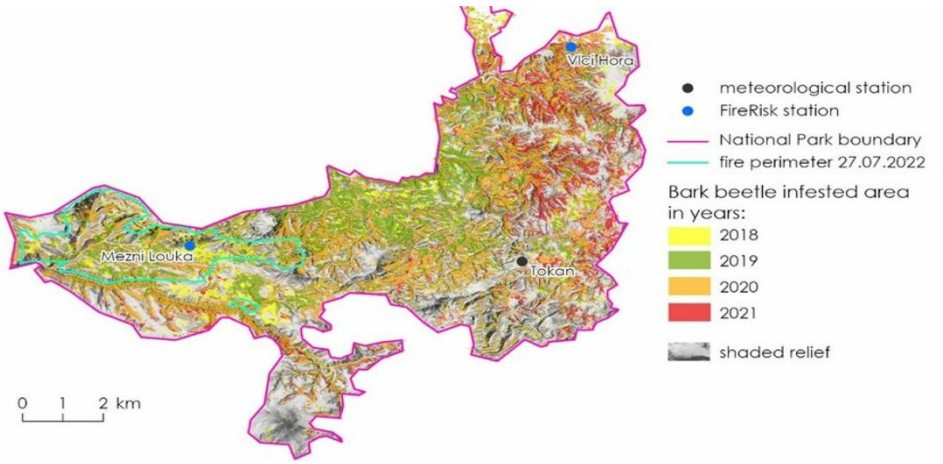
1.4. Case Study: Switzerland Bohemia National Park, Czech Republic

1.4.1. Introduction to the area

Spanning 80 km² in the Czech Highlands' Děčínská vrchovina province and averaging 358 meters above sea level, the Czech Switzerland National Park is 97% forested, with spruce making up 60% of the trees. The landscape is characterized by sandstone formations and notable erosion effects. Exacerbated by climate change, the spruce trees have been majorly affected by bark beetle outbreaks. A "Large-scale wildfires" plan exists for the park detailing protocols for fire management, including precautions like monitoring, entry restrictions, restrictions on burning of logging residues, camping only in designated areas, sources of water and firefighting resources including equipment and personnel. An essential document is the Methodological Guideline, which discusses when to implement or lift forest entry bans. Notably, in 2022, even with a warning of heightened fire danger from the Ústí nad Labem Regional Authority, there was no forest entry bans enacted. However, patrols, equipped to detect and put out fires, were conducted using service vehicles.

No historical fire data exists for this region. At the time of the 2022 fire, temperatures soared to around 30°C, with a high wildfire risk. This was anticipated based on forecasts but cannot be compared to past conditions.

Figure 21: Park boundary and extent of bark beetle outbreak in Czech Switzerland National Park between 2018-2021



Source: Kudlackova et al., 2023

1.4.2. Incident overview and lessons learned from UCPM response

On 4 July 2022, in the Czech Switzerland National Park, Ústí nad Labem Region, near the German border, an area of 1,100 hectares was affected by the largest wildfire in Czech history. The professional fire brigade incurred damages and costs amounting to around EUR 4 million, complemented by an additional EUR 2.5 million in state support for volunteer firefighters. Helicopters from the Police and Army were also deployed and within the framework of cross-border cooperation, also aircraft from the Federal Republic of Germany were used in the initial suppression phases. Approximately 6300 firefighters deployed and almost 10 km of hose lines were constructed.

Figure 22: Scene from Czech Switzerland National Park during final mop-up stages

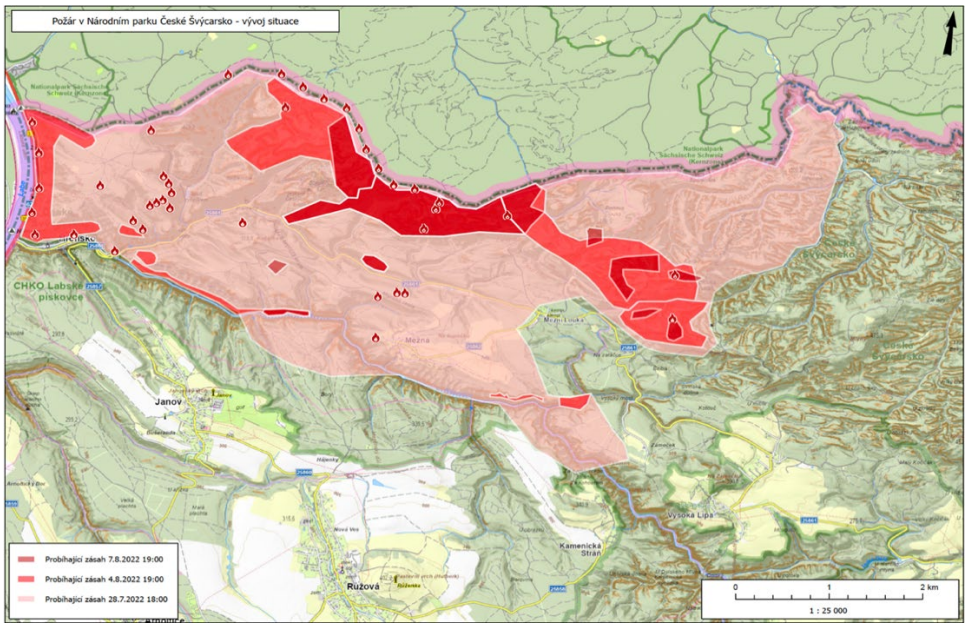
Source: General Directorate of the Fire and Rescue Service of the Czech Republic

On 26 July, the Czech Republic eventually activated the UCPM, garnering support from Italy, Poland, Slovakia, and Sweden (mostly aerial assets). As the fire crossed over into Germany, efficient cross-border coordination became paramount. Liaison officers were posted in both countries, ensuring smooth aerial traffic management and a continuous exchange of vital information. The deployment of a new Unmanned Aerial Vehicle System played an important role in detecting hotspots and monitoring the emergency scene in real-time. Coordination needs were further emphasized in conjunction with working with aerial assets from Spain.

An evident challenge that arose was the insufficient number of water sources near the wildfire, necessitating long-distance water transport and the installation of large-volume reservoirs. This incident further underscored the value of sharing expertise and strategies between Southern and Central European nations, not just concerning equipment, but also standard operational procedures. Moreover, after the incident, Czechia stressed the importance of a unified European approach in line with EU directives and recommendations. The aftermath of the wildfire has prompted Czechia to contemplate measures for increased preparedness, such as seasonal team pre-positioning and the introduction of a robust wildfire action plan. Furthermore, given the park's unique terrain and lack of proximate seas,

helicopters emerged as more efficient than planes for firefighting. In early 2023, Czechia expressed its ambition to be a hub for the rescEU helicopter capacities.

Figure 23: Czech Switzerland National Park fire perimeter and progression map



Source: General Directorate of the Fire and Rescue Service of the Czech Republic
Note: Fire extent in the Czech Switzerland National Park – development of the situation. The legend indicates in three different shades the fire progression and intervention progress at different dates.

1.4.3. Governance of wildfire risk management in the region

In the Czech Republic, forest owners or users with continuous stands over 50 hectares must implement measures for early fire detection and prevention during high-risk periods, including patrolling with adequate fire detection and response resources, unless managed by the Ministry of Agriculture. They must also maintain accessible roads for firefighting equipment and create conditions conducive for firefighting and rescue especially during periods of high fire danger. This includes managing combustible materials to limit potential fire spread, establishing firebreaks, and informing firefighters of specific on-site hazards, such as unstable trees from cuts.

During the 2022 NPBS fire, discussions between the National Park Administration and the Fire Brigade revealed that fire safety measures were integrated into various documents, primarily the crisis plan and its appendices. However, there wasn't a clear demand for a dedicated fire safety plan in these talks, and current regulations don't mandate one (it has since been requested). Nevertheless, a focused fire safety plan is recommended as it provides clearer guidelines for effective firefighting and rescue efforts. Historically, due to the limited impact of forest fires, fire risk financing wasn't addressed separately. Fire protection in the park is comprehensively regulated by Czech legislation and the park's internal rules, with regular checks by state and local entities, which when subjected to review, did indicate a resilient system.

1.4.4. Wildfire risk assessment

Fire protection in the national park is structured around legal regulations, standards, and a crisis plan. While the park outlined access conditions and water supply points for firefighting units in its

documentation, there were significant discrepancies in execution. After discussions with the park's administration, the crisis plan was revised, emphasizing fire water availability and road passability. Unfortunately, these measures were not fully implemented.

In 2011, 2014 and 2015, the Park underwent an audit and inspections to verify compliance with fire protection regulations. These reviews included document checks and on-site inspections of buildings, roads, and water sources. As preventive actions, the park developed a crisis plan, fire maps, "rescue points", initiated more fire patrols, restricted public access, and increased public awareness through various information campaigns. Recommendations also included enhancing security services, maintaining road networks, potentially deploying mobile tanks in the park, and conducting more regular patrols during periods of heightened fire danger. It was decided to conduct field surveys, with the Fire Brigade leveraging drones and aerial services for reconnaissance.

One significant challenge is the park's no-intervention zones, where beetle-infested trees remain until they naturally fall. This complicates interventions, as terrain permeability decreases while firefighter risks increase. The national park, especially its restricted zones, poses elevated dangers to first responders, especially due the risk of falling trees and also pose major access challenges. These concerns could be leveraged to advocate for a fire safety plan or legislative changes. National parks consist of various zones, each with its distinct intervention permissions.

1.4.5. Wildfire risk management planning and wildfire prevention

The local government ordinance details the requirements for securing firefighting water sources and their identification; this information is part of the county's fire protection documentation. This documentation outlines the identification, conditions for their consistent use, and an annex detailing each water source type, water volume, and responsible individuals.

Two primary legislative frameworks encompassing forest fire prevention are:

1. **The Forest Act:** This prohibits activities like smoking, open fires, and camping outside designated areas, and lighting fires within 50m of the forest edge. It states the responsibilities of forest owners and emphasizes preventive measures against fires, with a note that the act itself also supports the Fire Protection Act. It also details emergency measures to reduce damage to forests. State support for forests and forest owners includes services or financial assistance, and ensuring protection against fires.
2. **The Law on Nature and Landscape Protection:** This forbids actions like fireworks in national parks and storing chemicals or fuel outside designated areas. Forest owners and leasers in national parks must manage them to maintain ecological balance and biodiversity. To protect plants, animals, habitats, or manage non-native species, nature conservation authorities are permitted to conduct controlled burns, but they must take preventative measures against fires, notify local fire brigades, and may need to follow additional conditions.

Preventive measures encompass monitoring during high-risk periods, fire bans during dry seasons, camping restrictions, and requirements for emergency resources. A "Fire Map" is incorporated within planning documents.

Additionally, Methodological Guidelines provide information on topics like criteria for declaring or lifting forest entry bans, responsibilities of the national park's departments, public notifications, signage methods, and duty schedules for forest guards.

1.4.6. Wildfire preparedness

Bohemian Switzerland National Park failed to maintain fire protection measures outlined in the Fire Protection Act. Although they documented fire water sources and access roads, they didn't maintain them effectively.

There's a need to revisit fire protection in larger forest areas like the national park. Specifically, clear standards are lacking for the quantity of fire water sources, access roads, and the responsibilities of forest owners. These standards should align with the Fire Protection Act and necessitate the creation of a fire safety plan.

Considering the relatively small scale and severity of forest fires in the Czech Republic, wildfire detection mainly relies on citizen reports, and occasionally by forest or air patrol. Automatic area monitoring systems using cameras or satellites are not yet used for primary detection.

Fighting wildfires is a normal part of fire brigade training, but there are no specialized wildland firefighters. Basic wildfire response is including as normal training like other types of incidents such as traffic accidents or structure fires. Methodological guidelines for wildfire suppression are under development and focus on suppression tactics for first responders. There are also regular tactical drills for firefighting units, especially in areas with increased risk. Special fire trucks with a large water capacity or good mobility in the terrain are used to respond to wildfires. Helicopters of the police or army with extinguishing bags of up to 2500 litres of water are also used.

For extreme wildfires, fire departments may receive additional funding. The Czech Republic collaborates internationally, exchanging wildfire information through the CTIF Commission. With a comprehensive network of fire protection units across the country, early-stage fires are usually managed effectively. For larger fires, support from neighbouring regions is common.

1.4.7. Key lessons identified from 2022 and proposed remedies

Overall, the fire in the BSNP highlighted some main factors which contributed to the fire being able to spread and accelerate the way it did. The challenging terrain and condition of the forest roads (inadequate, blocked by fallen trees, etc.) hampered unit mobility of responders. Large quantities of fallen and standing dead trees due to protected area status and bark beetle infestation accelerated fire spread and prolonged burning and heat residency; some trees were intentionally weakened (cut) by the park authorities prior to the fire to fall with strong winds – this added another hazard for firefighters. Persistent drought and high temperatures did not offer relief for firefighters throughout the several weeks it took to finally extinguish the fire.

Key lessons identified (a-h) and proposed actions

a) The fire demonstrated the efficiency of the fire protection system, driven by the cooperation of professional and volunteer firefighters. The Fire Brigade of the Czech Republic effectively mobilized resources from across the country. The integrated rescue system principles guided the intervention. Funds from climate change programmes acquired by the State Material Reserves Administration supported capacity building. The Police of the Czech Republic coordinated aviation deployment; the Czech army also provided resources and support. The EU Civil Protection Mechanism was effectively utilized and the experience of the Fire Brigade of the Czech Republic from foreign operations (e.g. forest fires in Greece 2021) proved valuable.

b) Current laws don't adequately address fire protection, especially in national parks. There's no standardized risk assessment and appropriate intervention strategies for national parks, and deficiencies exist regarding firebreaks, water supply, access roads, and firefighting documentation. There are no rules for fire safety at the interface between forest areas and inhabited areas.

Proposed action: Amend legislation for enhanced fire protection in forests and in protected areas and form an inter-ministerial working group to draw insights from international good practice.

c) Water sources and supply for fire suppression in forests and adjacent areas is insufficient.

Proposed action: Increase the availability of water sources for fire suppression in forest plantations and adjacent populated areas (construction of basins, addition of hydrants).

d) There is no aerial firefighting service for forests under the Ministry of the Environment. Private entities had to provide aerial support via contracts with the Ministry of Environment and the existing service by the Ministry of Agriculture is suboptimal due to aircraft unreliability and the insufficient water-carrying capabilities of the aircraft.

Proposed action: Extend the aerial firefighting system to forests managed by the Ministry of Environment and establish an aerial firefighting service to provide aircraft or helicopters with a water capacity of 3,000 litres of water or more. Engage the Czech Republic more in the rescEU system.

e) Deficiencies were detected in the initial dispatch of resources by the fire department: When the fire brigades were dispatched on 24 and 25 July, the extent of the fire was not correctly estimated, and the number of units was not sufficient. The situation and severity of the fire was underestimated.

Proposed measure: Adhere to regulations and operational procedures. Create a support group within the Fire Brigade for large-scale interventions or appoint a qualified incident commander by internal decision of the Czech Fire Brigade.

f) In the case of the Fire Brigade of the Ústí nad Labem Region, the protocol for sending suppression resources is only adequate up to a level 2 alarm.

Proposed measure: Update the instruction on the preparation of alarm plans with the obligation to prepare alarm plans up to a level 3 alarm.

g) There is an identified need to strengthen cross-border cooperation between the Czech Republic and Germany in the field of joint preparedness for dealing with emergencies in border areas.

Proposed measure: Initiate joint projects and exercises funded by INTERREG.

h) Fire protection units are inadequately equipped for large forest fires, and local brigade units have outdated equipment.

Proposed action: Need for increased funding for the renewal and replenishment of equipment in the Fire Service of the Czech Republic and municipal fire brigade units emphasizing forest firefighting capabilities and preparedness.

2. OVERALL MECHANISM OF THE EU RESPONSE TO TACKLE FIRES AND THE SUBSEQUENT CRISIS MANAGEMENT

KEY FINDINGS

- In 2022, the UCPM effectively responded to increased wildfire activations, leveraging strengths like resource pooling and fast response; however, challenges like inconsistent training emerged, directing future efforts towards expanding capacities and harmonizing systems.
- As the EU bolsters its rescEU firefighting fleet to address escalating wildfires, it's crucial to simultaneously enhance the operational management and coordination capabilities of member states to ensure safe and efficient deployment during emergencies.
- DG-ECHO's Knowledge Network centralizes disaster risk reduction activities, promoting unified project storage, expert collaboration, training, and community engagement in line with the Sendai Framework.
- Despite Europe's varied operating standards hindering a unified firefighting response, a 2022 pilot programme under the ERCC emphasized the benefits and challenges of cross-training and cooperation, underscoring the need for a standardized framework and training before facing high-risk wildfire situations.
- The Wildfire PRAF is a new comprehensive tool for evaluating wildfire management under the UCPM, focusing on seven key areas of wildfire risk management and allowing countries flexibility in the review process.

2.1. Union Civil Protection Mechanism

In 2022, the Emergency Response and Coordination Centre (ERCC) reported 12 wildfire activations, with 11 in Europe and 1 in South America. Seven countries activated the UCPM and 10 Member States provided support through teams and in-kind assistance. This response included 33 firefighting planes, 8 helicopters, 6 ground modules, and 369 first responders with 97 vehicles. The Copernicus EMS was activated 56 times, producing 322 maps, which accounted for 57% of all maps delivered in 2022. These maps aided in both response and recovery. The 2022 wildfire season saw a significant increase in large wildfires and burned areas. Challenges faced by UCPM included limited resources, with a shortage of aerial assets at peak times. To address this, a €55 million budgetary boost was allocated to expand the rescEU fleet in 2023 and 2024. Other challenges included varying transportation times for assets and simultaneous emergencies in different regions. ERCC emphasized the importance of clear communication, accurate information, and coordination between air and ground resources for optimal wildfire response and between local emergency resources and modules from European Civil Protection

Pool (ECPP). They also highlighted the broader capabilities of the ECPP beyond just aerial support and the need to stablish a common operational framework at EU level to respond to wildfire emergencies.[17] From the experience acquired in recent years of the activations of the mechanism for wildfire emergencies, we can assess the strengths and weaknesses of the UCPM (Bloem et al., 2022).

Table 3: Strengths and weaknesses of UCPM

Strengths	Weaknesses/Challenges/Barriers	Future Direction
■ Pooling of resources ■ Institutional framework ■ Solidarity ■ Fast response ■ Resource sharing is cost effective ■ Continuous systematic incremental improvement	■ Training and familiarity not always adapted to setting of requesting country. ■ Different national fire management systems.	■ Potentially expanding and improving capacities of Civil Protection Pool and rescEU. ■ Improving convergence of training and systems

Source: Bloem et al., 2022 and PCF
Note: The authors do not find this list exhaustive, especially in terms of weaknesses/challenges/barriers

Figure 24: UCPM activations during the 2022 fire season

Source: PCF and DG-ECHO

2.1.1. RescEU

To strengthen the EU response to wildfires, the EC finances the stand-by availability of a firefighting fleet embedded in rescEU. Following several record-breaking wildfire seasons in Europe, rescEU is being reinforced to make available more aerial means every year. The Commission decides jointly with

[17] 2023 UCPM Lessons Learned Workshop

relevant MS on the deployment of these resources. This comes on top of other measures under the UCPM, such as the use of prepositioned ground teams to exchange knowledge and experiences and to ensure a prompt response in wildfire-prone countries. In parallel, the EC is also financing the development of a more ambitious future rescEU with a permanent fleet composed of medium amphibious planes and helicopters.[18]

It is important to emphasize that the increase in resources within the rescEU must be accompanied by an increase in the operational management capacity of these resources to get the most out of them when they are deployed to an emergency. Not all countries that request help from the mechanism have the requisite knowledge and resource management capabilities, including adequate training, experience, and competencies — especially in air-to-air and air-to-ground coordination. Many experts agree it is necessary to strengthen this area within rescEU to ensure future operations are safe, effective, and efficient when rescEU resources are deployed on international missions.

2.1.2. Wildfire Peer-Review Assessment Framework (PRAF)

The Wildfire Peer Review Assessment Framework (Wildfire PRAF) is a new specialized risk management and civil protection systems, emphasizing the hazards of large-scale fires in diverse landscapes. Originating from the Union Civil Protection Mechanism's (UCPM) Peer Review Assessment Framework, its purpose is to guide rigorous examinations of wildfire management systems under the EU's Civil Protection Mechanism across various countries. It encapsulates seven primary thematic areas crucial for assessing wildfire risk management capacities. Moreover, while aligned with UCPM policies, it extends beyond traditional areas to encompass emergency response, recovery, and deriving lessons. Countries or regions have the flexibility to decide their review's focus, be it comprehensive or targeted. The entire peer review process is meticulous, adhering to the ISO 22392:2020 standard, but further enriching it with steps like self-assessments by host nations and post-review evaluations to gauge the uptake of recommendations (Casartelli, 2023).

Figure 25: Seven thematic areas evaluated by the Wildfire PRAF

[18] https://civil-protection-humanitarian-aid.ec.europa.eu/what/civil-protection/resceu_en

2.1.3. European Civil Protection Pool

Recent episodes of extreme wildfire inside and outside the EU have activated the EU Civil Protection Mechanism and have shown that it is crucial to have resources than can be deployed internationally to an affected country with the same capacities and working procedures.

The countries participating in the EU Civil Protection Mechanism encompass 31 different standards of operations (SOPs). Variations in operating procedures create practical barriers to the creation of a fully effective firefighting mechanism in the EU[19].

While there is a pool of various resources offered by MS, Europe currently lacks a common operation framework for the forest fire modules integrated in the European Emergency Response Capacity (EERC). Lacking is a definition of the forest fire field exercise for their certification, a standardized firefighting training programme and a network for exchanging knowledge and experiences among forest fire modules. It is anticipated that extreme wildfire events will become more frequent in the future, it is therefore crucial to design a common operation framework for wildfire and assessment modules that can be deployed on an international mission based on the standardization of the capacities, competences, skills, and training.

2.1.4. DG-ECHO Knowledge Network Initiatives

With the launch of the Knowledge Network in December 2021, DG-ECHO created an umbrella for already existing programmes like the exchange of experts programme and expanding the scope of activities conducted through ECHO. The Knowledge Network also places emphasis on a platform to showcase ongoing projects with a server to continue to store information beyond project durations – new projects will not receive budgets for constructing new websites in an effort to amalgamate and retain project outputs on a permanent server. The Knowledge Network activities currently encompass a range of topics while their constitution also allows for a broadening of scope beyond just classical civil protection responsibilities but has advanced on the overall objectives regarding integrated disaster risk reduction and adhering to the principles of the Sendai Framework[20]. The main activities of ECHO's Knowledge Network include: [21]

- **Training programme:** A training programme for civil protection and emergency management experts working together on prevention, preparedness, and response by ensuring compatibility and complementarity between intervention teams and by improving the competence of the experts involved in the EU Civil Protection Mechanism. [22]
- **Civil protection exercises:** Exercises aimed at improving preparedness and enhancing collaboration among European civil protection experts and practitioners. [23]
- **Exchange of experts programme:** An exchange programme where civil protection experts spend a period in another member or participating state to the EU Civil Protection Mechanism. The aim is to share experiences and gain in-depth technical skills. [24]

[19] DG ECHO. Study on wildfire fighting resources sharing models Final report, October 2010

[20] The Sendai Framework focuses on the adoption of measures which address the three dimensions of disaster risk (exposure to hazards, vulnerability and capacity, and hazard's characteristics) in order to prevent the creation of new risk, reduce existing risk and increase resilience (UNDRR: https://www.undrr.org/implementing-sendai-framework/what-sendai-framework#:~:text=The%20Sendai%20Framework%20focuses%20on,existing%20risk%20and%20increase%20resilience).

[21] https://civil-protection-humanitarian-aid.ec.europa.eu/what/civil-protection/eu-civil-protection-knowledge-network_en

[22] https://civil-protection-knowledge-network.europa.eu/disaster-preparedness/union-civil-protection-mechanism-training-programme

[23] https://civil-protection-knowledge-network.europa.eu/disaster-preparedness/civil-protection-exercises

[24] https://civil-protection-knowledge-network.europa.eu/disaster-preparedness/exchange-experts-civil-protection-programme

- **Lessons learnt programme:** A broad lesson-learned programme, including the development of good practices with a purpose is to enhance efficiency and effectiveness of practitioners inside the Mechanism.[25]
- **Scientific advice and innovation:** A connection with scientific networks to provide the EU Civil Protection Mechanism with specific expertise and stimulate research and innovation.[26]
- **Thematic workshops and conferences:** Learning and networking opportunities designed around specific existing or emerging needs and risks management. These initiatives help experts gain cutting-edge knowledge on specific topics.[27]
- **Community engagement:** Regular dialogue on civil protection and disaster management between the members of the Knowledge Network community, to create a community-oriented and active network.
- **Partnership facilitation opportunities:** Funding of initiatives to bring the civil protection and disaster management communities closer together and foster their collaboration.[28]

2.1.5. Rapid analysis of 2022 UCPM prepositioning and activations

In 2022, a pilot programme to improve interoperability between forest fire modules under the umbrella of the ERCC was launched. Northern European resources were prepositioned in fire prone countries like Portugal and Greece, to exchange knowledge and experience around wildfire emergencies. Feedback from these prepositioning exercises were immensely positive. For example, according to the leader of a German team deployed to Greece in 2023, the team received critical training and capacity development through the host nation and learned about operational and environmental realities very different from their own in Germany. The networking and cooperation that resulted from the deployment was very positive. Nevertheless, he conveyed a huge sense of relief that no major fires broke out during their deployment as the exercise also made apparent the major gaps in training, compatibility, competencies, and overall preparedness of the German firefighters should they be required to operate for the first time in a Greek context. The biggest take-away was the importance of conducting such exchanges during peacetime first, before the need arises to intervene in an extremely dynamic and dangerous situation like the one which arose in Rhodes and near Athens less than two weeks after the German team returned home.

Successes

Bulgaria has established effective bilateral cooperation agreements with neighbouring countries, even extending to non-EU states. In Croatia, there has been year-round collaboration with Slovenian firefighters that spans from training sessions to social events, with a particular emphasis on enhancing cooperation with aerial resources for air-to-ground coordination. The Czech Republic has reported very positive feedback regarding success with UCPM and RescEU, highlighting them also as valuable learning environments. Norway's experience with pre-positioning and deployment of resources has proven insightful, helping the country identify areas of improvement for future preparedness. Meanwhile, Sweden has recognized Czechia for its excellent Host Nation Support, and Romania has noted the benefits of efficient coordination and communication with international collaborators, especially appreciating the optimal resource use and expertise sharing during their deployments.

[25] https://civil-protection-knowledge-network.europa.eu/eu-civil-protection-mechanism/ucpm-lessons-learnt-programme
[26] https://civil-protection-knowledge-network.europa.eu/knowledge-network-science
[27] https://civil-protection-knowledge-network.europa.eu/news-stories-events
[28] https://civil-protection-knowledge-network.europa.eu/projects/search

Improvement opportunities

Improvement opportunities have been identified across various European nations in their approach to wildfire management, for example:

- **Croatia** suggests permanently establishing the GFFF/GFFF-V module for immediate deployment instead of ad-hoc task force creation (currently underway).
- **Germany**, in 2022, primarily utilized rescEU during the mop-up phase and lacked personnel trained for wildfire response. Their aerial suppression in Saxony was limited by inexperience, and their deployment of untrained firefighters in Greece was criticized.
- **France** sees a need to enhance reliability on assets during simultaneous events and streamline the response request process.
- **Greece** advocates for a module specializing in forest fires for more significant incidents.
- **The Netherlands** aims to bolster its cooperation with UCPM and rescEU.
- **Italy** believes UCPM modules should be self-sustaining, suggests improved air coordination, and highlights that while aerial strategies are effective, ground coordination and information sharing lag behind.
- **Sweden** emphasizes logistical improvements, such as ensuring adequate food and proper accommodations for personnel, along with introducing "quick guides" provided by host nations to introduce local organizational and command structures.
- **Spain** regrets past political pressures influencing resource deployment and sees a need for more wildfire-trained ERCC duty officers. They propose adopting the Incident Command System (ICS) universally and highlight aerial coordination as a significant area for enhancement.

DG-ECHO Lessons Learned Workshop regarding 2022 (DG-ECHO, 2023)[29]

Lessons and good practices identified during the workshop include:

- Clear need for **more assets** (there was an average daily gap of 4 aerial means during the period when the UCPM was activated, with peak days when 10 aircraft were missing to fulfil requests).
- Need for logistics aspects to be taken more into consideration including the ones that would allow **increasing interoperability** amongst modules (e.g., spare pieces for deployed planes).
- **Diversification** in type of planes and other assets related to different scale of wildfires across various countries.
- Further improve the monitoring of forest fires and, where possible and appropriate, consideration of an **earlier request for assistance** to enhance the speed of mobilisation and reaction, bringing fires under control before they become unmanageable.
- Exploration of **airlift or other way of transport** in order to decrease the time of response.

[29] Note: This workshop mainly attracted civil protection authorities focused on response. It missed input from stakeholders outside the fire response cycle. Differences between southern countries and, for example, northern European ones weren't fully addressed. Not every member state participated, and wildfire expertise wasn't required to attend.

- Assuring safety of crews and ground forces, through an appropriate **air to air** and **air to ground coordination**. The process should be anticipated, defined and known before any deployment or request for assistance.
- Preparing in advance the Host Nation support by identifying **scooping areas** as well as providing trainings for experts to better adapt to the **specificity of the terrain** of a hosting country.
- Positive feedback on **pre-positioning exercise** encourages the continuation of the implementation of the project in the coming year.
- Reduction of the element of unpredictability through **monitoring tools** (incl. Copernicus services) and larger aircraft fleet available for support.
- Requirement for the input and contribution from all MS to the UCPM **action plan to strengthen prevention**.
- Stepping up knowledge exchanges between MS to ensure sharing and development of **good practices, expertise and guidance**, with emphasis on countries that usually were not affected by wildfires.
- Importance of **risk awareness campaigns** in reduction of human-induced ignitions. Commission should continue facilitating the exchange of expertise and collecting good practices.
- Development of a new tool helping countries to assess their strategies and plans for wildfire preparedness based on **peer review** and **self-assessment**.

3. USE OF COHESION POLICY FUNDS AND EU SOLIDARITY

KEY FINDINGS

- The Cohesion Policy framework includes several funds, four of them are being used to directly support wildfire risk management:
- Cohesion Fund: during the cycle 2014-2020 three countries used the funds for wildfire risk reduction and fire management: Poland, Portugal and Hungary. The new 2021-2027 states more clearly the investments that can be done in wildfires, which could help countries identify how they can use the funds for wildfires.
- European Regional Development Fund: during the cycle 2014-2020 a total of 17 European regions have benefited from the fund: Spain (2), Greece (7), Italy (2), Poland (5), Hungary (1). The 2021-2027 cycle is expanding the funding on disaster risk management to 15 countries, but it is unclear which countries will invest specifically in wildfire risk reduction.
- Interreg programme: there is a clear impact of Interreg on wildfire risk reduction. The example analysed, the cross-border Interreg Spain-Portugal (POCTEP), a total of 11 projects have been funded that address wildfires directly.
- Solidarity Fund: between the period 2002-2022 the fund has been used for recovery of 8 wildfire events in Europe, however, none since 2017.
- The Cohesion Policy funding did not have a direct impact on the 2022 fire season. However, a number of investments since the 2014 cycle started have contributed to reducing the risk of extreme wildfires over the years, such as: building capacity for response systems, implementing different landscape management approaches, and raising risk awareness amongst the population.

FUNDS

3.1. Identification of the policy and legal framework

The Cohesion Policy is a framework composed of several funding schemes that are used for investing in the European territories. In this section, we analyse how the different funding schemes and programmes are used to fund wildfire risk reduction and management.

Table 4: Summary of the main Cohesion Policy funds used to support wildfire related topics

	EU Solidarity Fund	Cohesion Fund	European Regional Development	Interreg
OBJECTIVES	Not intended to provide immediate emergency assistance, but to contribute to the restoration of normal living conditions	Support to Member States with a Gross National Income per capity below 90% EU-27 average to strengthen the economic, social and territorial cohesion of the EU	Strengthen economic, social and territorial cohesion in the EU; with particular attention to reduce economic, environmental and social problems in urban areas	Support cooperation across regions and countries through funding of projects
INVESTMENTS RELATED TO WILDIFRES	Restoring network infrastructure, including transport and communication; providing temporary accommodation and rescue; restoration of public and cultural assets; enabling businesses to recover; preventive infrastructure and cleaning-up operations	Improving the emergency response capacity (new equipment, PPI and vehicles); improving fire stations for professional and volunteer firefighters; fuel management; improving technological systems for preparedness and response (network of early warning systems)	*	Raising risk awareness, communication campaigns; training and capacity building for the response systems; improve planning in the prevention, preparedness and response to wildfires; fuels management; acquiring new vehicles; improving early warning systems**
GAPS	Eligible operations are not fully aligned with the key principle of "Building Back Better" for disaster risk management	A small percentage of the budget was invested in long term measures such as improved planning, research and innovation projects, and educational projects		Project-type funding allows for testing and piloting approaches and best practices, but not necessarily to consolidation in territory without further investment

**With the information available on the EU websites and also national websites, it has not been possible to access the information on how much was specifically invested in wildlife risk reduction, nor the types of actions that have been funded for that purpose*
***Only includes information of the Interreg V-A Spain Portugal Program (POCTEP)*

Source: PCF (analysis by authors).

3.2. Cohesion Fund (CF)

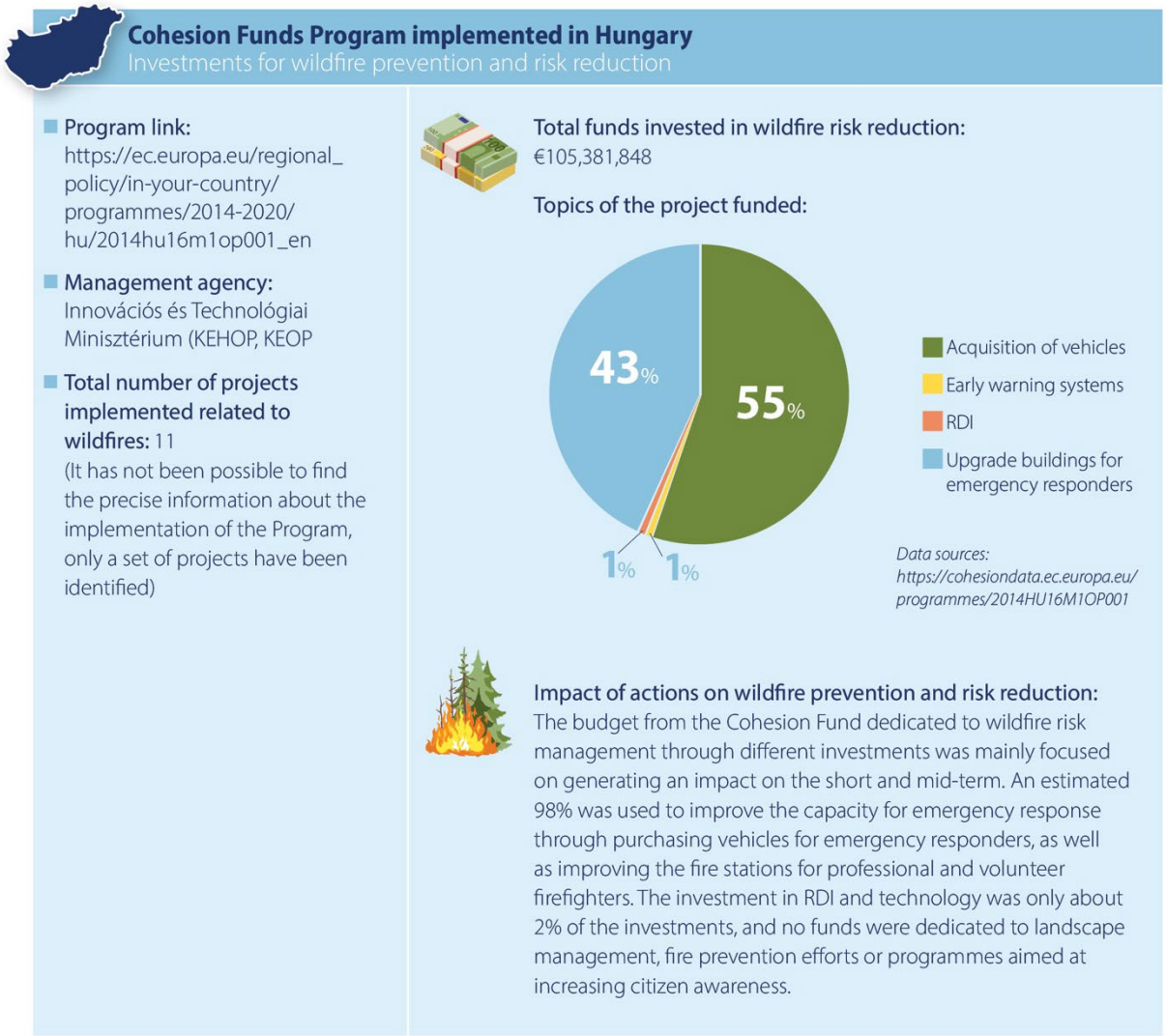
The Cohesion Fund (CF) provides support to Member States with a Gross National Income per capita below 90% of the EU-27 average to strengthen the economic, social and territorial cohesion of the EU. For the 2021-2027 period, the Cohesion Fund concerns Bulgaria, Czechia, Estonia, Greece, Croatia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Portugal, Romania, Slovakia and Slovenia. To analyse the impact of the CF on wildfire prevention and risk reduction, we conducted an analysis of the investments implemented in the previous program from 2014.

From 2014 to 2020, the EU invested in wildfire risk reduction in three countries, Poland, Portugal, and Hungary. The impacts generated by those investments have been calculated to reach over 8.9 million citizens. Topics of the projects funded are shown in the Boxes below.

Box 6: Cohesion Funds implemented in Poland

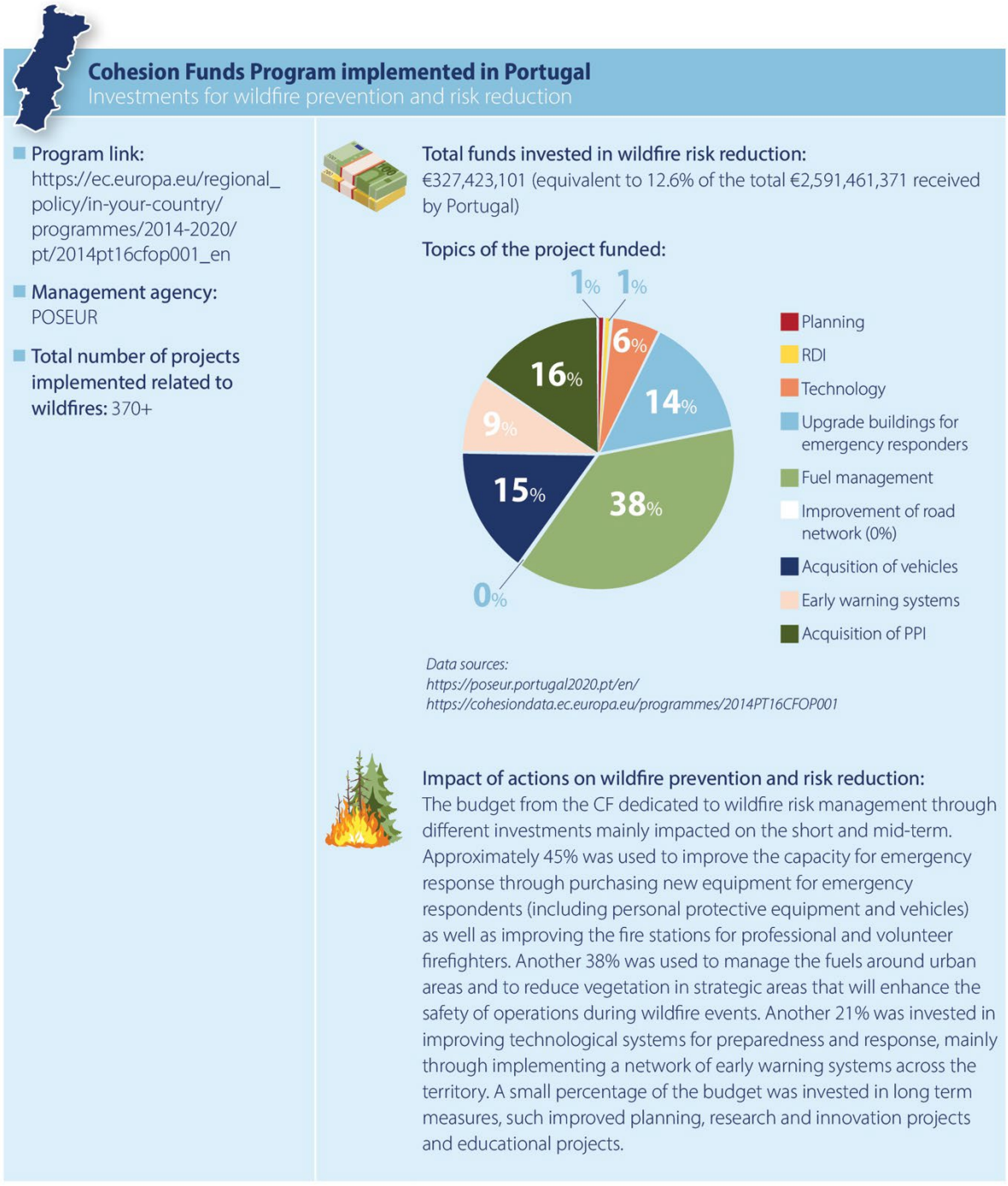
Source: PCF and Cohesion Funds website

Box 7: Cohesion Funds implemented in Hungary



Source: PCF and Cohesion Funds website

Box 8: Cohesion Funds implemented in Portugal

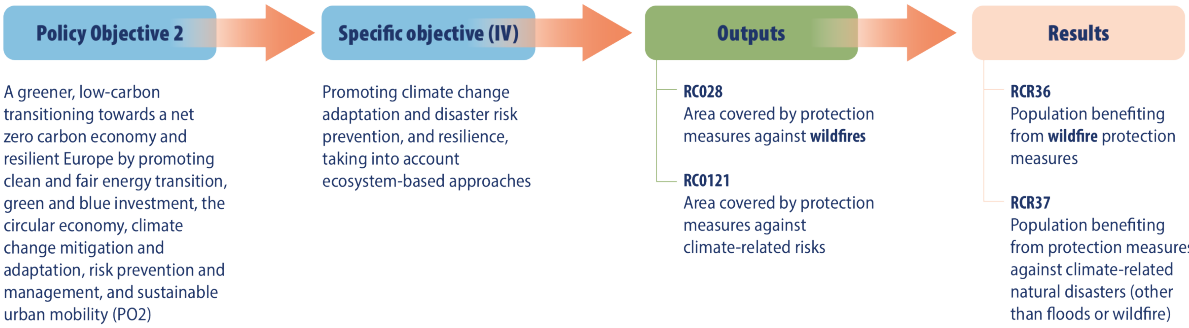


Source: PCF and Cohesion Funds website

In 2021-2027 European Regional Development Fund (c.f. 3.3) and the Cohesion Fund have unified objectives and outcomes to simplify their functioning. In the 2021-2027 programme[30], wildfire risk reduction is specifically mentioned and considered as an outcome and result of the investments:

[30] REGULATION (EU) 2021/1058 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 June 2021 on the European Regional Development Fund and on the Cohesion Fund.

Figure 26: Wildfire-relevant policy objectives of the 2021-2027 ERDF and CF programme



Source: PCF and ERDF and CP website.

3.3. European Regional Development Fund (ERDF)

The European Regional Development Fund (ERDF) is designed to strengthen economic, social, and territorial cohesion in the European Union[31]. The ERDF also gives particular attention to specific territorial characteristics. The ERDF action is designed to reduce economic, environmental, and social problems in urban areas, with a special focus on sustainable urban development. At least 8% of the ERDF resources are set aside for this field through territorial or local development strategies, i.e., Integrated Territorial Investment (ITI), Community-led Local Development (CLLD) but also tools supporting similar initiatives designed by Member States. The ERDF finances programmes in shared responsibility between the European Commission and national and regional authorities in Member States. The Member States' administrations choose which projects to finance and take responsibility for day-to-day management.

To analyse the impact of the ERDF on wildfire prevention and risk reduction, we conducted an analysis of the investments implemented in the previous program from 2014.

From 2014 to 2020, the EU invested in wildfire risk reduction in five countries, Spain, Greece, Italy, Poland, and Hungary (Figure 27)[32]. The impacts generated by those investments have been calculated to reach over 9.7 million citizens. However, with the information available on the EU and national websites, it has not been possible to access the information on how much was specifically invested in wildfire risk reduction, nor the types of actions that have been funded for that purpose.

In the new programme 2021-2027 the investments in wildfire risk management are not yet clear as information is not available. According to the Cohesion Policy website, the new ERDF programme investments on disaster risk management will be 1,912 million EUR, for 15 countries (Figure 28)[33].

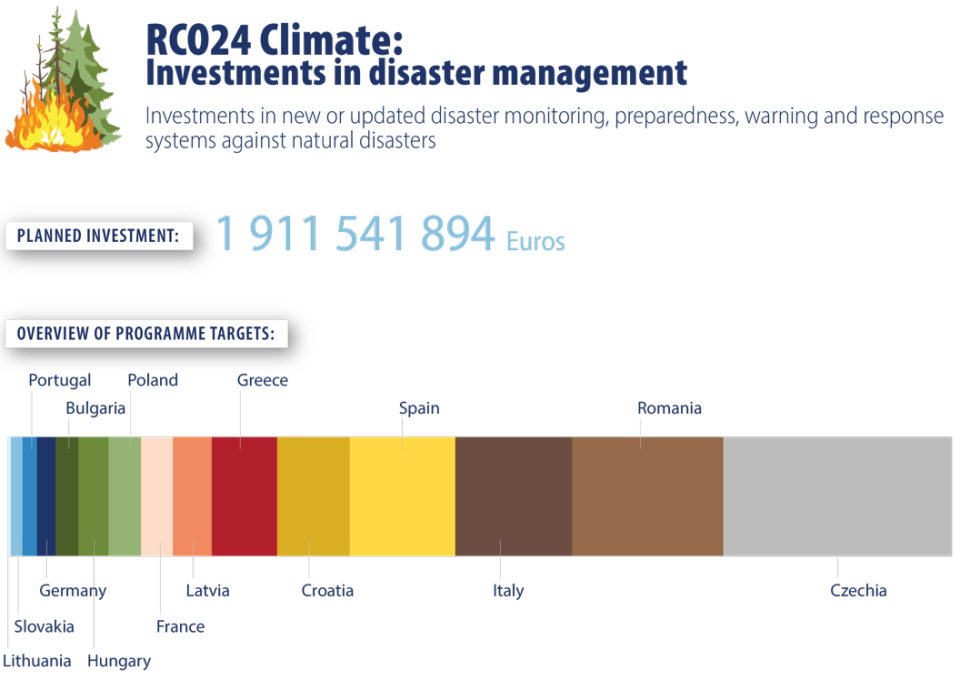
The new programme does not specify on which type of disasters the beneficiary countries will invest in – i.e., no information is available on how wildfire management will be addressed.

[31] https://ec.europa.eu/regional_policy/funding/erdf_en
[32] https://cohesiondata.ec.europa.eu/funds/erdf/14-20#achievements
[33] https://cohesiondata.ec.europa.eu/funds/erdf/21-27#achievements

Figure 27: Regions where ERDF programmes have been implemented

Source: PCF with data from EU Cohesion website.
Note: Regions where ERDF programmes have been implemented, highlighting the following regions (specific information on each programme can be found by using the programme code).

Figure 28: The new ERDF programme on disaster risk management



Source: PCF and the ERDF programme website.

3.4. European Territorial Cooperation (Interreg)

Interreg is the European Union's instrument to support cooperation across regions and countries. Interreg provides funding for projects between Member States, their outermost regions, the EU acceding countries and the neighbourhood countries[34]. During this period, Interreg is to continue to support cross-border mobility, and efforts to develop environmental protection, **emergency services**, skilled jobs, and access to public services for the next EU generation. Wildfires do not respect national borders, which is why wildfire risk reduction and fire prevention strategies are aligned with the vision of Interreg's to improve wildfire risk management governance structures across administrative borders. Nevertheless, there is no language explicitly mentioning disaster or wildfire management in Regulation (EU) 2021/1059 of the European Parliament regarding specific provisions for the European territorial cooperation goal (Interreg) supported by the European Regional Development Fund and external financing instruments[35].

Box 9: Use of Interreg funds for wildfire risk reduction

Use of Interreg Funds for wildfire risk reduction

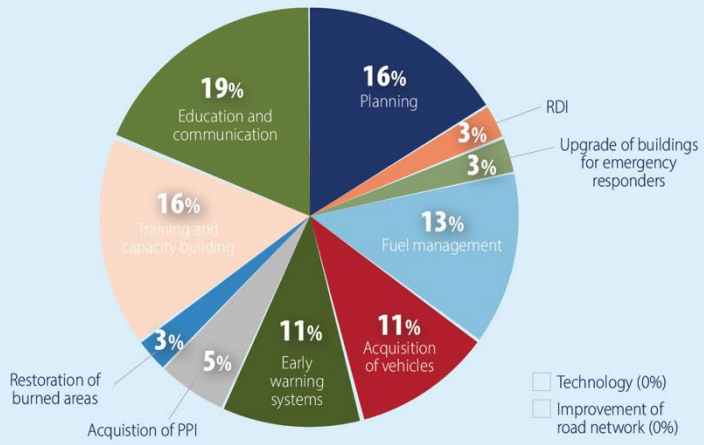
Example of Cross-border cooperation between Spain and Portugal (Interreg V-A POCTEP)

- Cross-border cooperation programs that specifically invest in wildfire risk reduction:
  1. Interreg V-A - Spain-Portugal (POCTEP)
  2. Interreg V-A - Italy-Croatia (2014TC16RFCB042)
  3. Interreg V-A - Italy-France (Maritime) (2014TC16RFCB033)
  4. Interreg V-A - Romania-Bulgaria (2014TC16RFCB021)
  5. Interreg V-B - Atlantic Area (2014TC16RFTN002)
  6. IPA CBC Greece – Albania (2014TC16I5CB010)
- Number of citizens impacted: 19.7 million

Interreg V-A - Spain-Portugal (POCTEP)

- Program code: 2014TC16RFCB005
- Number of wildfire projects related to wildfires funded: 11

Topics of the project funded:



Impact of actions on wildfire prevention and risk reduction: The POCTEP program projects are mainly dedicated to raising risk awareness, educating, and implementing communication for a better-informed population (19%). Training and capacity building for the response systems is another relevant action of the projects (16%), together with improving planning in the prevention, preparedness, and response to wildfires (16%). Many projects are also dedicated to managing fuels (13%), acquiring new vehicles (11%) and improving early warning systems (11%).

Source: PCF with data from the Interreg website.

[34] https://ec.europa.eu/regional_policy/funding/erdf_en
[35] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021R1059

In the period 2014-2020 the Interreg V programme funded over 100 programmes on the following topics[36]:

- cross-border cooperation along all EU land and maritime borders
- transnational cooperation, including macro-regional strategies and sea basins (13 programmes)
- interregional cooperation, which builds networks and lets leading regions share their successes and experience with other territories (4 programmes).

Due to time constraints, we have not analysed exhaustively all the Interreg programmes. But we provide examples of how wildfire risk reduction projects are being considered in some of them.

With a budget of 10 billion EUR the 2021-2027 Interreg fund provides a new generation of Interreg programmes in and outside the EU to further develop joint services and strengthen solidarity[37]. In addition to the current objectives, the 2021-27 programmes aim at better territorial cooperation governance for a safer Europe. The information on how the new programme addresses wildfire-related investments has not been found.

3.5. Solidarity Fund (SF)

The European Union Solidarity Fund (SF) was set up to respond to major natural disasters and express European solidarity to disaster-stricken regions within Europe[38]. The Fund was created as a reaction to the severe floods in Central Europe in the summer of 2002. Since then, it has been covering a range of different catastrophic events including floods, wildfires, earthquakes, storms, and drought. Between 2002 and the end of 2022, the Fund mobilised over EUR 8.2 billion for interventions in 127 disaster events in 24 Member States (plus the UK) and 3 accession countries (Albania, Montenegro, and Serbia). From those, 8% were wildfires.

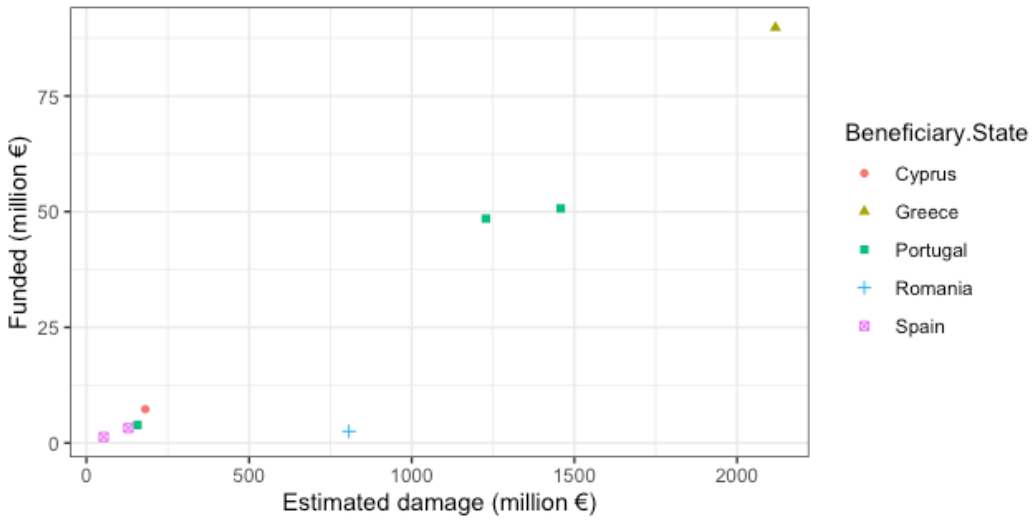
Table 5: Wildfires that received support from the Solidarity Fund between 2002 and 2023

Beneficiary State	**Occurrence**	**Nature of disaster**	**Category**	**Damage (in million €)**	**Total EUSF aid (in million €)**
Cyprus	June 2016	Drought and fires	major	181	7,3
Greece	August 2007	Forest Fires	major	2118	89.8
Portugal	July 2003	Forest Fires	major	1228	48.5
Portugal	August 2016	Madeira fires	regional	157	3.9
Portugal	June-October 2017	Forest fires	major	1458	50.7
Romania	August 2012	Drought & Fires	major	807	2.5
Spain	August 2003	Forest Fires (PT border)	neighbouring country	53	1.3
Spain	October 2017	Forest fires	neighbouring country	129	3.2

Source: Solidarity Fund website.

[36] https://ec.europa.eu/regional_policy/policy/cooperation/european-territorial/interreg-2014-2020_en
[37] https://ec.europa.eu/regional_policy/policy/cooperation/european-territorial_en
[38] https://ec.europa.eu/regional_policy/funding/solidarity-fund_en

Figure 29: Relationship between the estimated cost of the wildfires and the Solidarity Fund support for each event



Source: PCF with data from table 5

How the fund works:

- Countries affected apply for the funds.
- Between the application by the country affected and the granting of the fund, it takes an average 50-60 weeks (Bachtler et al., 2018).
- Applicants must use the financial contribution from the SF within 18 months.
- The funds have been used for: restoring network infrastructure, including transport and communications, providing temporary accommodation and rescue, restoration of public and cultural assets, enabling businesses to recover, preventive infrastructure and cleaning-up operations.

An analysis and discussion of how these funds are utilized in fire management follows in Chapter four.

4. DISCUSSION AND ASSESSMENT OF RELEVANT FUNDING IMPACTS ON WILDFIRE MANAGEMENT

KEY FINDINGS

- Shared management of Cohesion Policy funds between the EU and national agencies can make it difficult to understand, access, and properly use funds, reducing their impact on wildfire management or even resulting in funds being underutilized or reallocated.
- Wildfire management expertise is greatly lacking within ministries and agencies responsible for designing and implementing programmes leading to oversimplified investments that only focus on preparedness and response.
- Measures for fire detection and response have received significant funding, but their net impact on nature preservation is unclear. An increase in burned protected areas indicate funding is not mitigating wildfire risks. Experts advocate for investing in proactive measures like fuel management, prescribed fire application, and forest health to ensure a balanced approach: prevention and landscape resilience over mere fire suppression.
- Funding aids short-term wildfire recovery and focuses only on restoring burned areas to their previous state and thus lacking a long-term resilience perspective (i.e., to avoid a repeat scenario). Recent events hint at a shift towards prevention; France e.g., despite its structured recovery approach, hasn't utilized relevant EU funds for wildfire recovery.
- The Solidarity fund has effectively supported economic recovery post-fire; however, it lacks alignment with the "build back better" principle of the Sendai Framework. No information is available if this shortcoming is addressed in the 2021-2027 framework.
- Europe needs more investment on adequate training and capacity building; experts highlighted only a few countries (e.g., Spain, Croatia, and Portugal) assess firefighters as being adequately trained for current / future wildfire challenges and many countries expressed concerns about over-dependent on aircraft or water-based approaches.

4.1. Governance of Cohesion Policy Funds

The shared governance of the Cohesion Policy funds between the EU and the countries creates useful synergies between the different administration levels. However, the national agencies that are involved in the request and management of the funds determine the type of investments that are made (e.g., forestry-oriented measures or civil protection measures). These decisions impact the efficiency of the investments to fund approaches that enhance socio-ecological resilience and reduce the risk of large wildfires in the future.

The experts surveyed for this study noted it is often difficult to understand the Cohesion Policy governance and the different funding schemes. Access to funding is challenged by the complex structure of the different funding and programs, limiting stakeholders in their ability to implement effective strategies to reduce the wildfire risk across territories. It was also pointed out that to benefit from Cohesion Policy funding requires skilled staff and represents a cost to design and develop proposals

within the EU standards. Language was also cited as a barrier for instance, within countries where English proficiency amongst programme staff at national /organisational level is limited (and is also a criterion in project proposal quality). An evident shortcoming was the fire management expertise deficit of personnel designing programmes and allocating funds which lowered their effectiveness and the appropriateness of their impact across thematic areas. Sometimes national governments receive funds through one ministry, but then have difficulty and or relatively complex channels for reallocating budgets for fire prevention, preparedness, suppression, and recovery measures which then belong under the responsibility of multiple other ministries. For example, in the Czech Republic up to six ministries and authorities are responsible for managing Cohesion Policy Funds which may impact fire management objectives, yet none of which include the Ministry of Interior where the Directorate General of the Fire Rescue Service of the Czech Republic belongs. It was not possible to determine how well the various ministries and authorities communicated with each other and jointly pursued strategies at landscape level to address fire management. A similar issue is that financial ministries (e.g., Czech Republic, France), or ministries specific for administering European funds (e.g., Poland, Romania, Croatia) may receive and allocate funds, but do not have e.g., fire management expertise within the ministry. Newly fire-prone countries also lack wildfire experts or agencies with thematic experience to effectively guide investments. The fund-receiving ministry usually also depends on the type of funding mechanism (e.g., Solidarity Fund vs. ERDF). It was apparent that generally low levels of national wildfire expertise resulted in money being spent on buildings, trucks, and camera systems instead of more sustainable measures considered as priorities by the expert community. The main exceptions were some examples of Interreg programmes which invested in more holistic approaches like wildfire risk governance or examples from Portugal and Spain where thematic experts (e.g., AGIF in Portugal) were clearly involved in the planning of programmes and use of resources which were used for fuel management and other activities aligned with expert community consensus on good practice in integrated fire management and risk reduction.

Allocated funding from one Fund was sometimes unused (underspending) and eventually eligible for "reprogramming" (transfer) to another funding scheme.[39] It was not clear whether and how this may have resulted in funds earmarked for wildfire management being unused or reallocated; considering the wildfire expertise deficit identified above, this is worth investigating as a potential bottleneck.

4.2. Nature Preservation

The impact of the Cohesion Policies on nature preservation across member states is not quantifiable. Using the principle of 'disaster avoidance' one can argue that measures supported through the discussed funding mechanisms in Chapter 3 contributed to the early detection and more effective response to wildfires (detection systems, firefighting vehicles and equipment, road and access quality, water sources, etc.) and thereby limited their environmental impacts. Similarly, for example, the construction of fuel breaks and water basins in Germany, fuel reduction, community awareness and infrastructure hardening in Portugal can also be assessed as lessening the impacts of wildfires on natural and protected areas. The OP Infrastructure and Environment Programme in Poland calls for 100% of Natura2000 sites country wide, to be covered by a management plan[40]. Here, there is an opportunity to include fire prevention and management planning aimed at reducing the impact of unwanted fires, however, no details are available as to whether such measures are included.

[39] https://cohesiondata.ec.europa.eu/stories/s/Cohesion-policy-2014-2020-investment-progress/4e3b-ddcr/
[40] https://ec.europa.eu/regional_policy/in-your-country/programmes/2014-2020/pl/2014pl16m10p001_en

Unfortunately, with triple the 10-yr average of burned protected areas in 2022 and 2023, there is a clear trend of protected areas being increasingly and disproportionately impacted by wildfires (c.f. section 1.1.5). **During the 2023 fire season, 41% of the areas burned were Nature 2000 protected sites**[41]. This calls into question, whether current nature conservation policies, are adequate to preserve nature in the future, unless appropriate fire management strategies are implemented. Data would suggest European funding is not having a measurably net positive impact on nature preservation vis á vis wildfires (though no inverse correlation is suggested). Experts agree more investments in fuel management and other forestry measures are needed to reduce negative wildfire impacts in protected areas. In this regard, forest health and diversity, understory microclimate, disturbance management, and forest cover continuity are critical factors in mitigating wildfire severity (Held and Pronto, 2023).

The use of prescribed fire where cultural and natural fire regimes are present, is widely considered by the wildfire community as the most effective tool for nature protection and vegetation management to reduce the risks of more devastating uncontrollable wildfires. Mediterranean countries have gathered experience with planning and implementing prescribed burning for nature conservation. Outside the Mediterranean Basin, countries like Germany are an example of where fire has been reintroduced as a conservation tool in heathland environments despite no documented historical natural fire regime. Other European funding sources (e.g., LIFE Programme) have been important resources for these types of activities. Expert feedback strongly advocated for more funding in training and application of prescribed fire across Europe. At present, prescribed burning is not regulated by all European countries and even forbidden despite its proven benefits for conservation and risk reduction.

In the new Cohesion Policy cycle 2021-2027, EUR 14 billion are being dedicated to climate change adaptation and disaster risk management. This includes the risk of flooding, wildfires, droughts, and sea-level rise (European Commission, 2023)[42]. One of the expected results to mitigate those risks is a new green infrastructure of 229,000 hectares across Europe. It is unclear how much of this infrastructure is distributed across the different risks, and the particular investment in wildfire risk management. The recent "Declaration on the management of large wildfires in Spain", indicates that it is urgent that at least 1% of the national forest cover (260,000 ha) is managed annually to prepare the land to face large wildfires, prioritizing strategic management areas (Pau Costa Foundation, 2023)[43]. Following the results of the Spanish wildfire experts, the area needed for the whole Europe to effectively reduce wildfire risk would greatly exceed the planned 229,000 ha of green infrastructure.

It is important to note, that it could become counterproductive for investments through Cohesion Policy funding instruments to overemphasize robust fire suppression measures in fire-prone environments – versus investing more in fire prevention and landscape resilience measures. In other words, too much focus and investment on suppressing all fires will result in larger amounts of vegetation available for future fires and cause greater damages to infrastructure and environmental destruction further down the road. This is often referred to as the Fire Paradox.

[41] https://joint-research-centre.ec.europa.eu/jrc-news-and-updates/wildfires-2023-41-burnt-area-eu-within-natura-2000-protected-sites-2023-09-08_en

[42] https://ec.europa.eu/regional_policy/sources/reports/2021-2027-programming-outcome/report-outcome-2021-2027-cohesion-policy-programming-part1.pdf

[43] https://www.paucostafoundation.org/wp-content/uploads/2023/06/Declaration-on-the-management-of-large-wildfires-in-Spain_eng.pdf

4.3. Post-fire Recovery

The Cohesion Policy funding schemes have been useful for implementing wildfire risk reduction strategies in the short term, but the investments in mid and long-term risk mitigation strategies are largely not apparent or limited to the examples provided above. One clear example is the Solidarity Fund which is used for recovery after catastrophic events, but it is not designed to invest in building back better to prepare the territory for future events. While other European policies and funding schemes focus more on this (e.g., CAP, Horizon, Research and Innovation, MS funds, etc.), one could argue rebuilding and restoring infrastructure or land as it was, in a vulnerable state in a high-risk area, is a poor use of funds if not at minimum harmonized with other programs aimed at better buffering against potential future disasters.

When asked about whether funding was available post fire for any measures aimed at increasing the resiliency of affected areas to future fire events, experts and national authorities offered very little feedback on the Cohesion Funds, and reported other funds that were used for recovery[44]. In Croatia, some grants were provided to restore potentially damaged agricultural areas to ensure continued production; in the German state of Brandenburg, some funds were used in the creation of fuel breaks. Poland has used funds for "building back better" but only because they have detailed national guidelines regarding restoration procedures in fire-damaged areas which are a part of the "Forest Protection Instructions" enforced within Polish State Forests (thus, regulating internally how the funds are used). Most examples were in line with restoring to the previous state, like in Cyprus where funds were only available for replanting damaged forest plantations to their previous state.

The recent fire in the Czech BSNP in 2022, could however signal a shift in post-fire recovery investments as fires were added to the management measure "prevention and management of anthropogenic risks" which addresses the improvement of environmental monitoring, increase of control processes, efficiency and the improvement of prevention and management processes for the prevention of risks related to human, agricultural or industrial activities. This effectively facilitates a legal pathway for EU funding to focus more on prevention and landscape resilience measures.[45]

In theory, France would be one exception where the recovery of burned areas is overseen by the state representative, the prefect, who organizes the reconstruction plan. The forest's ownership status (private or public) is considered. The National Office of Forestry leads the discussions, factoring in ecological (like species and biodiversity), economic (such as forestry and tourism), housing management, and fire prevention measures. However, France has never been a recipient of the Solidarity Fund for a wildfire disaster, and most funds received by France comes from the ERDF – which did not cover any measures related to wildfire management during the 2014-2020 programming period.

4.4. Economic Recovery

According to the evaluation report conducted during the period 2002-2016 (Bachtler et al., 2018), the Solidarity Fund succeeded in its primary operational objective of delivering a financial contribution to areas afflicted by a natural disaster, thereby facilitating their recovery. The SF is not intended to provide immediate emergency assistance, but to contribute to the restoration of normal living conditions.

[44] Countries which used Solidarity Funds include, Cyprus, Greece, Portugal, Romania and Spain.
[45] Survey response, General Directorate of the Fire Rescue Service of the Czech Republic

In a second report, it is also indicated that, in general, the scope of eligible operations is not fully aligned with the key principle of "Building Back Better" for disaster risk management (European Commission, 2019). The post-disaster recovery phase is seen as a critical opportunity to build resilient infrastructure adapted to future wildfire risks. However, it was stated that the SF finances the restoration of infrastructure according to its original state prior to the event. The review concludes that further consideration should be given to the alignment between the eligibility conditions for the SF operations and the guiding practices of disaster risk management and post-disaster reconstruction. Economic recovery focused on returning to a vulnerable, pre-disaster state, cannot be seen as a long-term sustainable investment. No information has been found on how this shortcoming is addressed in the 2021-2027 framework.

4.5. Wildfire Management

From the information available and consulted, it is not possible to assess how the Cohesion Policy funding schemes directly impacted the 2022 fire season. However, there have been a number of investments across Europe since the 2014 cycle started that may have contributed to reducing the risk of extreme wildfires in some regions during the subsequent years. Those investments are related to building capacity for response systems, implementing different landscape management approaches, and raising risk awareness amongst the population. Poland is one example where the Polish State Forests implemented a project between 2016-2023 – „Comprehensive adaptation of forests and forestry to climate change – prevention, counteracting and reduction of the effects of threats related to forest fires" as a part of the OP Infrastructure and Environment Programme[46]. Here for example, CF and ERDF funded the procurement of 67 patrol and firefighting vehicles, equipment of 42 alarm-command points, construction (70) and modernisation (68) of fire lookout towers, construction of 12 meteorological stations, and the purchase of modern fire location's equipment (183 pcs.)[47] While this is a measurably direct impact in terms of advancing wildfire detection and suppression capabilities, it does nothing to reduce wildfire risk itself. This is consistent with what national fire experts we consulted reported: Cohesion Policy funds are being used mostly for short-term investments (e.g., early warning cameras) that had limited or no impact on wildfire risk reduction. Similarly, the purchase of new vehicles and equipment has been identified as one of the investments commonly used across Europe, however, equipping fire management professionals and volunteers is only useful if the appropriate training and capacity building is also enhanced. In sum, the efficacy of such shorter-term investments in equipment is threatened by a non-holistic approach which does not also prioritise risk reduction, community engagement and training and capacity building for responders.

Of the countries surveyed, respondents of only 3 countries – Spain, Croatia, and Portugal – felt firefighters were sufficiently trained to meet the current and anticipated wildfire suppression challenges. On the one hand, France highlighted its well-trained civil protection force, its efficient and centralized coordination and resource sharing, but over-dependency on the use of firefighting vehicles and water-based suppression tactics, suggest there is room for improvement considering current and anticipated water shortages. Greece is also a wildfire prone country which is notoriously not only water-dependent for fire suppression, but overly dependent on firefighting aircraft (Independent Committee and GFMC, 2019). Very few countries possess firefighting forces especially trained for wildfire management.

[46] https://ec.europa.eu/regional_policy/in-your-country/programmes/2014-2020/pl/2014pl16m10p001_en
[47] Survey response, Polish Sate Forest Authority.

4.6. Improvement Opportunities

Based on the evaluation of the impact of Cohesion Policy funding instruments, some improvements can be highlighted to achieve a more holistic and integrated approach to wildfire management, beginning with an overview on the appropriateness of the instruments for wildfire management. To do so, we have assessed the available information and the four funding instruments analysed in this report against the (seven) criteria established by the European Commission's Wildfire Peer-Review Assessment Framework as developed by experts from the Member States, and the general criteria laid out for this study (Table 6). As the Wildfire PRAF is designed to address regional and national level wildfire management from a holistic standpoint, it can well serve as a backdrop for gauging how balanced Cohesion Policy funding has been applied. We assess that only **Interreg** demonstrated a consistently strong multidisciplinary approach to integrated fire management (IFM). So little information on the **ERDF** funds as they related to fire management was available that, that no uniform assessment can be made other than it has on some occasions demonstrably contributed to fire prevention and response (e.g., Poland) or economic recovery (likely in Greece). There may be many more investments, but not enough information was available. The **Solidarity Fund** very clearly only addresses certain criteria making it not an appropriate instrument for wildfire governance, prevention and planning or risk assessments and mitigation. Its non-alignment with the "build back better" principle also diminishes its overall contribution to long-term economic recovery and resilience, lessons learned, or preparedness for future disasters. The **Cohesion Funding** was effectively used to buy equipment and vehicles for wildfire preparedness and response but even in these categories overlooked important elements like training and capacity building which are equally important factors for preparedness and response. It largely neglected investments in wildfire prevention and risk awareness and overall could be seen as somewhat contributing to other key criteria. Overall, apart from a few examples (notably Portugal) the ERDF, SF and CF instruments were largely assessed as overly simplistic in terms of investments in IFM. Because Portugal offers an example of a more holistic investment strategy at national level, and Interreg has a track record of meeting more of the listed criteria at programmatic level, one cannot argue the funding mechanisms are not fit *per se* (except for the limitations of the SF). It would seem funding is technically available for more balanced investments in IFM but is for various reasons mentioned in section 4.1 above not utilized in this way. **Improvement opportunities and policy recommendations to achieve more desirable impacts of Cohesion Policy funding is discussed in Section 5.2.1.**

In conclusion, the Cohesion Policy funding schemes are suitable mechanisms to fund wildfire prevention, preparedness, mitigation, and adaptation but less so for recovery. The analysis conducted reveals that several countries have been able to use those funds to reduce wildfire risk and increase socio-ecological resilience. Despite some good implementation examples, in general terms, the funds have been used for short-term investments and with a relatively small impact on reducing the future wildfire risk. While funding cycles of up to four years (e.g., Interreg programmes) contribute to testing and piloting new initiatives and identification of best practices, it is unclear how these types of initiatives are then consolidated in the territory beyond the project duration. Additionally, they are limited in creating sustainable jobs and maintaining the fire management infrastructure. Most of the wildfire experts who participated in our survey have experience with EU funding schemes and some of them pointed out that the current funding mechanisms lack a system to monitor the efficiency of project implementation that would allow quantifying the impact generated in the territory during and after the project.

Table 6: Appropriateness of evaluated funding schemes fit to Integrated Fire Management

	Cohesion Funds	EU Solidarity Fund	European Regional Development Fund	Interreg
WILDFIRE PEER-REVIEW ASSESSMENT FRAMEWORK (DG-ECHO)				
Governance of wildfire risk management	?	✗	?	✓
Wildfire risk assessment	?	✗	?	?
Wildfire risk management planning	Ø	Ø	?	✓
Wildfire Prevention	✗	✗	?	✓
Wildfire Preparedness	✓	Ø	?	✓
Response	✓	Ø	?	✓
Recovery and lessons learned	Ø	Ø	?	Ø
GENERAL CRITERIA PROVIDED FOR THIS STUDY				
Wildlife and nature preservation	Ø	✗	?	✓
Preventing and tackling forest fires	Ø	✗	Ø	✓
Secure and rapid economic recovery	Ø	Ø	Ø	?

KEY:
Are funds fit for addressing the listed criteria?
✓ yes ✗ no Ø somewhat ? unknown

Source: PCF (authors analysis)
Note: Based on the available information, the table analyses the perceived current appropriateness of the Cohesion Policy to ensure wildlife and nature conservation, prevent and tackle forest fires, and secure a rapid economic recovery offering a suggested level of fitness for each relevant policy/ fund based on how funds were used.

5. FURTHER CONSIDERATIONS AND POLICY RECOMMENDATIONS

KEY FINDINGS

- Evaluating cumulative high-impact key sources of fire activity in MS, can provide an opportunity for investing in targeted measures with greater sustainability and impact.
- Based on different estimates, every €1 invested in prevention and preparedness can save between €4 to €7 and even more in response and recovery costs.
- Climate smart SFM can contribute to fire prevention, reduce fire intensity and severity, and promote faster and more effective post-fire regeneration of forest landscapes by various near and longer-term strategies.
- Existing initiatives such as the Landscape Fire Governance Framework or the FAO Global Fire Management Hub offer an opportunity for European Institutions to align funding instruments to the presently expressed need of the global wildland fire community, and, to work more closely with the accumulated expertise of international organizations and other institutions in the field of fire management capacity development.

5.1. Further Considerations

5.1.1. Investing with more impact

With landscapes across Europe becoming more susceptible to wildfires and as result of climate change, land use change and human activities, it is unavoidable to experience singular large and extreme wildfire events (relative to their context and historical fire regimes) – like the fire in on the Slovenian-Italian border in 2022. On the other hand, looking at Romania which in 2022, accounted for over 17% of all area burned in Europe, data would indicate investments into alternatives to crop burning, increased citizen awareness, possible enhancements in penalties and enforcement capacity, as well as fire suppression capabilities could represent a significant opportunity to reduce total burned area and overall emissions across the European Union. Directing CF at possible solutions and alternatives to the crop burning issue in Eastern Europe has potential to circumvent significant impacts in the prevention phase, whereas comparable financial investments in for example firefighting capacity in a country like Croatia would likely have a marginal or very minimal effect.

Overall, our study recognized that funding instruments which could positively impact fire management, were highly scattered throughout various programmes with trickle down effects for fire management. The result of this, is that the impact is difficult to trace and often highly diluted. Another angle would be to better map fire management stakeholders across Europe and canvass what their needs are. DG-ECHO is presently launching such a stakeholder mapping exercise, while another current project is

cataloguing good practices in wildfire risk awareness and communication initiatives in Europe and abroad, with the aim of publishing an EU-wide strategy. Here, the main objective is wildfire prevention and impact mitigation, which is aligned with, for example, studies conducted by the World Bank indicating money invested in prevention has an effective impact of anywhere from 4 -16 times the cost of response, damages and recovery. While the exact cost ratio can vary based on the specific context, disaster type, and region, a commonly cited figure is that every €1 invested in prevention and preparedness can save between €4 to €7 in response and recovery costs. (World Bank, 2021). Applying this concept to wildfire management highlights the gross discrepancies between what Europe spends preparing for and fighting against wildfires, versus what is invested in prevention, community engagement and risk awareness, and landscape resilience measures.

Prevention versus suppression

Between 1980 and 2010/2015, European countries, like France, Germany, UK, and Italy, had 3-4 times more investments in fire suppression than in prevention[48]. Overall, since 2000, almost three times as much has been spent on suppression as was invested in prevention across Europe. Yet, the annual trend in area burned has continued a steady increase despite all efforts to change it; clearly, a new era of fire demands a more comprehensive and balanced strategy (Independent Technical Commission, 2017). Investing in fire suppression has largely been favored as it has been somewhat falsely perceived as immediate and visible impact on reducing wildfire risks, whereas fire prevention measures like fuel management and early warning systems can be costly and lengthy to implement. Recently, Europe has increasingly recognized the significance of fire prevention, evident in policies like the EU Forest Strategy and the European Commission's Action Plan on Wildfires. These policies and initiatives emphasize the need to invest in fire prevention measures, such as fuel management, early warning systems, and public education and awareness campaigns and aim for more balanced investments between fire prevention and fire suppression in Europe.

[48] Based on available records

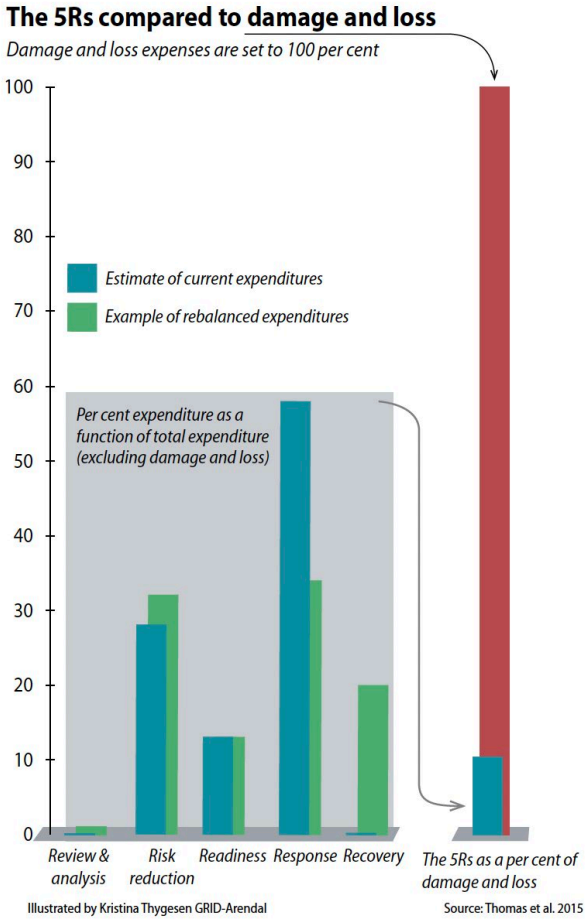


Figure 30: Illustration of costs associated with the 5Rs of wildfire management

Source: UNEP and GRID-Arendal.
Note: Illustration of costs associated with wildfire management – the 5Rs – Review and analysis, Risk reduction, Readiness, Response, and Recovery. The estimate of current expenditures across the 5Rs (blue) comes from U.S. data (Thomas et al. 2015) but is considered likely to closely represent spending in developed states. Currently, there is very little spending on review and analysis (critical in determining the effectiveness of investment), a disproportionate amount on response, and very little on recovery. The suggested expenditures (green) represent a preliminary attempt to rebalance investments in a way that could reduce damage and loss (red), which currently greatly exceeds all spending on the 5Rs.

5.1.2. Role of European research funding in wildfire related projects

The EU has invested over €200 million in wildfire research projects during the last two decades. In the last three years, the EU invested ca. € 80 million into strategic innovation projects which will demonstrate the efficiency of integrated wildfire risk management to mitigate extreme wildfire events. For instance, the EU-funded FIRE-RES project builds upon the FirEURisk project's outcomes (e.g., risk assessment models, fuel maps, etc.) and will accelerate the implementation of a more holistic fire management approach to promote resilient landscapes across Europe. By integrating research, technology, civil protection, policy and governance spheres related to wildfires, the project will generate new knowledge about sustainable integrated fire management models[49]. Overall EU investments in wildfire R&I has led to significant advances in our understanding of wildfire behaviour and the development of new and innovative prevention, suppression, and high-tech approaches – which are still evolving but could be transformative in future wildfire management[50].

[49] Interview response, European Research Executive Agency
[50] https://cordis.europa.eu/project/id/101037419

Figure 31: Key EU wildfire research and innovation investments, outcomes and themes

Source: PCF with input from REA

5.1.3. Investing in areas of special concern

Protected areas:

Urgently needed are a set of guidelines for fire management in protected areas which can be adapted among countries and adjusted according to the conservation and protection measures in place, as well as according to the type of ecosystem or threatened value. One assessment approach could be according to the categories of protected areas which are:

- *Fire-dependent /adapted* – ecosystems or sites where flora and fauna have largely adapted to fire affects; either they can withstand fire occurrence in appropriate intervals (frequency, severity, and seasonal timing) or some species may require fire as an essential process.
- *Fire-sensitive* – ecosystems or sites that are largely non-adapted to fire occurrence and where fire activity could lead to detrimental feedbacks, and or have a much more severe impact on non-fire adapted species.
- *Potentially threatened* – ecosystems or sites which have largely not evolved with fire but due to factors like human activities or conflicts, land-use change, climate change, etc., are particularly vulnerable to wildfires or newly establishing fire regimes which have been historically absent.

Worldwide, limited guidelines have been developed and implemented concerning the planning and response protocols for fire management in protected areas. A handful of countries which regularly address fire in National Parks and UNESCO areas include for instance, the United States, Russia, and Australia. Among European countries, there is little to no discernment between fire management and suppression actions taken on protected areas, versus non-protected areas. For example, in Spain, the Spanish Ministry of Environment offers some courses on managing fire in protected areas, however, no

guidelines exist for fire suppression in these areas and firefighters will aggressively fight fire with no difference in approach or tactics whether the area is protected or not. In counter examples from Germany and Austria, – the amount water used to a extinguish wildfires in sensitive areas was likely more damaging (e.g., due to erosion) to the ecosystem than the (low-intensity) fire itself. Management approaches must be adapted in these areas, as the Czech example highlighted just how dangerous it can be to, if needed, suppress a fire when the safety of firefighters is avoidably threatened.

A draft "Forest fire protection and suppression plan for the Polish part of the Bialowieza Forest Transboundary World Heritage Site" has developed an environmental impact plan for fire suppression in the Bialowieza National Park on the border with Belarus – but is a rare example of any such considerations across Europe (Forest Research Institute, State Fire Service, & General Directorate of State Forests, 2019-2021). In the United States, often National Parks will have their own fire management plans in place which cover everything from the use of prescribed burning in the Park to the limitations that should be observed when suppressing a wildfire. The overarching guidelines governing fire suppression actions in protected areas in the United States are called Minimum Impact Suppression Tactics (MIST). Another common application of MIST is in cultural heritage sites (e.g., archeological sites) where disturbing the soil could be very damaging. While plans in specific protected areas will have their own guidelines (for example, in designated wilderness areas, no machinery, including chainsaws may be used), these tactics call for measures to lessen the environmental impact of firefighting, while still meeting firefighter safety and fire containment objectives.

Contaminated areas:

Similar low-impact tactics have been implemented on radioactively contaminated areas, most notably for the Chernobyl Exclusion Zone in Ukraine, where operating machinery or otherwise disturbing contaminated soil poses a danger to firefighters. Technical modern solutions for such complex challenges are in their infancy and would need immediate investments and support. Currently, there remains no good practice for wildfire suppression in such areas, although the Waldbrand-Klima-Resilienz project[51] (funded by the German Federal Ministry of Food and Agriculture) in Germany, and Project Vesta[52] in the USA (funded by the US Department of Defense) are investigating high-tech solutions for fire management on contaminated areas.

As traditional firefighting methods cannot be utilized in these contaminated areas, investments are urgently required to innovate and advance a combination of current good practice in fire management such as the use of indirect attack using tactical fire and precision aerial ignition drones and remote-controlled robotic systems with extinguishing systems and /or demining and fire-break creation capabilities (Pronto and Held, 2023).

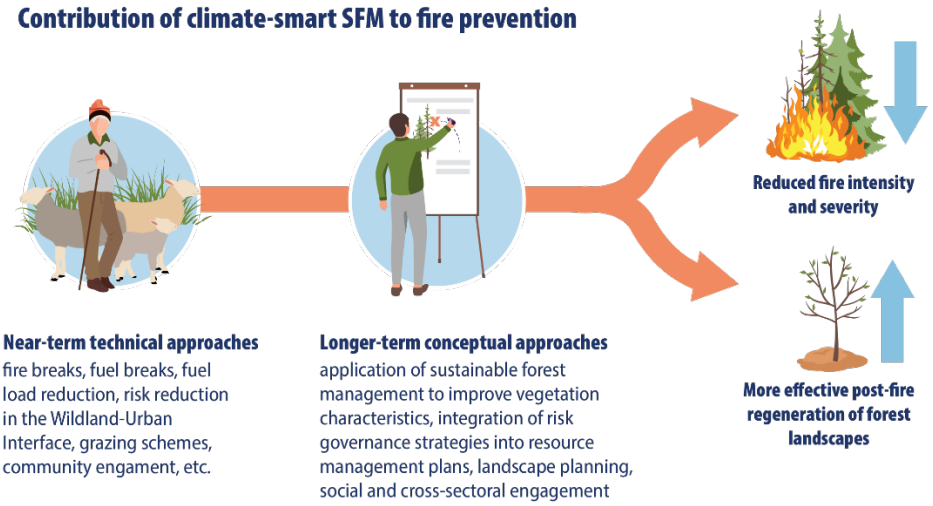
5.1.4. Role of sustainable forest management (SFM)

In 2022, Forest Europe – the Ministerial Conference on the Protection of Forests in Europe – launched a pilot phase on the role of climate smart sustainable forest management to achieve wildfire risk reduction in Europe. This effort supports the Bratislava Ministerial Resolution "Adapting pan-European forests to climate change" (2021) and its practical application via the establishment of a pan-European forest risk facility (FoRISK). The FoRISK Pilot, active from September 2022 to February 2024, evaluates policy tools for disturbances such as wildfires, biotic threats, and storms. National focal points from signatory

[51] https://www.waldbrand-klima-resilienz.com
[52] https://www.socaltechbridge.org/project-vesta

countries involved in forestry assess the feasibility, funding, and potential enhancements of the FoRISK concept[53]. The wildfire pilot phase collected feedback from experts in the greater European community, conducted an intensive workshop, and produced a policy brief to represent insights of the expert community regarding the near and longer-term strategies to better protects forests and communities from wildfires through combining climate smart sustainable forestry with integrated fire management.

Figure 32: Contribution of climate smart SFM to wildfire prevention



Source: PCF, Held and Pronto, 2023

The Forest Europe policy brief emphasizes the importance of Sustainable Forest Management (SFM) to reduce wildfire risk. Key strategies include supporting a forest's microclimate through targeted practices such as continuous cover forestry and selective regeneration. Deadwood accumulation (where appropriate) can boost water storage capacity, improve soil quality and reduce temperature through evaporation. Agroforestry, silviculture, and mixed grazing are promoted to fulfill diverse objectives. Limiting skidding lanes and developing roads for emergency access are essential, particularly in high-risk zones. Experts also recommend integrating pre-defined fire control lines, buffer zones (reduction of vegetation density, structure, and type), and other protective measures, especially near vital protected areas, critical infrastructure, and settlements. Prescribed burning (where appropriate) can serve ecological, training, and educational opportunities for first responders, forest and land managers and other relevant stakeholders (e.g., nature conservation). Collaboration and capacity building in climate aware SFM and Integrated Fire Management (IFM) are pivotal, with a focus on inclusive risk governance that encourages diversity and dialogue. Lastly, it's recognized that even well-managed forests can burn in extreme conditions, but SFM offers various mitigation measures for all phases of a fire (Held and Pronto, 2023).

5.1.5. The Landscape Fire Governance Framework

The International Wildland Fire Conferences (IWFC), initiated in 1989, strive to foster international collaboration by exchanging insights on wildland fire policies, research, and management. The conferences focus on enhancing nations' capabilities to minimize the adverse effects of landscape fires on both the environment and people, while also promoting the understanding and sustainable use of

[53] https://foresteurope.org/workstreams/risk-prevention/

natural fire in ecosystems that depend on it. All eight conferences have also had the involvement of international organizations, the United Nations, governments, high-level national authorities, as well as diverse stakeholders and NGOs from civil society from all continents. The process represents the most high-level forum on fire management internationally and its outputs have also informed other major negotiations like the Paris Climate Accord. In a culmination of efforts from the past 35 years, the conference stakeholders at the 8th IWFC held in May 2023 in Porto, Portugal, published the Landscape Fire Governance Framework.

Figure 33: Five Priorities for Action (summarized) of the Landscape Fire Governance Framework

Source: PCF and AGIF (2023)

The Landscape Fire Governance Framework offers global guidelines for addressing wildfire challenges. Aimed at policymakers, it underscores the importance of comprehensive fire management, integrating different stakeholders and knowledge types. It champions both traditional and novel solutions, backed by current expertise and international standards. The framework stresses coordination, valuing rural regions, and proactive fire prevention. Its governance model encourages stakeholder participation, risk assessment, and understanding cultural risk views, advocating for collective responsibility. It suggests that overarching entities facilitate international cooperation and suggests standardized training and best practice sharing. The framework pushes for countries to adopt integrated fire management and strengthen cooperation networks. It could pave the way for binding UN agreements and promote a global fire management initiative and funding. In summary, effective fire management requires solid governance, stakeholder cooperation, and global partnerships.

5.1.6. Intensified cooperation between countries and regions

The global community of experts and stakeholders working across borders on the topic of wildfire is relatively small which presents the opportunity to link existing initiatives and consolidate good practices and solutions more easily. Below are several further examples of international, regional, or national

initiatives aimed at awareness raising and capacity building in integrated fire management. These activities and initiates should be better linked with the instruments explored in this study.

I. The Food and Agriculture Organization of the United Nations (FAO) and the United Nations Environment Programme have introduced the Global Fire Management Hub. This initiative aims to bolster national capabilities for integrated fire management. Launched during the 8th International Wildland Fire Conference, the hub's goal is to transition from merely combatting large fires to prioritizing their prevention. The hub is intended to provide timely information, training, and support for coherent fire management strategies across regional, national, and community tiers. The hub encourages collaboration, emphasizing knowledge sharing, capacity enhancement, fire risk assessment, and community resilience. Furthermore, it will assist nations in amplifying their integrated fire management efforts, offering policy guidance, knowledge exchange, and supporting projects like the AFFIRM Mechanism funded by the Korea Forest Forest Service[54].

II. The Organization for Security and Co-operation in Europe (OSCE), while its primary mandate is related to conflict prevention, crisis management, and post-conflict rehabilitation in Europe, Central Asia, and North America, the OSCE has also been involved in broader issues related to environmental security, such as transboundary environmental problems and natural disaster risk reduction. Under its Environment and Security Initiative, the OSCE has supported projects to bolster fire management capacities in South Caucasus countries. In Central Asia, with assistance from the Global Fire Monitoring Center (GFMC) the OSCE supported the creation of the Fire Management Resource Center – Central Asia Region (FMRC-CAR) in Ulaanbaatar, Mongolia. In Eastern Europe, the OSCE and GFMC collaborated to enhance fire management in radioactively contaminated areas in Ukraine and Belarus, focusing on wildfire management in regions affected by the Chernobyl disaster. Similarly, the Council of Europe and the GFMC established the Regional Eastern Europe Fire Monitoring Center (REEFMRC) in Skopje North Macedonia, which has since produced guidelines, management procedures, and training resources on the topic of wildfire management.[55]

III. In response to Spain's significant wildfires in 2022, the Pau Costa Foundation gathered the wildfire community to formulate proposals for improved wildfire management. With rigorous technical and scientific standards, a broad consensus was achieved on both immediate and long-term strategies, relevant not just for Spain but for Europe. The wildfire community, with its accumulated knowledge and expertise, outlined 10 key themes and challenges. Among their findings, there are specific strategies and objectives that are on accordance of the multiple other guidelines worldwide about the need of integrating fire management and land use planning. Particularly, for the purpose of this report we consider the following outputs of special relevance:

1. There's an urgent need to develop forests that are more resilient to fires. This means focusing on forestry configurations that not only reduce fire intensity but also prioritize forest value and biodiversity preservation (i.e., improving the provision of ecosystem services)

[54] https://www.fao.org/forestry/news/100706/en/
[55] https://gfmc.online/globalnetworks/seeurope/SEEurope_8.html

2. Post-fire recovery does not mean re-establishing the land to a pre-fire state. Recovery should assess fire impact using technical criteria, incorporating factors like species ecology, their relation to fire, forest and habitat dynamics, future scenarios, climate change, demands of the local population, etc., while ensuring consistent monitoring of the proposed recovery steps.

3. Forest and agroforest landscapes must allow for safe intervention from firefighting services while upholding their social, environmental, and resource values. Territorial planning that includes agricultural and forest management strategies aimed at lowering vulnerability to large wildfires, contribute to more wildfire resilient landscapes and less vulnerable societies

4. Legislation should consider wildfires in land-use planning, management, and in all sectoral policies, in a comprehensive and cross-cutting manner, which is binding for decision-making

5. A national legal framework is essential to fund a diverse, local and sustainable primary sector: High Nature Value (HNV) silviculture, agriculture and livestock farming, grazing, transhumance and the fight against rural depopulation must be elements of the sustainability paradigm (Pau Costa Foundation, 2023).

5.2. Policy Recommendations

5.2.1. Policy recommendations and improvement opportunities to increase the impact of Cohesion Policy funding on IFM

1. **Ensure that ministries and national agencies have access to wildfire expertise.** This would better ensure funding programmes are being utilized to their fullest extent to support IFM and go beyond just investments in response capabilities. The network of regional wildfire expertise across Europe is extensive, but experts are often not aware that such funding can be used to implement wildfire risk management approaches. Ensuring the countries have plans in place to advise on investments that are more efficient to reduce risks in the short, mid, and long term would improve the efficiency and impact of the investments.
2. **Facilitate access to information and funding**. Enhance transparency and simplify the structure of the Cohesion Policy funding schemes. More clarity is needed on the different funding schemes: how to access them, how funding can be used and what are the implementation agencies at EU and national levels. Much of this depends on communication efforts by the European Parliament, the EC and national agencies at MS level. Carrying out this study made clear, huge amounts of information is either buried or simply not available which means experts, organisations, agencies etc., who deal with wildfire management simply are not aware of funding opportunities or e.g., that these programmes are being implemented in their country under different ministries. Furthermore, if they unaware of their use for wildfire-relevant investments, they cannot positively influence their practical and strategic application.
3. **Establish an EU-coordinated advice team of regional wildfire experts**. This team could assess the investments of CP funds in different countries based on current and future wildfire risk and provide insight for strategic and practical application so funds (see points above).
4. **Improve databases on past and current funded initiatives to enhance traceability**. To conduct this study, we have searched extensively for information available on the 2014-2020

and 2021-2027 programmes. We have found that the information and data are unorganised and often incomplete. It is difficult to find how different funding schemes, within the same Cohesion Policy, have contributed to wildfire risk reduction strategies. The information available often states that datasets are not exhaustive, links do not work, and basic information is provided in national languages which makes it complex to understand and analyse.

5. **Cohesion Policy funds must invest in mid- and long-term risk reduction**. This approach would help consolidate initiatives in the territory beyond the project cycle duration.
6. **Build back better approach**. Amend the administrative rules and application criteria of funding schemes, such as the Solidarity Fund, to ensure the investment enhances socio-ecological systems resilience under the vision of building back better to prepare for future disasters and not just promote recovery to pre-event vulnerable status.

5.2.2. Policy recommendations for governance of wildfire funding instruments

1. **Enhanced Coordination of Funding Schemes**:
    - Streamline coordination among various funding mechanisms within the Cohesion policy framework and across different Directorate-Generals (DGs) of the European Commission.
    - Undertake a comprehensive mapping of available funding opportunities to bolster clarity and transparency – also in the field of fire management.
    - Coordinate and collaborate with other EU funding instruments such as the Common Agricultural Policy (CAP), the EU Forest Strategy, Resilience and Recovery Facility, the LIFE programme, the Technical Support Instrument, the EU Mission on Adaptation to Climate Change, the Forest Europe process, and UCPM funding programmes.
2. **Establishment of EU-wide Legal/Binding Frameworks**:
    - Develop legal or binding frameworks for wildfire management at the EU level, drawing inspiration from established regulations for other hazards, such as flooding.
    - Adopt and promote the Landscape Fire Governance Framework within MS.
3. **Identification and Addressing of Funding Shortcomings and Bottlenecks**:
    - Address shortcomings in certain mechanisms, especially the lack of "build back better" principles within the EU Solidarity Funding scheme.
    - Remedy the lack of wildfire management expertise within ministries and agencies responsible for designing and implementing relevant programmes.
    - Conduct a thorough review of current funding schemes to identify and address bottlenecks, especially at the national administrative level of the management of funds where multiple ministries or agencies are impeded in their effective use due to varied or conflicting mandates or purviews.
4. **Promotion of Multi-Stakeholder Approaches**:
    - Recognize wildfire management as a cross-cutting issue, requiring engagement with a broad spectrum of stakeholders – and ensure funding is administered accordingly.
5. **Establish One-Stop-Shop for Wildfire Investment and Knowledge Brokering**:
    - Create and promote a centralized platform, possibly the "Knowledge Network platform," from DG-ECHO, where nations and organizations can access comprehensive details about funding schemes from different DGs relevant to wildfire risk reduction.
    - Fund in-person activities (workshops, study tours, expert exchanges, etc.) that bridge the gap between the fire management sector and all DGs vested in wildfire risk

reduction. This ensures that national representatives and other key players can efficiently navigate and leverage available funding while learning how best to invest.

6. **Adequate Funding for DG ECHO**:
    - Ensure that the Directorate-General for European Civil Protection and Humanitarian Aid Operations (DG ECHO) is adequately funded and resourced, enabling them to effectively implement various wildfire-related initiatives, especially with an increasing focus on wildfire governance support, prevention, and risk awareness activities. In 2023 and again for 2024, there are more states and nations requesting assistance through the Wildfire PRAF than can be satisfied showing an unmet demand for national IFM capacity development.

7. **Formation of an EU-Coordinated Wildfire Expertise Team**:
    - Assemble a team of regional wildfire experts to evaluate Cohesion Policy fund investments in nations based on their present and predicted wildfire risks.
    - Guarantee national agencies' access to in-country wildfire expertise.
    - Recognize and leverage the vast network of regional wildfire expertise across Europe, enlightening them about the potential use of such funds for wildfire risk management.
    - Encourage countries to have actionable plans, advising on investments that most effectively reduce risks in the short, medium, and long term, thus maximizing the utility of investments.

5.2.3. Policy recommendations for practical application of wildfire-related funding mechanisms

1. **Implementation Guidelines for Prescribed and Tactical Fire Use**:
    - Develop clear and detailed guidelines to ensure prescribed fires align with the latest nature conservation policies. These guidelines should consider the environmental impact, safety precautions, and the ecological benefits of prescribed fires.
    - Encourage more countries to legalize the use of prescribed burning for multiple resource management objectives and tactical fire use as a recognized good practice during wildfire suppression emergencies.
    - Ensure enough access to high-quality training to facilitate capacity in safely and effectively carrying out prescribed burning and tactical firing operations.

2. **Guidance for New Fire-Prone Countries**:
    - Provide tailored guidance for countries newly prone to wildfires, ensuring they adopt strategies enhancing socio-ecological resilience, and consider lessons learned from countries more accustomed to managing wildfire risks.
    - Encourage them to avoid short-term investments that lack long-term wildfire risk reduction benefits.

3. **Strategy Consolidation in Territories**:
    - Propose a cohesive, overarching strategy that transcends short project cycles. This ensures that wildfire-related interventions are not fragmented but are part of a larger, sustained vision for territory management.

4. **Expand Scope of Expert Exchange Programme (ECHO)**:
    - Bolster the expert exchange programme to ensure the sharing of knowledge, best practices, and innovative approaches. This could include workshops, training sessions,

and periodic meet-ups among wildfire experts and especially non-civil protection actors (wildfire management stakeholders).

5. **Support a Unified Communication Strategy and Risk Culture**:
    - Formulate a common communication strategy that is consistent across different Directorate-Generals (DGs). This would help in promoting a unified risk culture, ensuring clarity in messaging, and fostering a shared understanding of wildfire management across the EU (in progress).
6. **Promote International Best Practices and Collaboration**:
    - Highlight and document international best practices in wildfire management. For instance, the recommendations from various declarations, national strategies, the Wildfire Peer Review Assessment Framework, etc.
    - Cooperate with international organizations who also address wildfire management such as with the UN-FAO, Council of Europe, ITTO, OSCE and European Forest Institute.
7. **Invest in Training and standardisation**
    - The relatively new discipline of wildfire analysis must be supported and further developed (e.g., the Advanced Fire Analysis Network[56]) at all levels to support wildfire emergencies and in the development of planning and prevention activities based off projected fire spread models and indicators of heightened fire risk.[57]
    - Europe currently lacks a common standardized operation framework for the forest fire modules integrated in the European Emergency Response Capacity (EERC) raising significant concerns of untrained and underprepared responders who may put themselves and others at risk.
    - Few European countries have especially trained wildland firefighters and many countries also in part rely on volunteers; good practice training and wildfire response capacity development is urgently needed to ensure safe and effective operations.
8. **Review of Management Plans for Protected and Contaminated Areas**:
    - Undertake a comprehensive review of management plans for protected areas, such as National Parks, especially those severely impacted by bark beetles or storm damage. This will help in ensuring that these plans are robust, adaptive, and responsive to changing environmental threats.
    - Support innovative solutions and practical applications for fire management on contaminated lands.
9. **Promote Research and Innovation in[58]:**
    - Developing new and improved prevention and suppression technologies. This includes high-tech approaches such as satellite monitoring and artificial intelligence, and more traditional approaches such as fuel management and early warning systems.
    - Improving our understanding of wildfire behaviour. This includes research on how climate change and other factors are impacting wildfire risk and severity.

[56] https://fireanalysisnetwork.eu

[57] Both survey respondents for this study and expert inputs at the 2023 UCPM lessons learned workshop, all uniformly called for more trained wildfire analysts.

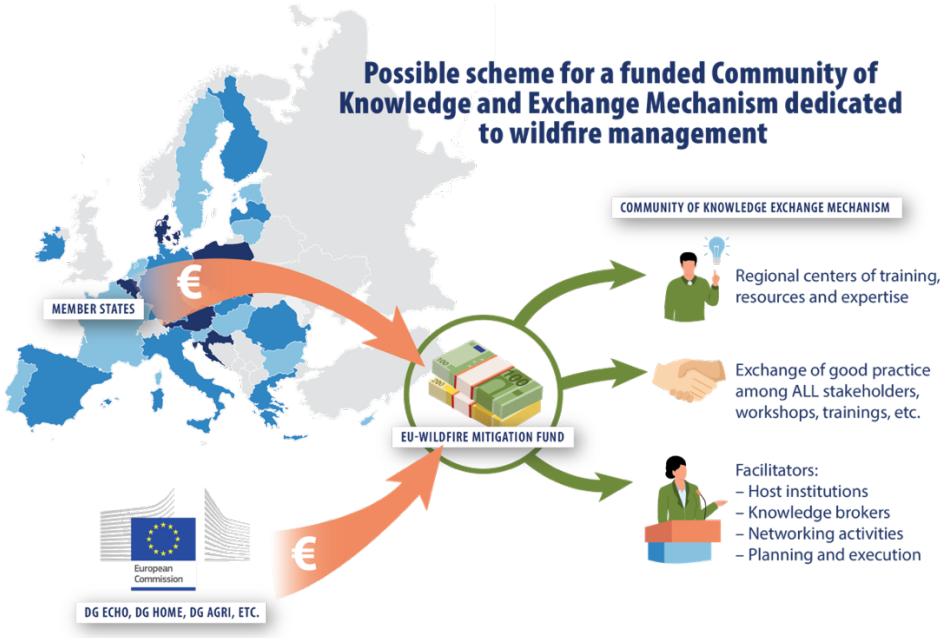
[58] It is important to note, investments in fire-related research are relatively small in comparison to wildfire-related financial investments under Cohesion Funding schemes

- Developing more effective ways to implement sustainable risk management practices. This includes research on how to better integrate wildfire risk management into land use planning, forest management, and public policy.

10. **Estabshment of a European Wildfire and Mitigation Fund**

- A dedicated fund for capacity development within Member States not tied to short term project activities or medium-term funding programmes.
- Broadly accessible to various stakeholders addressing integrated fire management at landscape level (not just civil protection).
- Platform to fund training (and trainers), expert exchanges, study tours, workshops, conferences, etc. on a sustainable basis and not tied to short-term projects; experts and organisations have for years been promoting a sustainable funding source of such invaluable networking activities which effectively share good practice.

Figure 34: Concept for EU Wildfire Mitigation Fund



Source: PCF

Note: Possible scheme for a sustainably funded Community of Knowledge and Exchange Mechanism dedicated to wildfire management, supported at the level of the European Commission.

REFERENCES

- Abel Gil, 2023. *Depopulation is changing the fire map of Europe*. European Data Journalism Network. Published August 24, 2023. Accessed September 25, 2023.
- Bachtler, J., Begg, I., Ferry, M., & Ogilvie, J., 2018. **Ex Post Evaluation of the European Union Solidarity Fund 2002-2016**. European Commission.
- Bloem, S., Cullen, A., Mearns, L., & Abatzoglou, J., 2022. *The Role of International Resource Sharing Arrangements in Managing Fire in the Face of Climate Change*. Fire, 5(4), 88.
- Casartelli V, Mysiak J., 2023. Union Civil Protection Mechanism - Peer Review Programme for disaster risk management: *Wildfire Peer Review Assessment Framework (Wildfire PRAF).*
- Directorate-General for European Civil Protection and Humanitarian Aid Operations (ECHO), 2023. *UCPM Lessons Learnt Programme Meeting Lessons identified from 2022 wildfire season 10-11 January 2023*. Draft report (unpublished).
- European Commission, 2019. *Evaluation of the European Union Solidarity Fund 2002-2017* (SWD (2019) 187 final). Brussels.
- European Commission, 2023. *Cohesion 2021-2027: forging an ever stronger Union. Report on the outcome of 2021-2027 cohesion policy programming* (Staff Working Document, 2023) 134 final, Part 1/2). Brussels.
- Forest Research Institute, State Fire Service, & General Directorate of State Forests. (2019-2021). *Forest fire protection and suppression plan for the Polish part of the Bialowieza Forest Transboundary World Heritage Site*. Warsaw.
- Held, A., & Pronto, L., 2023. *Reducing wildfire risk in Europe through sustainable forest management: A policy brief*. FOREST EUROPE, Ministerial Conference on the Protection of Forest in Europe.
- Independent Committee and Global Fire Monitoring Center (GFMC), 2019. *Report of the Independent Committee tasked to analyze the underlying causes and explore the perspectives for the future management of landscape fires in Greece*. Athens.
- Independent Technical Commission, 2017. *O complexo de incêndios de Pedrógão Grande e concelhos limítrofes, iniciado a 17 de junho de 2017* [ITC Report].
- Kudlackova, L., Podebradska, M., Blahova, M., et al., 2023. *Using Flammap to Assess Wildfire Behavior in Bohemian Switzerland National Park*. Manuscript under review at Springer, Natural Hazards.
- Marilen Martin, 2023. *Ukraine's wildfires surge amidst war*. European Data Journalism Network. Published August 7, 2023. Accessed September 25, 2023.
- Müller, M. M., Vacik, H., & Vilà-Vilardell, L., 2020. *FOREST FIRES IN THE ALPS: State of knowledge, future challenges and options for an integrated fire management* (white paper). EUSALP Action Group 8. Austrian Federal Ministry of Agriculture, Regions and Tourism (BMLRT).
- Observatoire des Risques Nouvelle-Aquitaine, 2022. Risques – Nouvelle-Aquitaine: Un été marqué par les feux de forêt de Landiras, La Teste-de-Buch, Saint-Magne et Saumos (33). *Évènements du Territoire, Risques Naturels*.
- Pau Costa Foundation, 2023. *Forum for debate and proposals for action for the management of large wildfires in Spain*. Results.
- Pronto, L. & Held, A., 2023. *Ferngesteuert*. Forst und Technik, 6/2023, 30-33.
- Préfecture de la Gironde. (2021). ***Dossier Départemental des Risques Majeurs*** (DDRM-2021) Gironde Risque Feu Forêt.

- Préfète de Nouvelle-Aquitaine, 2022. *INCENDIES ÉTÉ 2022 Gironde et Landes: Retour d'expérience*. Octobre.
- Rodrigues, M., Camprubí, À. C., Balaguer-Romano, R., Coco Megía, C. J., Castañares, F., Ruffault, J., Fernandes, P. M., & Resco de Dios, V., 2023. *Drivers and implications of the extreme 2022 wildfire season in Southwest Europe*. Science of The Total Environment, 859(2).
- San-Miguel-Ayanz, et al., 2023: *Advance report on forest fires in Europe, Middle East and North Africa 2022*, EUR 31479 EN, Publications Office of the European Union, Luxembourg, 2023.
- SERVICE DÉPARTEMENTAL D'INCENDIE ET DE SECOURS DE LA GIRONDE, 2022. *FEUX DE FORÊTS ET D'ESPACES NATURELS: Ordre d'OpératiOns départemental Feux de FOrêts et d'espaces naturels - SDIS 33*. 2022 Edition. April.
- Simon, T., Mayr, G.J., Morgenstern, D. et al., 2023. *Amplification of annual and diurnal cycles of alpine lightning*. Climate Dynamics (2023).
- Thomas, D., Butry, D., Gilbert, S., Webb, D. and Fung, J., 2017. *The Costs and Losses of Wildfires: A literature review*. Special Publication 1215. National Institute of Standards and Technology. U.S. Department of Commerce.
- United Nations Environment Programme, 2022. *Spreading like Wildfire – The Rising Threat of Extraordinary Landscape Fires*. A UNEP Rapid Response Assessment. Nairobi.
- The World Bank, 2021. *Economics for Disaster Prevention and Preparedness: Investment in Disaster Risk Management in Europe Makes Economic Sense - SUMMARY REPORT*. The World Bank.

ANNEX

Surveyed Experts

Albania	Zoica Kokaveshi	Aleksandër Moisiu University of Durrës
Bulgaria	Nina Dobrinkova	Bulgarian Academy of Sciences
Croatia	Klaudijo Filcic	VZPGŽ / Fire Service Association of Primorje and Gorski Kotar County
Cyprus	Georgios Boustras	European University Cyprus
Czech Republic	Petr Oslejsek	General Directorate of the Fire Rescue Service of the Czech Republic
Czech Republic	Roman Berčák	Czech University of Life Sciences Prague
France	Laurent Alfonso	Ministry of Interior and Overseas - Civil Security
France	Fabrice Chassagne	General Directorate, Civil Protection and Crisis Management
Germany	Johann G. Goldammer	Global Fire Monitoring Center (GFMC)
Germany	Alexander Held	European Forest Institute
Germany	Constantin Desselberger	Ministry for Agriculture, Environment and Climate Protection, Brandenburg State
Greece	Zisoula Ntasiou	Hellenic Fire Service
Ireland	Ciaran Nugent	Department of Agriculture, Food and Marine
Italy	Michele Buccolo	Italian Civil Protection Departement
Italy	Gianluca Calvani	Forest Fire Unit, Tuscany Region
Italy	Francesco Cataldi	Ministry for Infrastructures and Transport
Italy	Nicoletta Ormenese	Forest Service, Veneto Region
Italy	Dario Negro	National Civil Protection Department
Latvia	Zigmunds Jaunkikis	State Forest Service
Netherlands	Edwin Kok	Netherlands Fire Service
Netherlands	Jelmer Dam	National Institute for Public Safety (NIPV)
Norway	Ove Stokkeland	Grenland Fire and Rescue
Poland	Jan Kaczmarowski	General Directorate of State Forests
Portugal	Maria Gomes	AGIF, Agency for Integrated Rural Fire Management
Romania	Airinei Cristian	Department of Emergency Situations - Ministry of Internal Affairs
Spain	Elena Hernández Paredes	Ministry for the Ecological Transition and Demographic Challenge
Spain	Pedro Sánchez	Pau Costa Foundation
Sweden	Gustav Alfvin	Swedish Civil Contingencies Agency - MSB

Additionally collected expert inputs from (email correspondence, informal phone, or online interviews)

Fire Management Officer	Food and Agriculture Organisation of the United Nations

Senior Policy Advisor	Organization for Security and Cooperation in Europe
Wildfire Meteorologist	Dutch Meteorological Service
Training Expert	State Fire Academy, Regensburg, Bavaria, Germany
Chief Commissioner	EUTR / NEBIH Directorate or Priority Affairs, Hungary
Head of GRAF	Catalonia Fire and Rescue Service
Professor	Department of Mechanical Engineering, Faculty of Science & Technology, University of Coimbra, Portugal
Planning and Programming Officer	DG-ECHO, Unit B-2
Team Leader	DG-ECHO, Unit B-2
Policy Officer	DG-ECHO
Policy Officer	European Research Executive Agency, REA, Unit B-3, Biodiversity, Circular Economy, and Environment

Europe is grappling with increased wildfires due to climate extremes, with protected areas especially vulnerable and fires in contaminated lands presenting distinctive challenges. European response mechanisms are constructive, but they require enhanced comprehensive management strategies, including community involvement and preventive measures. The Cohesion Policy funds aids against wildfires, yet issues with governance, focus, and fund distribution limit its effectiveness. More emphasis on prevention, improved coordination, and integrated funding access, alongside enhanced information exchange and alignment with global initiatives, is crucial.

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