European Commission

Land-based wildfire prevention

Principles and experiences on managing landscapes, forests and woodlands for safety and resilience in Europe

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Land-based wildfire prevention

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2021

Directorate-General for Environment

Foreword

Wildfires have always been a part of Europe's history, especially around the Mediterranean. Today, however, that threat is spreading to Central and Northern Europe, with countries such as Ireland, Sweden and the Netherlands now facing these new and unexpected pressures.

Climate change is aggravating the situation, making countries more prone to wildfires and increasing the intensity of such events. With every passing year, the wildfire season starts earlier and ends later, with these fires becoming more frequent events that can strike in any region.

In the recent past, horrifying images of wildfires have showed that it is a global phenomenon. From the West Coast of the United States to Australia, and from the Amazon to the Arctic Circle, these dramatic images have reached us, as many of our citizens – and many of our ecosystems – have suffered similarly catastrophic events.

In this new context, enhanced information to support evidence-based policies, prevention and cooperation are our most important tools to tackle wildfires and enhance wildfire risk management in Europe and globally. The experience of Mediterranean countries has shown that the risk of wildfires can be successfully addressed through better planning and land-use management, in combination with education and awareness campaigns, and enhanced preparedness for firefighting.

Cooperation is equally essential, with decision makers at all levels benefiting from continuous exchanges of information and experiences. Back in 1998, the Commission established an Expert Group on Forest Fires, which serves as a platform to share experience and lessons learned, supporting the development of EU initiatives and science-based policies such as the European Forest Fire Information System. Better communications help planners get the best out of all the instruments at their disposal, such as funding for wildfire prevention and tools for a common response.

This booklet prepared by the European Commission with the support of fire management experts in the countries, provides a summary of the current and future trends of wildfires in Europe and tools to monitor them at European and country level.

The report includes an overview of existing land-based wildfire prevention and good practices, and showcases good practices that can save lives. These guidelines are well aligned with the goals of the European Green Deal and the Biodiversity Strategy. We are convinced that together we can get better prepared to address the increasing threat of wildfires in Europe and can create a more effective response to an ever more frequent common problem, with important benefits for our citizens and the natural environment we depend on.

Virginijus Sinkevičius

European Commissioner for Environment, Oceans and Fisheries

Mariya Gabriel

European Commissioner for Innovation, Research, Culture, Education and Youth

Preface

European Commission Expert Group on Forest Fires

An expert group is a consultative body initiated by the European Commission to provide it with advice on specific topics. The Expert Group on Forest Fires (hereafter: the EGFF) was set up in 1998 and includes experts from the group's member countries' environmental or forestry administrations. Representing over 40 countries from the EU and its eastern and southern neighbourhood, the EGFF is a key forum for the Commission to monitor the current trends toward increasingly frequent and catastrophic wildfires, and to help determine adequate and effective European responses in cooperation with the EU Member States. Managed jointly by the Commission's Environment and Joint Research Centre Directorate-Generals, the EGFF meets twice a year - ahead of and after the "main" wildfire season. The current work of the group focuses on the development of common criteria for wildfire risk assessments and recommendations for fire risk reduction by landscape and forest management. In addition to these key activities, the EGFF also contributes to the further development of the European Forest Fire Information System EFFIS[1], to the drafting of the Commission's annual 'Wildfires in Europe, Middle East and North Africa' report as well as to information exchanges on fire-resistant forests and sustainable forest management. Moreover, it exchanges on good wildfire prevention practices and lessons learned throughout the entire fire cycle.

This booklet is an example of how exchanges of information and good practices at European and international level can facilitate a better understanding of land-based wildfire prevention and facilitate effective responses.

[1] https://effis.jrc.ec.europa.eu/

European Commission DG-Environment.
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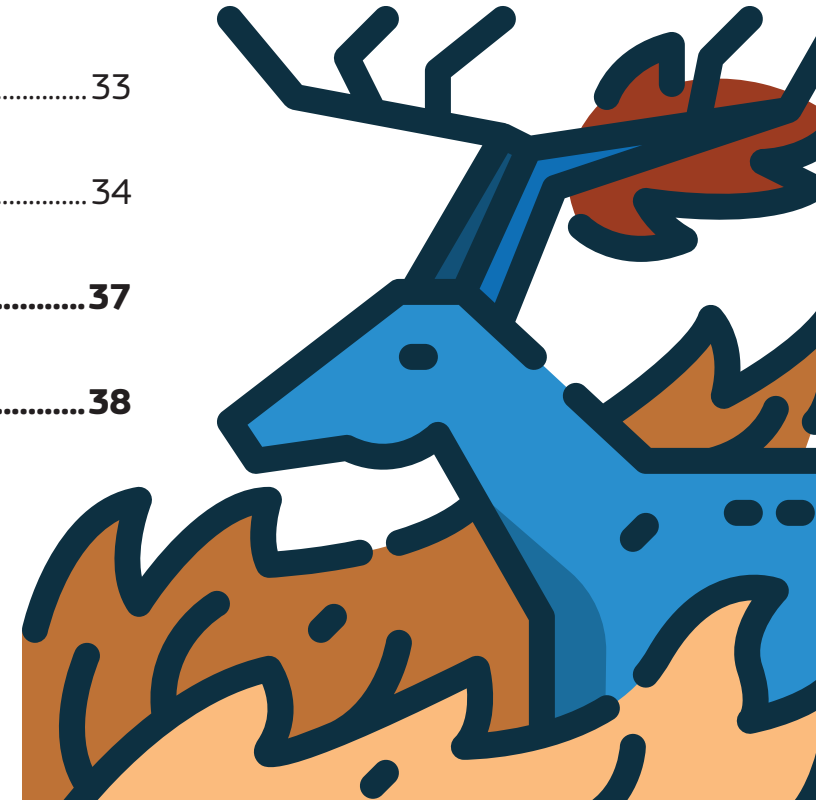


List of example boxes:

1. Introduction

In recent years, wildfires have had an enormous impact on Europe's natural capital, economy, and its people. In 2017, more than half-a-million hectares of land burned in Portugal alone, causing 118 deaths, both civilians and firefighters. In 2018, Greece suffered 102 deaths because of wildfires, and even countries traditionally not considered prone to wildfires were heavily afflicted: in Sweden, more than 23 000 hectares burned and the assistance deployed to fight the forest fires was the largest European civil protection operation for forest fires in the last decade. European Forest Fire Information System (EFFIS) reports[2] show that the temporal and spatial patterns of wildfires in Europe are changing. In 2019 and 2020, the wildfire season was extended, starting sooner or lasting longer than expected, with the number of fires and burned area surpassing the average of the last twelve years in record time. Wildfire occurrence has continued to increase outside of fire-prone countries, triggering new wildfire-response developments and challenges.

The causes behind these recent trends are complex. Climate-change (especially new weather patterns), land-management changes, social patterns such as rural abandonment and urban expansion, changing cultural traditions and leisure behaviours, and sub-optimal fire management policies have all influenced the fire impact in Europe[3]. More countries are increasingly affected by wildfires and the response capacity is facing growing challenges, despite existing coordination and conspicuous investment. New scenarios of global climate change also show a potential increase in the occurrence of so-called catastrophic fires, i.e. wildfires that are too severe to be put out.

In response to these alarming trends, a priority should be greater attention to **land-based fire prevention practices** as part of integrated fire management. These practices can translate into more fire-resistant and resilient landscapes and communities that are better equipped to face the expected risks. Prevention practices can save lives, livelihoods and nature, provided that they are correctly conceived and implemented in good time. In relation to past approaches, integrated management will consider prevention, preparedness and response policies of wildfires as a whole, avoiding the isolation of measures, actions and budget.

The Commission Expert Group on Forest Fires (hereafter referred to as EGFF)[4] exists to exchange information and propose updated practices in order to facilitate effective policy responses. This booklet and its underlying recommendations are meant to share the group's expertise with all potentially interested stakeholders and to increase awareness on the need to work on wildfire prevention even more intensively and in an increasingly coordinated manner. The booklet will also assist practitioners and policymakers from countries new to wildfire threats, seeking to develop and adapt suitable policy responses.

Extensive information and guidance already exist in certain countries. This booklet draws from some of these references in order to inventory the existing guidance at a national or regional level. It furthermore provides complementary information on relevant EU-led mechanisms (e.g. European Union Civil Protection Mechanism) or EU-funded initiatives (e.g. LIFE projects) relevant for preventing and controlling wildfires.

[2] https://effis.jrc.ec.europa.eu/reports-and-publications/annual-fire-reports

[3] JRC Technical Report: Forest Fires in Europe, Middle East and North Africa 2017 https://effis.jrc.ec.europa.eu/reports-and-publications/annual-fire-reports

[4] https://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupDetail&groupID=416

2. Wildfires and trends

What is a wildfire? Wildfires, including forest fires, are defined as "any uncontrolled vegetation fire that requires a decision, or action, regarding suppression"[5]. The term "forest fire" is generally used when the extension of a fire is at least 0.5 hectares and when parts of trees are destroyed[6]. A wildfire is, therefore, a broader concept than a forest fire.

Wildfires are affecting more and more Europeans. Catastrophic fires caused devastating losses in Portugal, notably in 2008 and 2017, and cost the lives of 102 people in Greece in 2018 – the highest known death toll caused by a single wildfire in Europe since the year 1900[7]. In some countries, there has been an increase in the number of small fires while others, such as Sweden or Norway, were unexpectedly heavily affected, both in term of number and size of burnt areas.

Currently, 85% of the burned area in Europe is located in Southern Europe (Portugal, Spain, France, Italy and Greece) due to the higher risk weather conditions inherent to the Mediterranean region. In these five countries, an average of almost half a million hectares of land burned annually during the last 20 years[8]. Climate change projections suggest that these countries will remain the most heavily affected (Figure 1). Yet at the same time, these projections show that fire danger is also increasing in non-traditionally fire-prone regions such as northwest and central Europe. Other scenarios, such as from the Swedish Civil Contingencies Agency[9], even show a much more striking increase of fire risk in northern European countries.

Next to the increase in the number of days per year with high to extreme fire danger, there will likely be an increasing impact

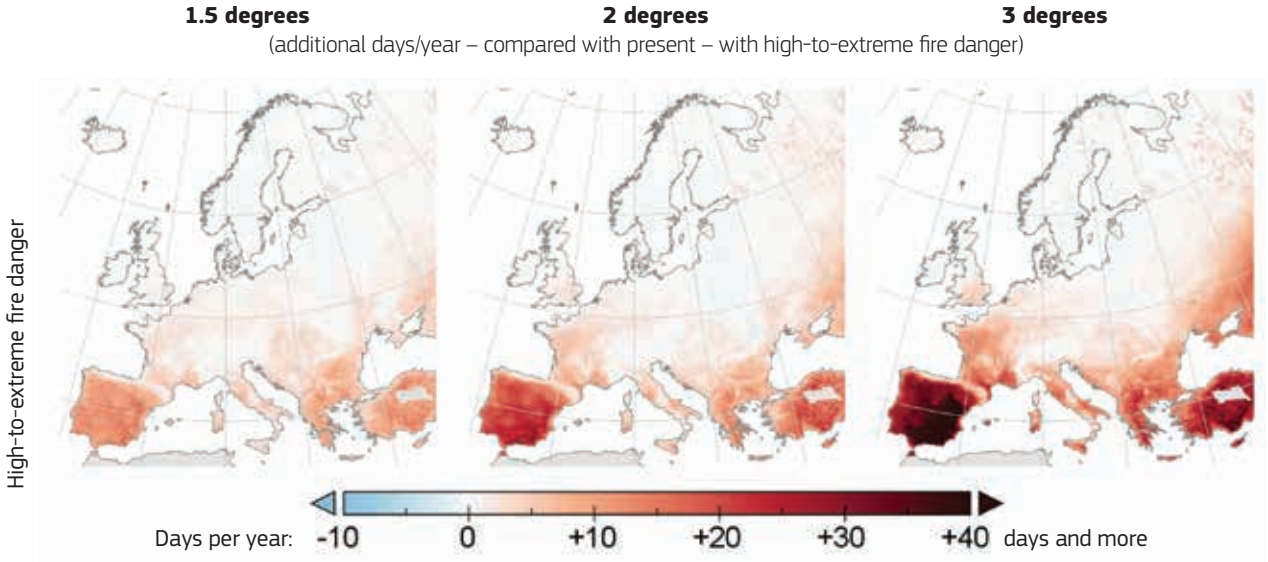


Figure 1: Additional days per year with high to extreme fire danger (daily Fire Weather Index ≥ 30) compared to 1981-2010 control period, for different levels of global warming (Source JRC Peseta IV).

[5] European glossary for wildfires and forest fires (2012) ctif.org/sites/default/files/2018-01/European%20glossary%20for%20wildfires%20and%20forest%20fires.pdf
[6] agriculture.gouv.fr/prevenir-et-lutter-contre-les-incendies-de-foret
[7] Joint Research Centre: Climate Impacts in Europe, 2018
[8] JRC Peseta IV Technical Report on Wildfires, 2020 ec.europa.eu/jrc/sites/jrcsh/files/pesetaiv_task_9_forest_fires_final_report.pdf
[9] rib.msb.se/filer/pdf/28030.pdf

from extreme fires across large areas, with long-term effects. Countries already report that the wildfire season starts earlier and finishes later in the year, putting an additional strain on wildfire fighting preparedness and response resources. As an example, a study in France[10] published in January 2020 assessing potential climate change impacts on fire danger through the projection of the widely-used Fire Weather Index (FWI), forecast large increases in FWI in the French Mediterranean area: by mid-twenty-first century, a summer elevated fire danger three times more likely when summer temperature anomaly exceeds +2°C, but in the northern hemisphere, especially in boreal areas, the differences could exceed +5°C, while also worsening the effect of climate change by the additional release of potent greenhouse gases due to the larger area of burned forests and melting permafrost. However, in countries such as Spain, despite an increase in fire risk factors, fires have decreased in the last few decades[11]. This decreasing fire activity coincides with increasing fire suppression resources and can point towards the value of appropriate wildfire management.

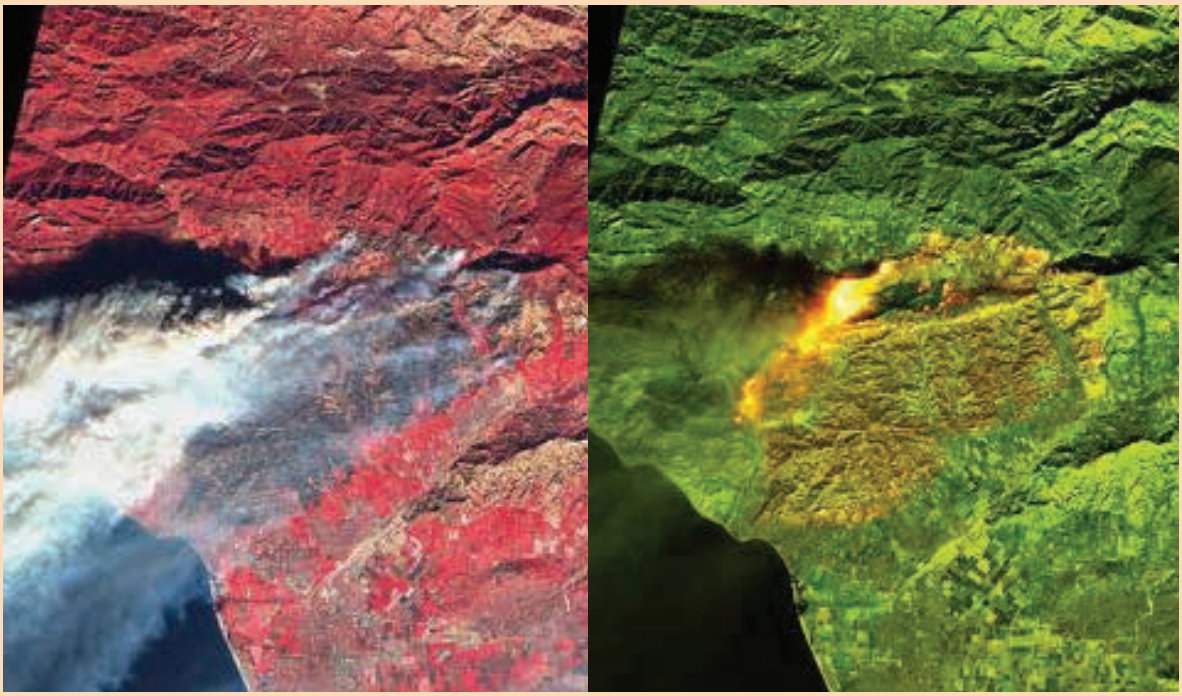
Moreover, an additional challenge is that the number of people potentially affected by wildfires is growing. The number of Europeans exposed to at least 10 days of high to extreme fire danger per year is expected to grow to 78 million people in case of a 3°C global temperature increase, which would mean 15 million people more than today[12]. Wildfires may cause significant economic, social and environmental damage. Even relatively small fires, such as the 2014 forest fires in the Austrian Alps, which burned an area of 100 ha, may lead to costs of several million euro due to the exposure to secondary natural hazards, such as rock falls. The prevention of wildfires is therefore essential, and in the current context, monitoring and mapping of vulnerable and affected areas is the first step that needs to be undertaken (See Example Boxes 1, 2 and 3).

10 link.springer.com/article/10.1007/s10584-019-02629-w

11 link.springer.com/article/10.1007/s13595-019-0874-3 Urbieta, I., Franquesa, M., Viedma, O. & Moreno, J. (2019). Fire activity and burned forest lands decreased during the last three decades in Spain. Annals of Forest Science. 76. 90. 10.1007/s13595-019-0874-3

12 Costa, H., de Rigo, D., Libertà, G., Houston Durrant, T., & San-Miguel-Ayanz, J. (2020). European wildfire danger and vulnerability in a changing climate: towards integrating risk dimensions, EUR 30116 EN, Publications Office of the European Union, Luxembourg, ISBN: 978-92-76-16898-0, doi:10.2760/46951, JRC119980

Example Box 1:



Copernicus Sentinel data of an active fire

Monitoring wildfires with remote sensing

In 2018 the European Commission's Directorate General for the Environment commissioned a study[13] to assess the contribution of (satellite-based) Earth Observation (EO) to forest monitoring systems by reviewing the available scientific literature and by summarising existing operational or experimental attempts at European and global level.

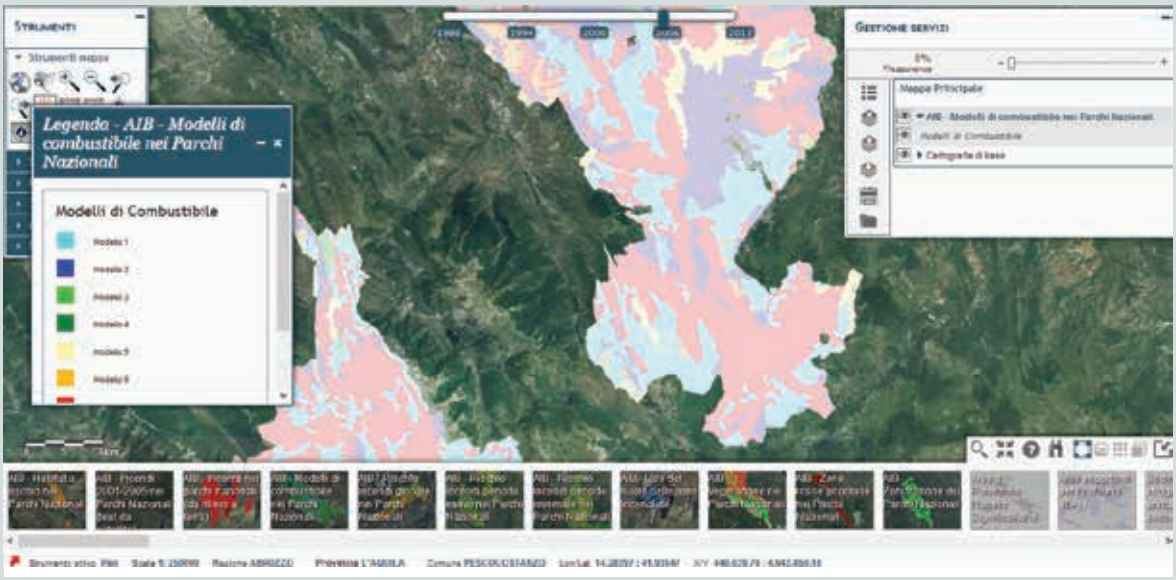
Thanks to the collected information, it was possible to describe the advantages and limitations of various remote sensing techniques and to design strategies and recommendations for effective use of EO data at European level for six highly relevant threats, including wildfires.

To prevent ignition and to reduce the impact of wildfires, EO-based monitoring systems can be used during three stages: before the fire (pre-fire), during the fire (active), and after the fire (post-fire). In all stages, remote sensing can support wildfire management:

- Pre-fire, to reduce the ignition risk, knowledge about fuel types and their conditions is extremely informative. This information was found to be accessible from optical datasets from Sentinel-2, combined with suitable weather information and forest structure information (e.g. gap-size distribution and vertical forest structure).
- During an active fire, forest firefighters should ideally be supported by thermal imagery, which they can use to better judge the situation and adapt response actions. Currently, suitable EO sensors for this task are not well adapted to smaller forest fires but future Copernicus satellites should ideally have at least one thermal sensor at 50 m spatial resolution with 5 days revisit time to address this gap. Meanwhile, currently available coarse resolution (and geo-stationary) thermal sensors could be further exploited for assessing large-scale fires and drought conditions.
- Post-fire, satellite monitoring can help describe the altered state of the landscape and help to decide on recovery actions. The provided information can then be complemented by information on fire severity and finally the monitoring of vegetation recovery.

[13] Atzberger, C., Zeug, G., Defourny, P., Aragão, L., Hammarström, L., Immitzer, M. (2020). Monitoring of Forests through Remote Sensing, doi:10. 2779/175242

Example Box 2:



Data viewer of the Forest Fire Project on the Italian National cartographic portal

The “Forest Fire Project” –
Using cartographic data to fight forest fires in Italian national parks

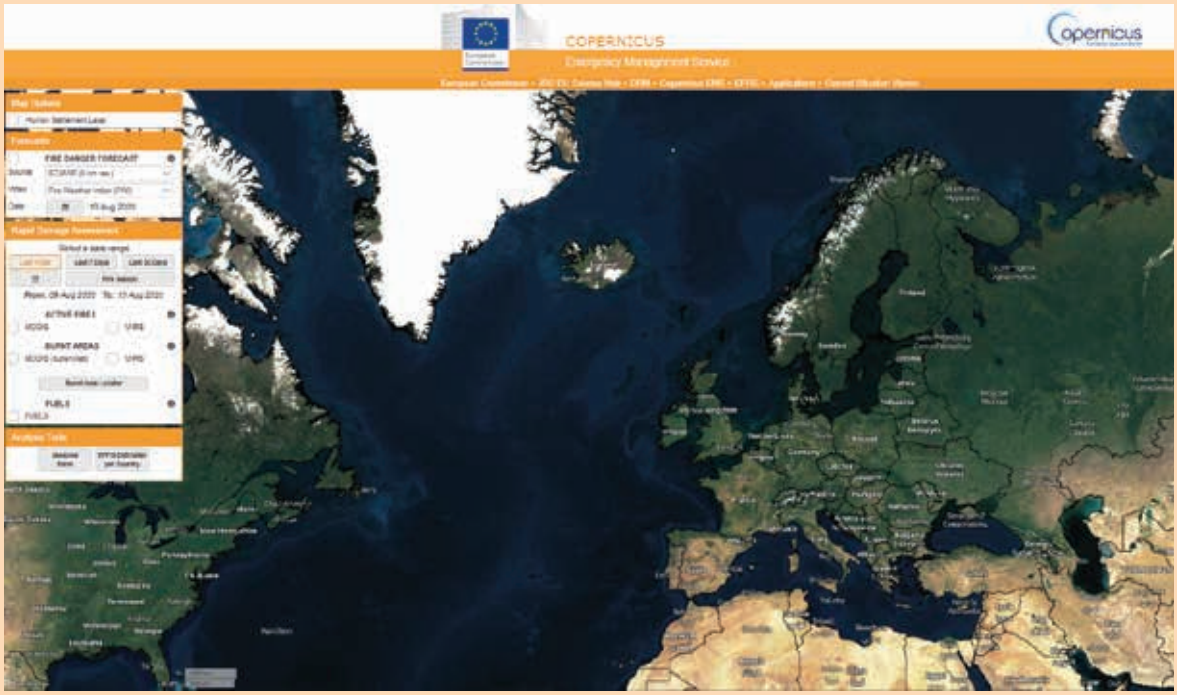
The Italian Ministry of the Environment, Land and Sea Protection developed the **“Forest Fire Project”**[14] **on the Italian National cartographic portal.** The project, based on results of previous projects carried out in collaboration with several research institutes, supports forest fire fighting plans in national protected areas.

Cartographic information is available as free and reliable data to facilitate the creation and implementation of so-called “Forest Fire Plans”. This information, accessible on an online viewer application[15], displays a large amount of detailed spatial data on fire risks, such as general fire risks in summer and winter, fuel constitution, priority habitats at high risk, and past activities of forest fire extinction.

While primarily intended for the relevant authorities and support services, the information can be used by many actors, such as researchers or land planning managers. The National cartographic portal allows users to overlay various cartographic information and base maps supporting the “Forest Fire Project”. It is also possible to add layers from other sources. These “personalised” overlaps, which can be saved locally, allow in-depth analysis and deductions aimed at specific objectives of territorial planning and management.

[14] sisef.it/forest@/contents/?id=efor0609-007
[15] pcn.minambiente.it/viewer/index.php?services=AIB_Incendi_PNZ

Example Box 3:



EFFIS – The European Forest Fire Information System

The **European Forest Fire Information System (EFFIS)**[16] supports the services in charge of forest protection against fires in EU countries and provides the European Commission and European Parliament with updated and reliable information on wildfires in Europe.

Since 1998, EFFIS has received support from a network of experts from the Expert Group on Forest Fires. In 2015, EFFIS became one of the components of the Emergency Management Services[17] of the EU Copernicus programme.

A number of specific applications are available through EFFIS, including:

- Up-to-date information on the fire season in Europe and in the Mediterranean region.

  This includes the current day's meteorological fire danger maps, a forecast for up to 6 days, daily updated maps of hot spots and fire perimeters, and information on burnt areas. The meteorological risk maps are based on the Canadian Fire Weather Index System and various sub-indices within the index are available, which enable objective fire danger values to be obtained to suit a variety of different fire regimes that occur across Europe.

- Fire News

  A selection of news from the press covering wildfires in Europe and updated daily by the EFFIS team. The user can filter news by countries through the news map.

16 effis.jrc.ec.europa.eu/
17 emergency.copernicus.eu/

3. What influences wildfires?

Wildfire risks are addressed by the EGFF in the publication "Basic criteria to assess wildfire risk on pan-European level"[18], which is an ongoing work towards European criteria facilitating the assessment of wildfire risks. In a simplified manner, this can be illustrated as in Figure 2 below:

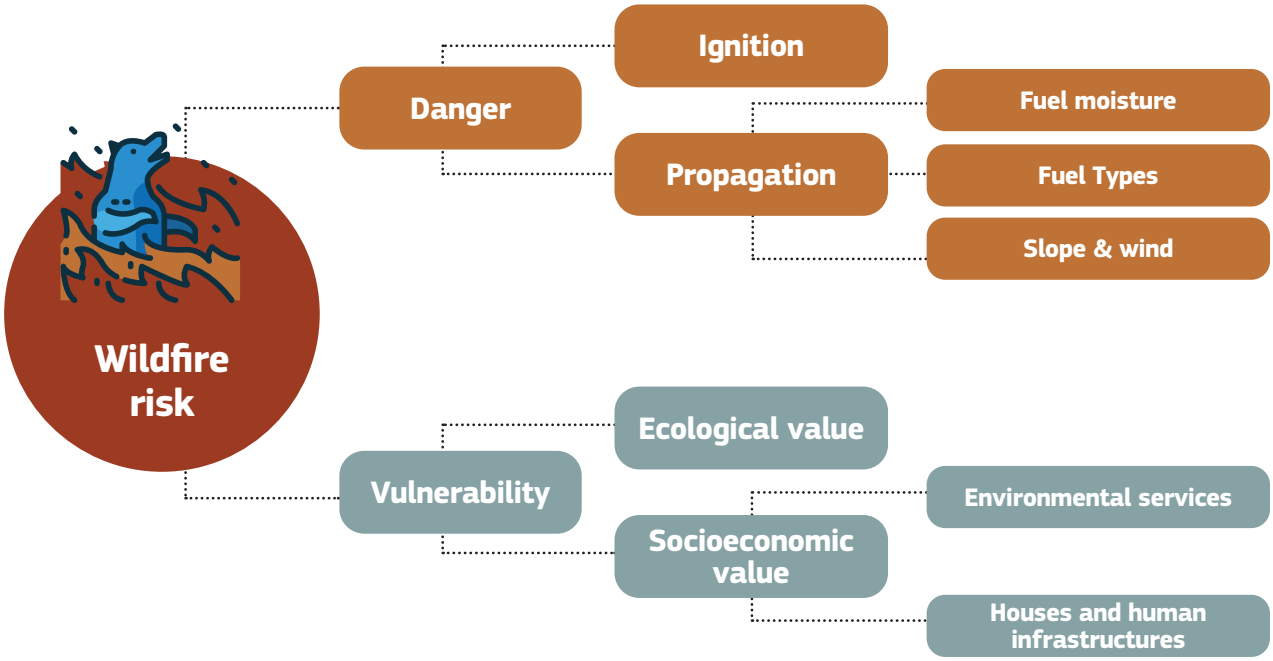


Figure 2: Basic components of wildfire risk assessment

In this context, the danger components of wildfire risk relate to the ignition and propagation probability of a fire, while the vulnerability components address the exposure and vulnerability of assets that are prone to be affected by wildfires. Some of the factors that affect fires can be characterised as either internal or external to the system (such as tourists, which during certain periods of time can overwhelm the local population without being well-informed on the existence of the fire hazards in the area).

In addition to the risk-assessment dimension dealt with in the "Basic criteria to assess wildfire risk on pan-European level", it is useful to look qualitatively to the causes behind the increase of wildfires (referred hereafter as "drivers"[19]). Forest-related wildfire drivers are intrinsic to the forest and its structure, health and composition. On the other hand, external drivers (see Figure 3) influence wildfire risk even though they are not related to the characteristics of the forest. This is why we refer to them as external pressures. The reader should however know that, in practice, these drivers are all closely interlinked.

a. External drivers

External drivers like climate change, land-management and use, weather and people influence wildfire risk. Increasing temperatures and increased droughts are the underlying causes of the higher risk of wildfires as they predispose fuel to ignition. Higher temperatures and more frequent

[18] JRC Technical Report: Basic criteria to assess wildfire risk at the pan-European level, 2018 https://effis.jrc.ec.europa.eu/reports-and-publications/effis-related-publications

[19] By "drivers" are meant the elements which generate wildfires and cause them to make progress.

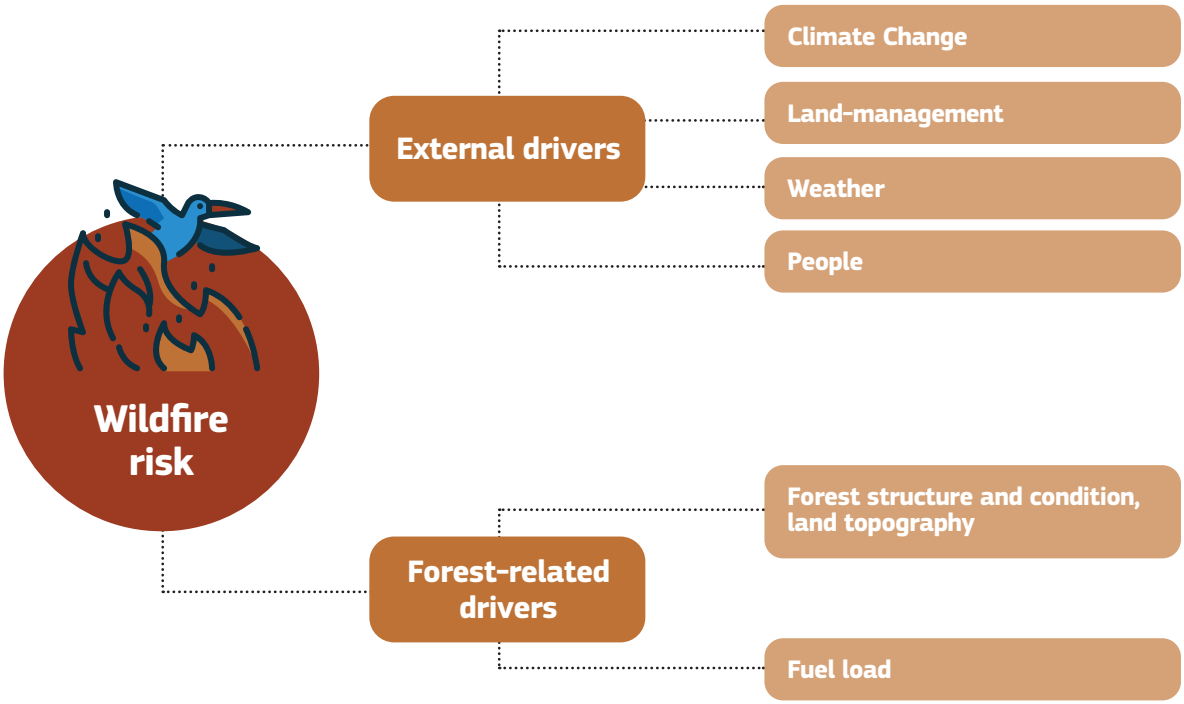


Figure 3: Wildfire drivers

droughts lead to more days with high fire risk, which explains part of the impact that climate change has on wildfire risks. Rising temperatures and droughts also affect the vegetation types, because changing environmental conditions put stress on existing vegetation types and therefore increase their dryness and vulnerability to wildfires[20].

At the same time, the changed climatic conditions are increasing the duration of the growing season[21] which in turn may lead to changes in species composition and to increased fuel load and, hence, wildfire risk.

Moreover, the changing environmental conditions may influence the species' distributions, potentially making ecosystems more fire-prone.

Strongly connected to climate are, of course, changes in weather patterns. Several areas in Europe face wildfires in winter, even when temperatures are below freezing point, e.g. during foehn events (warm and dry downwards-sloping mountain winds) in mountainous regions. This is due to vegetation senescence when the vegetation is in winter sleep and drier than the rest of the year. Evapotranspiration (water evaporation and plant transpiration to the atmosphere) also influences the dryness of the vegetation and soil and therefore the susceptibility of an area to wildfires. Under the influence of climate change, evapotranspiration has increased in parts of Europe, especially in some of the areas most vulnerable to wildfires. Decreasing rainfall and more frequent droughts will impact areas in Europe which, historically, only rarely faced wildfires. This occurs directly through lower relative humidity, and indirectly, through vegetation that is more susceptible to wildfires since it is not adapted to the drier conditions. The wind is another critical factor influencing wildfires, which can determine its spread and have an important role in oxygen supply and relative humidity.

People are at times victims of wildfires, while at the same time human actions often contribute to wildfires. Even though

[20] Costa, H., de Rigo, D., Libertà, G., Houston Durrant, T., & San-Miguel-Ayanz, J. (2020). European wildfire danger and vulnerability in a changing climate: towards integrating risk dimensions, EUR 30116 EN, Publications Office of the European Union, Luxembourg, ISBN: 978-92-76-16898-0, doi:10.2760/46951, JRC119980

[21] eea.europa.eu/data-and-maps/indicators/growing-season-for-agricultural-crops-2/assessment

fires can be triggered by natural causes (lightning strikes, volcanism, self-igniting gas emissions), EFFIS data[22] shows that the majority of fires in Europe are caused by humans, either accidentally, by negligence or deliberately. Accidental wildfires can occur because of damaged power lines or railways among others. People's behaviour can lead to wildfires due to negligence, for example through the use of fireworks or cigarettes, the careless use of fire to remove vegetation or through campfires, especially when weather conditions are unfavourable. Criminal reports have shown that fires are sometimes started deliberately (arson).

Land-management and planning are the main link between forest-related factors and external actions. Fire management is land management and vice versa. While rural decline can contribute to the development of wildfires in some areas, in other situations urban expansion has resulted in people moving into areas that are wildfire-prone. Newcomers may have little or no knowledge of land management, or traditional practices or fire risks. This trend is coupled with rural abandonment, which also contributes to an increased fire risk and propagation, through the lack of people to manage the fuel load. Negative attitudes towards traditional fire use practices by non-farming rural dwellers can also impact the management of vegetation and fuel loads.

b. Forest-related drivers

The composition and structure of a forest, including the topography of the site where the forest is located, as well as the activities influencing the forest tree composition also have an impact on wildfire risk and its occurrence. The stress on vegetation and possible changes in vegetation has already been mentioned, when referring to climate change. However, the vegetation composition and the fuel load, can also be influenced by forest management choices, e.g. the risk can be decreased through applying thinning and pruning, ensuring the discontinuation between the ground and crown level, substituting risky species for more resistant ones and introducing or removing certain structural elements according to the site conditions and management goals. Meanwhile, practices such as planting fast-growing tree species in order to rapidly obtain commercial returns might increase the risk in the absence of appropriate preventative silvicultural practices. The location and composition of new planting can influence risk, and young, newly-planted forests in high fire risk landscapes are especially vulnerable.

Generally, deciduous trees are less susceptible to wildfires than conifers, since the former typically grow in more humid microclimate and contain fewer flammable resins. Young coniferous forests, certain bushes and shrubs, as well as Eucalyptus and Cypress forests are particularly susceptible to wildfires[23]. Equally, very dense young forests in newly afforested areas with significant biomass accumulation are generally at greater risk. In addition, mono-species and mono-age stands can be more prone than a forest with more complex structures and diverse species and age compositions, especially if they are not managed properly. Tree density is another factor that can influence the wildfire risk, as does the presence of shrubs and flammable vegetation in between the ground and the crown level (vertical continuity).

Overall, it is clear that management choices affecting forests have a direct impact on the wildfire risk and, as such, they need to be factored in to reduce it.

Finally, another factor influencing wildfire risk is forest location (accessibility) and traditional rural activities developed in the area. As mentioned, human presence has been determined to have a strong influence on ignition. A higher number of human-related activities within a forest area will lead to a higher probability of ignitions, which highlights the need to consider education programmes and awareness-raising campaigns as key elements in the prevention equation.

[22] JRC Technical Report: Forest Fires in Europe, Middle East and North Africa, 2019 https://effis.jrc.ec.europa.eu/reports-and-publications/annual-fire-reports

[23] forestresearch.gov.uk/research/building-wildfire-resilience-into-forest-management-planning/

4. Preventing wildfires

In this chapter, we highlight prevention measures that should be taken at national, regional and local levels, depending on the responsibilities assigned through national legislation, with a view to making landscape and communities more resistance and resilient to wildfires.

a. Governance

Governance is a key aspect of wildfire prevention, by defining who is responsible for wildfire protection, including prevention and management, and who is responsible for landscape planning and forest management. These responsibilities often lie with different organisations or in different parts of the same organisation. It is thus important to ensure that wildfire prevention is also part of the priorities of those working on the planning and management of the landscape. Regular meetings and information sharing to achieve a joint approach are important when the competences are scattered among different organisations, as well as a common vision and awareness of the risks amongst the entities involved (See Example Boxes 4 and 5).

Example Box 4:

AGIF – The Agency for the integrated management of rural fires in Portugal

Following the catastrophic 2017 wildfire season, Portugal heavily invested in a new wildfire defence strategy. This led to recommendations being published in high-profile reports:

- Portugal wildfire management in a new era assessing fire risks, resources and reform (Beighley and Hyde[24], 2018)
- Two Independent Technical Commission reports on the June and October 2017 fires (2017[25], 2018[26]).

This new strategy also led to the creation of the **Agency for the Integrated Management of Rural Fires (AGIF)**[27], which is now responsible for the integrated analysis, planning, evaluation and strategic coordination of the Integrated Management System of Rural Fires, including the qualified intervention in high-risk events.

AGIF
AGÊNCIA PARA A GESTÃO INTEGRADA DE FOGOS RURAIS

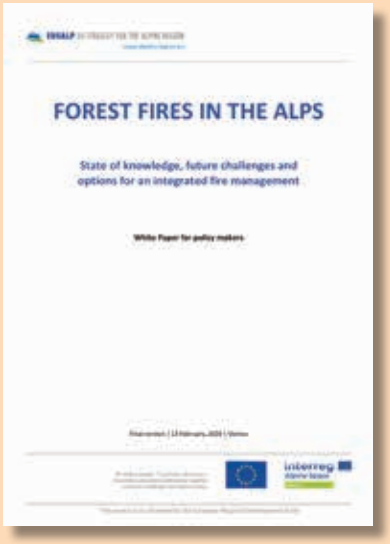
[24] isa.ulisboa.pt/files/cef/pub/articles/2018-04/2018_Portugal_Wildfire_Management_in_a_New_Era_Engish.pdf
[25] parlamento.pt/Documents/2017/Outubro/Relat%C3%B3rioCTI_VF%20.pdf
[26] parlamento.pt/Documents/2018/Marco/RelatorioCTI190318N.pdf
[27] agif.pt

Example Box 5:

Forest fires in the Alps

State of knowledge and further challenges

Together the Macro-regional Strategy for the Alpine Space's Action Group 8 (responsible for risk management and climate change, including major natural risks prevention), the Austrian Federal Ministry of Agriculture, Regions and Tourism launched a study on the state of knowledge and future challenges caused by forest fires. With scientific guidance from the Institute of Silviculture of the University of Natural Resources and Applied Life Sciences, Vienna, good practice examples were collected and recommendations for an integrated forest fire management in the Alpine Space were elaborated.



The resulting **White Paper "Forest Fires in the Alps"**[28] states that current efforts to prevent and fight forest fires are not able to cope with the occurrence of extreme forest fires in the Alps. The implementation of an integrated and anticipatory strategy comprising measures for fire prevention, firefighting and restoration of forest fire areas is urgent and should be implemented as soon as possible. This is in line with the development of climate-friendly forests, which is a challenging but necessary task in the service of the Alpine population.

[28] alpine-region.eu/results/forest-fires-alps-state-knowledge-and-further-challenges

b. Planning

There are obvious advantages in anticipating the risk and the drivers of wildfires. This can be done by building resistant and resilient landscapes and societies based on the prior estimation of the wildfire risks, coupled with appropriate management of the forest and of the human activities taking place therein. A sound planning comprises several stages (in short: scoping and survey, risk assessment, implementation, monitoring and review) and also includes contingency plans for being ready to respond to unforeseen developments. The logic being that a higher investment in planning will lower the likelihood that wildfires will have significant negative economic, social and environmental impacts (See Example Boxes 6 and 7).

Since climate and weather conditions have a decisive effect, when choosing the best planning strategies, the changing climatic conditions and their consequences must be properly taken into account.

Populations living near green spaces must become acquainted with the different wildfire risks and associated activities. Since urban areas are sometimes stretching into rural areas, there is a risk of wildfires affecting an increasing proportion of the population in these areas. More people must thus be made aware of wildfire and its consequences, and they need to know how to act in case of a fire. In some regions, e.g. the European Alps, wildfires can lead to the destruction of protective forests, which can, in turn, endanger the population and infrastructure through secondary natural hazards such as mudflows, rock falls or avalanches. This requires adequate information and education.

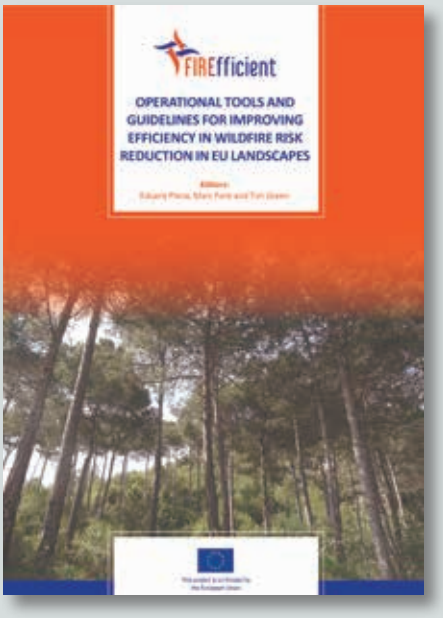
When planning infrastructure and urban development close to wildfire-prone areas, the associated risks need to be considered and potential hazards need to be identified. Ecosystems with important fire risks must be evaluated especially in relation to human habitation. Any planning must be done in an integrated way and be the result of wide consultation with people and relevant stakeholders, in order to increase awareness and to gain support for the measures adopted.

Example Box 6:

Tools and guidelines for improving efficiency in wildfire risk reduction – Cataluña

These tools and guidelines aim to show how the resilience of forests to wildfires can be improved through proper risk governance, appropriate forest management, and landscape planning activities.

They were developed in the frame of the European project FIREfficient (Operational tools for improving efficiency in wildfire risk reduction in EU landscapes)[29]. The project built capacity for land planners and managers by enhancing the transfer of best practices and lessons learned in wildfires' management.



[29] http://firefficient.ctfc.cat/images/book_guidelines.pdf

Example Box 7:

Regional forest fire prevention plan – Cantabria

In Cantabria, one of the Spanish regions most affected by forest fires, a **Forest Fire Prevention Plan**[30] was adopted in 2018, based on the participation of all relevant stakeholders (public and private). It provides a good example of conciliation and coordination that requires funding and could be replicated in other regions in Europe.

The resulting document is structured around 6 general objectives, 27 specific objectives and 77 clear actions to carry out. It implies an investment of over €25 million for the period 2017-2020 to guarantee an adequate planning and coordination system between the different administrations, to provide the region with an efficient wildfire communication and awareness strategy, and to reduce the impact of forest fires in Cantabria.

The greatest economic and technical effort is concentrated in the area of prevention and, within this, in the reconciliation of interests between the different land users to avoid the illegal use of fire. It promotes a comprehensive use of natural resources that favours sustainable rural development, secures the population, improves the quality of life, promotes the multifunctionality of the land, and achieves adequate conservation of ecosystem services.

[30] Plan estrategico de prevención y lucha contra los incendios forestales en Cantabria 2017-2020 https://dgmontes.org/documents/16835/7538995/PEPLIF+definitivo/f59aaba4-4c5c-9e65-6914-bbdef2221af4

c. Forest management

Trees have, naturally, a very long life-cycle, depending on species. When it comes to monocultures or semi-natural forests, which represent the highest share of forest in Europe, most of today's forest planning issues and complexities depend mainly on choices made in the past. For the same reason, the choices we make today will be decisive for the future. Be it for existing forest or for planning the forests of the future, management choices have a crucial impact on a forest's vulnerability to wildfires. When drafting forest management plans, this needs to be considered (See Example Box 8).

Regeneration and tree planting

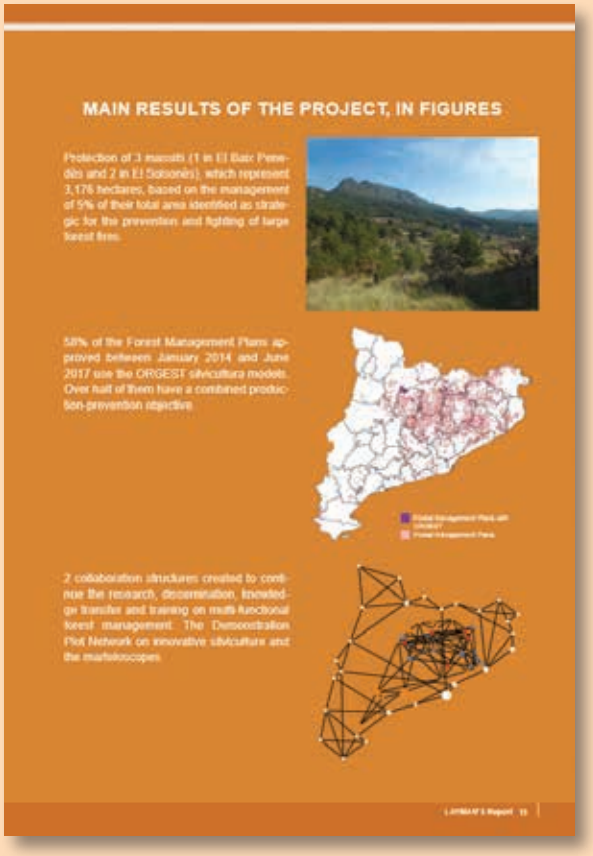
Ideally, tree species chosen for planting should be the best adapted to the current and future climatic conditions. In general, if site conditions allow it, deciduous species tend to be more resistant to wildfire. Moreover, species with a higher age mix and species mix tend to be less vulnerable to wildfires compared to mono-age and mono-species stands, since their more complex structure can slow fire spread and due to the different wildfire behaviour of the various species. Variable retention treatments (the preservation of structural elements of a forest such as nurse logs for ecological purposes) are used to increase vertical and horizontal discontinuities in flammable fuels, favouring the growth of trees with resistance and resilience traits (e.g. large diameters, deep roots, fecund mother trees). To avoid stress due to changing climatic and weather conditions that may negatively impact tree health, suitable varieties of native species should be selected that are adapted to the local circumstances such as soil and water. When possible, genotypes that are already part of a well-functioning ecosystem should be chosen. Exchange of knowledge and expertise between southern and northern latitude countries can help with this selection.

The support of old-growth forests is encouraged for their essential benefits for biodiversity and carbon storage. Depending on the conditions, these forests will have a more humid microclimate that can potentially mitigate wildfire risk; however, in some cases, they can also be more prone to wildfires and provide good conditions for their spread in boreal forests.

Wildfire risks also need to be considered in landscape planning. Either during urban planning processes or at the individual forest level, when drafting landscape management plans, in order to ensure that wildfire risk is duly taken into consideration.
This means investing in wildfire expertise and the interconnection of experts at different governmental levels.

Prescribed burn by the Integral Wildfire Prevention Team (EPRIF) of Noia (Galicia, Spain)

Example Box 8:



LIFE+ DEmORGEST

Management guidelines to increase forest resilience

The LIFE+ DEmORGEST project[31] has strengthened the capacity of forest owners and forest professionals in Catalonia to protect forests against fires in a sustainable way.

The project's objectives were:

- To help reduce the vulnerability of Catalan forests to Large Forest Fires (LFF), through the adoption of new forestry models by private foresters.
- To increase the ability of forest owners and managers to apply and provide new sustainable perspectives and models for the prevention of LFF.
- To raise society's awareness of the role of forest management in the fight against LFF and the conservation of forests and the services that they provide.

Guidelines for Sustainable Forest Management in Catalonia[32] were developed, as a set of technical tools for forest management. These guidelines represent the initial proposal for management guidelines for the various tree formations in Catalonia, which include existing scientific and expert knowledge, and address the specific conditions of the station, sector and market qualities in Catalonia.

31 cpf.gencat.cat/web/.content/or_organismes/or04_centre_propietat_forestal/03_linies_actuacio/transferencia_de_coneixement/projectes_europeus/life_demorgest/static_files/LAYMAN_ang.pdf

32 Bonet, J., Pique, M., Martínez de Aragón, J., Beltrán Barba, M., Vericat, P. & Cervera, T. (2012). Models de gestió per a la producció micològica en boscos de pi roig (Pinus sylvestris L.). Sèrie: Orientacions de gestió forestal sostenible de Catalunya (ORGEST).

Managing fuel loads

When discussing wildfires, fuel is any material that can support combustion within a wildfire. Its condition depends on moisture content and the live or dead vegetation status. According to different circumstances, fuel management can reduce combustion risks. In this sense, prescribed burning (planned and supervised fires to reduce the fuel amount based on different management objectives) is frequently used across Europe. The collection of biomass for the purpose of local consumption (e.g. heating) can also be beneficial but is becoming a residual practice given the social and demographic changes. It is important to acknowledge that in an appropriate setting, prescribed fires are desirable due to their role in supporting land-use, and ecosystems (new growth, more diversity of the structure of heather moors, habitat restoration) and the increased wildfire resilience that they bring by removing fuel load (See Example Boxes 9 and 10). Skills on fuel-loads and knowledge on fuel-load distribution are therefore important to facilitate the management of prescribed fires, to understand the dynamics of wildfire propagation and to develop efficient wildfire management plans (See Figure 4 and Example Box 11). In addition, prescribed burning, thinning, forest grazing, etc., should, in any case, be used in a duly planned way. There is also a need to consider that the beneficial outcomes of all these practices can have only a temporary effect since vegetation continues growing afterwards, if not considered in a long-term planning instrument that includes measures to control vegetation. These can be supported by rural development programmes. Closer-to-nature forestry practices which promote the leaving behind of deadwood in forests might, depending on the local conditions, require further precautions to prevent forest fires.

Example Box 9:

Prescribed burning for biodiversity

The LIFE Taiga project

As part of this five-year project in the Swedish Taiga, some 120 prescribed burnings were carried out between 2015 and 2019. The aim of these actions was to increase and conserve biodiversity in the most common habitat type across much of Sweden (Western Taiga). The controlled burning events primarily took place in coniferous woodlands containing mostly pine. All controlled burning events took place in Natura 2000 sites which were already set aside for nature conservation and which the County Administrative Boards is responsible to manage on behalf of the EU. LIFE Taiga and burning for nature conservation involved restoring and conserving unique habitats for coming generations.

Life Taiga[33] was financed by the EU and the Swedish Environmental Protection Agency, and is one of the largest projects of its kind, with a budget of almost €10 million over five years. It is part of the EU's and the County Administrative Board's work to help protect threatened species and their essential habitats.

[33] lifetaiga.se/controlled-burning-in-woodlands/

Example Box 10:

Prescribed burning TREX Andalucía 2019

In November 2019, the Andalusian government organised, in cooperation with the United States-based Nature Conservancy, a training and exchange programme on prescribed burning[34]. This training helped firefighters and land managers to use fire as a tool for fire management. The training grouped participants in so-called burning teams to familiarise themselves and gain experience on prescribed burning planning, execution and evaluation. It also addressed the impact on the landscape and how prescribed burning can be used in changing climatic conditions. The training took place for eleven days and discussions have started on how to replicate this training in other parts of Europe.

[34] conservationgateway.org/ConservationPractices/FireLandscapes/HabitatProtectionandRestoration/Training/TrainingExchanges/Documents/Andalucia-2019-Announcement-English.pdf

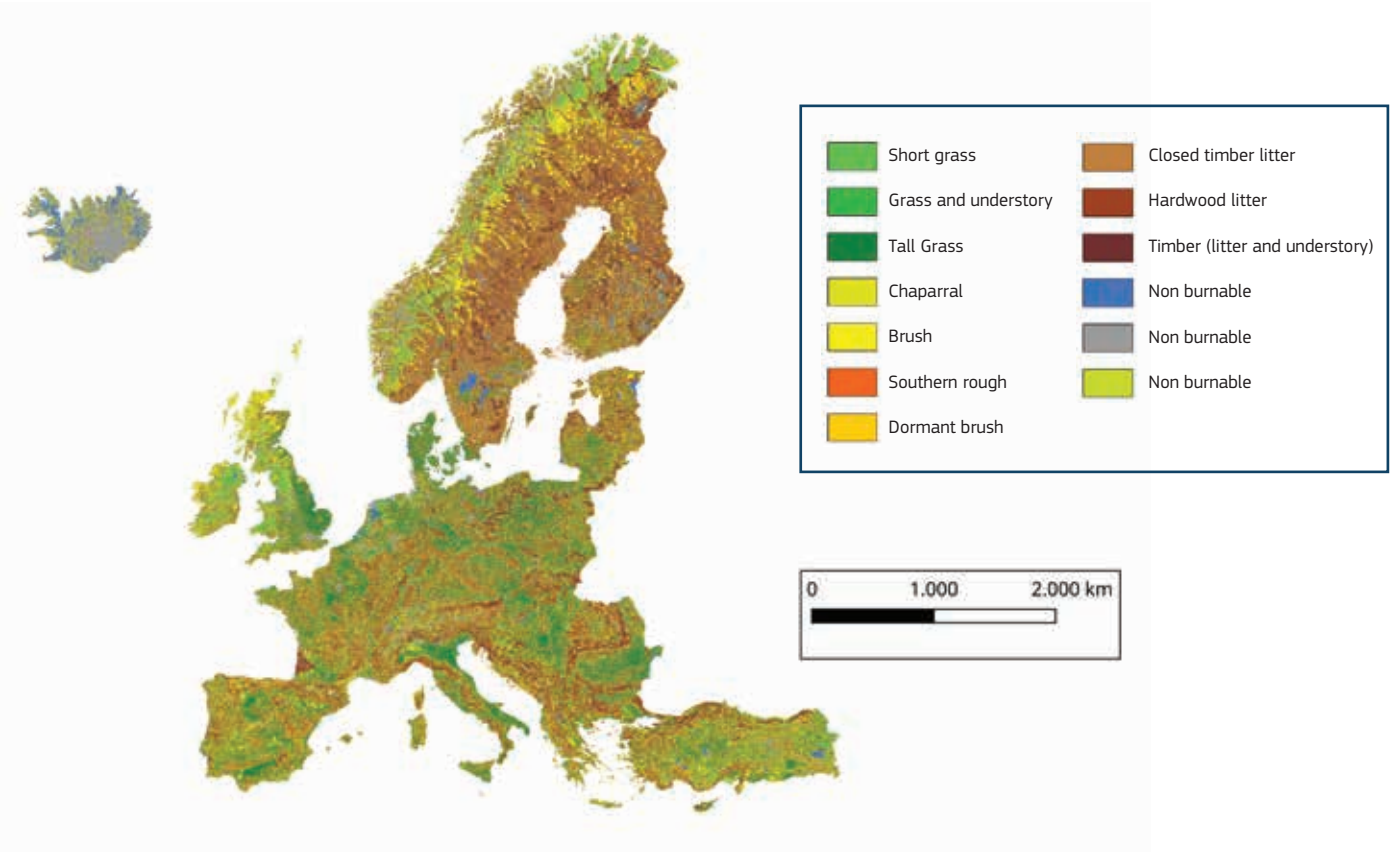
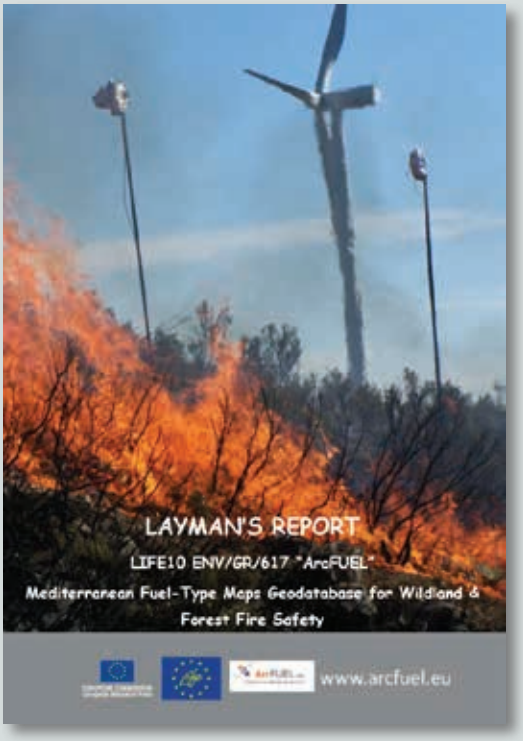


Figure 4: EFFIS Fuel distribution in Europe

Example Box 11:

The ArcFUEL LIFE project

In 2015, the ArcFUEL project[35] delivered a thorough methodology for fuel classification mapping in the Mediterranean region. It uses an online geo-database based on readily available, harmonised, accessible and interoperable data according to EU INSPIRE Principles[36]. The methodology was demonstrated via pilot applications in Greece, Portugal, Italy and Spain.



[35] ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=home.showFile&rep=file&fil=LIFE10_ENV_GR_000617_LAYMAN1.pdf

[36] inspire.ec.europa.eu/inspire-principles/9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Another effective and sustainable practice to reduce wildfire risk is grazing, which can be done by wild as well as domesticated animals, depending on the land use (See Example Box 12).

Example Box 12:

GrazeLIFE

Fuel load management through grazing

GrazeLIFE[37] is a preparatory LIFE project supported by the Commission's LIFE programme with €500 000 running from 2019 to 2021. It is coordinated by Rewilding Europe and is implemented in 11 European countries.

The project will evaluate the effectiveness of various grazing management models with domesticated and (semi-) wild herbivores. While the main objective is to prevent wildfires it has other benefits such as fostering climate change adaptation and biodiversity-rich ecosystems.


ANDREY NEKRASOV

The first results of the project show that natural forests with normal free-roaming populations of herbivores can be more resilient to wildfires, as different species of grazers are very effective and efficient in removing fuel by focusing on different plant material for food.

[37] grazelife.com

Creating a mosaic landscape with different functions and ecosystems can also help effectively manage fuel loads. This leads to a more diversified environment with different habitat types, different vegetation, natural barriers, and a variety of management practices, which offers more options for rural populations to develop their economic activities and contribute to its maintenance.

New structures must be set up, or existing structures used, to provide the necessary education and training on land-management techniques, such as prescribed burning or which vegetation and trees to plant to increase resistance and resilience against fires (See Example Box 13).

For all stakeholders there is a need to create awareness on:

- The role of prescribed burning, to ensure that people understand that these controlled practices can contribute to a more resistant and resilient landscape that contributes to their safety
- How their behaviour can cause ignition, particularly during high-risk seasons
- How they can contribute to lower the risks of wildfire
- How to act in the event of a fire.

Example Box 13:

Promoting locally-led sustainable farming and fire management in upland areas, Ireland

In developing responses to wildfires, Ireland has closely followed the FAO's voluntary guidance for fire management in advance of developing suitable national strategies of its own. This has proved important in the early stages of development, in terms of defining priorities for action, and the development of suitable evidence to base actions on.

Early on, it became clear that active and economically viable farming in fire-prone upland areas is one of the most effective ways to prevent and reduce the effects of wildfires. While active grazing patterns can reduce fuel loads, other activities by farmers can also benefit biodiversity protection and enhancement, as well as the protection of landscapes and ecosystem services.

Ireland's EIP-AGRI Operational Groups encourage co-operation and innovation in specific rural areas by offering new opportunities to bring a broad range of people together to overcome common challenges. To date, there are 23 EIP-AGRI projects[38] in operation, with 6 of these projects related to upland (mountain) areas where fire has been identified as a significant problem. These 6 projects all contain fire management modules, integrated with other habitat management and farming measures. These modules are intended to improve the understanding of upland vegetation management and its role in relation to fire, and address these issues through improved farming practices.

In practice, this has involved results-based payments to farmers, based on the outcomes of work they have completed, under the supervision of the projects. Examples relevant to European fire management include improved upland grazing measures, direct vegetation management using mechanisation and prescribed burning techniques, as well as education and exchange within and between groups.

[38] agriculture.gov.ie/farmerschemespayments/europeaninnovationpartnershipincludinglocallyledschemes/eip-agrioperationalsgroups/

d. People

People are often a cause and can also be victims of wildfires, so their role is key in any prevention strategy. People need to be aware of which activities, under which conditions, can lead to an uncontrolled wildfire, but also which activities can contribute to mitigate the risk.

Wildfires pose a European problem, so increasing Europe-wide awareness and creating a common understanding on this topic is necessary, especially because part of the wildfire season overlaps with the main holiday period during which people travel around the continent. Tourists are often less well informed about local risks, do not know the emergency information channels, and might not speak the local languages, all exacerbating wildfire risks. Infrastructure such as roads or railways may also increase the risk of ignition and require further attention.

Example Box 14:

FFPE – Raising awareness for forest fires and training of forest fire agents and volunteers in Estonia

The aim of the FFPE LIFE project (2010-2012)[39] was to raise awareness on forest fire prevention in Estonia, provide training in the field with a focus on local conditions and improve networking amongst key stakeholders. This helped to reduce the environmental damage caused by forest fires in Estonia and provided an example for other EU regions.

The project planned to conduct awareness-raising campaigns aimed at specific stakeholders, support networking, and organise training and other events to achieve the following goals:

- to increase awareness of forest fires and measures to address them in everyday life
- to enhance the implementation of forest fire prevention measures
- to enhance networking around forest fire prevention at regional and local levels
- to help achieve the priorities of the EU Forest Action Plan: protection of forests against biotic and abiotic factors
- to considerably contribute to fulfilling the EU's overarching objective to halt the loss of biodiversity.

The FFPE project successfully produced a range of awareness-raising materials, reached out to key stakeholders on the issue of forest fire prevention and developed networking amongst decision-makers in Estonia. The project produced a set of awareness-raising materials aimed specifically at: 1. visitors to forests in Estonia; 2. forest owners; and 3. youngsters. The project selected demonstration sites and best practice examples to use in training. Project events were held in six counties that have high or medium fire risk in Estonia.

[39] ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3507&docType=pdf

Example Box 15:

ForFirEx 2019 - The first national level simulation exercise in Romania

A national-level forest fire simulation exercise, ForFirEx 2019[40], was led by the Inspectorate General for Emergency Situations between 23 and 27 September 2019 and aimed to coordinate the activities of the integrated leadership and intervention structures in case of a fire in the forestry fund. Participating in the exercise were firefighters, foresters and twenty soldiers. Trucks, a C-27 J Spartan aircraft and two helicopters from the Romanian Air Force, were used to transport materials and 'victims', as well as the staff of the Emergency Situations Cell with the Ministry of National Defence and liaison offices from the advance operative posts.

The exercise was carried out based on a fictitious scenario and was aimed at training and testing the decision-making, command and coordination structures within the elements making up the National Emergency Management System. It also allowed to test the informational-decision making flow and public communication, assess the training level of the staff and the existence of the necessary resources for the interventions. The viability of the measures established through the National Response Concept in case of a wildfire could also be verified.

[40] agendapompierului.ro/articole/Aplicatii_Tactice/2019_09/Exercitiu_national___Incendii_de_padure.html

Another area to act upon would be countering rural abandonment, which causes the loss of traditional knowledge on land-management including forest and pasture management. Promoting sustainable jobs with good wages and full-time employment in the forestry sector could facilitate the maintenance of knowledge and sustainable forest management practices. New opportunities to live in rural areas also need to become available while ensuring that people can keep contact with the urban areas. There is a need to make rural areas attractive for younger people, e.g. by ensuring a high quality of essential services such as schools and high-speed internet. The EU has dedicated policies for this.

Example Box 16:

Wildfire prevention campaign in France

French local actors are very involved and regularly carry out preventive measures, but certain types of behaviour are even more worthy of being publicised. This is why the Ministry for an Ecological and Inclusive Transition, in conjunction with the Ministry of the Interior and the Ministry of Agriculture and Food, launched in 2019 a national forest fire awareness and prevention campaign[41] for the third year running.

In 2020, the whole of mainland France has been included in the campaign. This applies not just to forest fires, but all other types of vegetation fires as well (fallow land, roadsides and railway embankments, fields, moors, ferns, etc.). The purpose of the campaign is to publicise advice and recommendations to follow in the event of a forest or vegetation fire, as much as to ensure that people don't start a fire themselves and to advise on how to protect oneself should a fire break out.

[41] ecologique-solidaire.gouv.fr/en/campagne-feux-forets

5. A common strategy to wildfires

a. Funding wildfire resilience

There are several possibilities at EU and national level to access public funding for implementing measures that help prevent wildfires. Existing funding opportunities may be used to better manage forests in order to improve their resistance and resilience to wildfires, to set up campaigns to raise wildfire awareness or to create job opportunities in rural areas.

The Common Agricultural Policy (CAP) and the European Structural and Investment Funds offer the possibility to support wildfire prevention measures. Member States' authorities are invited to invest in wildfire prevention when planning for the use of these funds. Ensuring that all stakeholders are aware of these possibilities and that the right stakeholders have access to them is important. For that purpose, knowledge of these funds and how to apply for them, e.g. by providing guidelines, should be further disseminated.

In addition to actively supporting wildfire prevention, the EU supports the restoration of burned land as well as training and advisory service measures for land and forest owners and managers through its Rural Development Fund. Meanwhile, firefighting activities and investments are supported by the Regional Development Fund.

Under the CAP, restoration and prevention measures against fires and other natural disasters were implemented under the previous programming period (2007-2013) with €2.4 billion of total public expenditure. For the 2014-2020 period, €1.7 billion total public expenditure was allocated for prevention activities and almost €700 million for restoration actions. In addition, €1.4 billion has been planned for investments in improving the resilience of forests, which will also contribute to the mitigation of wildfire risks. There is a need for disseminating information towards the potential beneficiaries: for example, under the current programming period (2014-2020), controlled grazing to decrease the wildfire risk is eligible for support and several CAP-funded programmes have included it among the eligible expenditures. This environment-friendly practice will also be eligible in the new programming period (post-2020).

Member States and regions have allocated almost €8 billion for climate change adaptation and risk prevention and management for the 2014-2020 period from the European Regional Development Fund (ERDF) and Cohesion Fund, including for cross-border and transnational cooperation. Interreg programmes[42] and the EU macro-regional strategies play a key role in strengthening cooperation in this field, supporting projects and long-term cooperation processes. These investments provide significant funds for forest fire risk prevention and management in the Member States. Thanks to the investments of the period 2014-2020, more than 16.5 million Europeans will be better protected from wildfires[43].
The EU Solidarity Fund provides financial aid for emergency and post-disaster reconstruction operations. In the period 2017-2019, the EU Solidarity Fund supported two Member States – Portugal and Spain – by allocating €54 million for dealing with damage inflicted by forest fires in 2017 only. Lists of relevant funding programmes can be found on the European Commission's dedicated webpages[44].

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42 Interreg, as an integral part of EU cohesion policy, provides a framework for joint action between Member States and also between Member States and third countries, to find common solutions to shared problems. It promotes exchanges of experience across borders and facilitates acting together. https://interreg.eu/

43 See cohesiondata.ec.europa.eu/themes/5#

44 ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls_en
ec.europa.eu/environment/ecoap/about-action-plan/union-funding-programmes
ec.europa.eu/info/funding-tenders/funding-opportunities_en
ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/rural-development_en
ec.europa.eu/regional_policy/en/funding/

b. Working together at European level

When wildfires overwhelm national response capacities, the EU Member States and seven Participating States can trigger the EU's Civil Protection Mechanism to ask for a coordinated, rapid and effective international response (See Example Box 17).

In addition to the actions from the Civil Protection Mechanism, the EU supports and complements prevention and preparedness efforts of the Member States and the Participating States by focusing on areas where a joint European approach is more effective than separate national actions.

In this context each year, the European Commission publishes calls for proposals to fund activities aimed at promoting and encouraging cooperation in prevention, preparedness and awareness-raising activities in civil protection and marine pollution. These calls target both national civil protection authorities and research institutes. They can include risk assessments to identify disaster risks across the EU, encouraging research to promote disaster resilience and reinforcing early warning tools in wildfires but also in other areas or risks, such as flash floods or landslides, known to occur in the aftermath of large wildfires.

Additionally, the Mechanism can co-finance the transport of assistance to the affected area as well as operational costs.

When fires of such magnitude occur, the EU Member States and the Participating States regularly show solidarity by sending assistance in the form of firefighting planes, helicopters, firefighting equipment and teams of experts. Regarding expertise, it is important to highlight how specific knowledge and experience on wildfires from the more experienced countries in Europe can contribute and make a difference in supporting other countries to be better prepared and have a better response to wildfires (See Example Box 18).

In June 2016, the European Commission published an Action Plan on the Sendai Framework for Disaster Risk Reduction 2015-2030[45]. The Action Plan provides for a more systematic disaster-risk-informed approach in EU policy making. Through society-wide engagement, it proposes concrete activities on risk knowledge, risk investments, disaster preparedness, and resilience including wildfire risk.

[45] https://ec.europa.eu/echo/partnerships/relations/european-and-international-cooperation/sendai-framework-disaster-risk-reduction_en

Example Box 17:

European Civil Protection and Humanitarian Aid Operations

Between 2007 and 2019, 30% of all requests for assistance through the EU's Civil Protection Mechanism[46] were in response to wildfires.

The European Union Civil Protection Mechanism coordinates pan-European assistance and ensures that all EU Member States and the Participating States to the Mechanism receive timely information in times of crises and emergencies. Upon its activation by any country worldwide, the Mechanism ensures the rapid deployment of resources and personnel that are tailor-made to fit the needs of each individual emergency.

At the operational heart of the Mechanism lies the European Commission's Emergency Response Coordination Centre. The Centre monitors forest fire risks and emergencies across Europe, supported by national and European monitoring services such as the European Forest Fire Information System. At the onset of the forest fire season each year, the Centre engages with national authorities from the EU Member States and the Participating States to exchange information on the status of prevention, preparedness and response activities and maintains close contact with national authorities throughout the forest fire season.

In March 2019, the EU Civil Protection Mechanism was upgraded to establish a new European reserve of capacities (the "rescEU reserve") which includes firefighting planes and helicopters. For the 2020 wildfire season, the European Commission co-financed the stand-by availability of additional aerial forest firefighting capacities to address potential shortcomings in responding to fires. Croatia, Cyprus, France, Greece, Italy, Spain and Sweden put together 13 firefighting planes and six helicopters at the disposal of other EU Member States in case of an emergency. The new system also sees greater investment in knowledge sharing and preparedness activities, despite the unusual challenges imposed by Covid-19 restrictions, which halted most of the tactical international reunions and the exchange of experiences in the field.

The Mechanism was activated five times for forest fire emergencies in 2019, in Greece, Israel, Lebanon, Bolivia and Guatemala. Furthermore, the Copernicus Emergency Management Service regularly produces satellite maps on demand to help national authorities respond to wildfires. In the same year, Copernicus produced 108 maps of areas affected by wildfires.

[46] ec.europa.eu/echo/what-we-do/civil-protection/forest-fires_en

Example Box 18:

Lessons learned from forest fires – EU NEDIES project

The NEDIES project was conducted at Ispra by the Institute for the Protection and Security of the Citizen of the European Commission's Directorate-General Joint Research Centre (JRC). The objective of the project was to support the Commission Services of the European Communities, Member State Authorities and EU organisations in their efforts to prevent and prepare for natural disasters and accidents, and to manage their consequences. The main NEDIES activity was to produce "lessons learnt" reports based on experience gained from past disasters, notably one on forest fires, which is based on the contributions presented at a NEDIES meeting held at the JRC in Ispra on 23 and 24 May 2002[47].

Regarding forest fire management

From the discussions held during the meeting, the following considerations were made:

- It is essential to focus on the present fire risk, i.e. in real time. This of course depends on various variables such as type of fire, wind speed, vegetation type, etc. Furthermore, the risk could be increased during the development of the fire, if the fire management is carried out in an inefficient manner.
- The use of the internet is becoming more and more important, as the number of people with internet access is increasing.
- It is the State's role to set up large resources in depots so as to ensure better management of resources to fight forest fires. Many problems arise due to lack of resource and bad management.
- Training of firefighters is vital both for the rescuing of potential forest fire victims and the survival of firefighters during life-threatening interventions.
- The early assessment of a fire is of utmost importance. It is not enough to have a good monitoring system. It is essential that the experts behind the system are able to work well with the coordination group so as to assist in making quick and adequate forest fire management and firefighting decisions.

Identified needs

The Civil Protection Authorities identified the following needs:

- It is essential that the civil protection world and the research world collaborate more closely together. Research should be involved in all phases of disaster risk management so as to assist in its improvement. For example, there is a need to have lightweight equipment for firefighters, along with special fire-resistant uniforms.
- Disseminating risk information is challenging. It is essential that socio-economic research is carried out to assist authorities in this area. This way, the potential impacts are evaluated and the public's opinions on acceptable risk are taken into account before decisions are taken.

[47] lib.riskreductionafrica.org/bitstream/handle/123456789/394/5620%20-%20NEDIES%20Project.%20Lessons%20Learnt%20from%20Forest%20Fire%20Disasters.pdf?sequence=1&isAllowed=y

6. Conclusions

In recent years, wildfires have been in the spotlight as their impact on people and nature has increased. In this booklet, we have highlighted the reasons for this increase and the complexity of the interconnected factors behind these developments.

Mitigating wildfire risks requires looking at land and how it is managed, to ensure that the structure, composition and use of forests, woodland and other vegetation landscapes make it more resistant and resilient against wildfires.

People need to be informed and educated about wildfires so that through their actions they do not increase fire risks but, on the contrary, actively support the mitigation of wildfires.

This requires investments in education, human resources, planning tools and equipment by the competent authorities at all levels (local, regional, national and European). The EU provides funding and facilitates the coordination of joint responses.

The European Green Deal Communication[48] adopted in December 2019 by the European Commission announces a new EU Forest Strategy for 2021 that will have as its key objectives effective afforestation, and forest preservation and restoration in Europe in order to, among other things, reduce the incidence and extent of wildfires.

The EU Biodiversity Strategy to 2030 adopted in May 2020[49] states that the Commission will continue to work with the Member States to ensure that the EU is sufficiently equipped to prevent and respond to major wildfires, which can inflict significant damage on forest biodiversity.

This shows that the political backing by the EU for the preservation of forests and landscapes is there. It is the task of competent authorities in the Member States to seize the occasion and make the best use of funding and cooperation opportunities in order to enhance the effectiveness of their response to wildfires and contribute to the long-term preservation of a crucial common heritage: our European forests and natural landscapes.

[48] COM (2019) 640 of 11.12.2019
[49] COM (2020) 380 of 20.5.2020

RECOMMENDATIONS

1. Wildfires affect all of society. A good governance framework is essential in order to ensure cooperation among all stakeholders, both public and private.

2. Wildfires prevention should be a priority in landscape planning.

3. New scenarios linked to changing climate conditions and their consequences require anticipation of the risk and drivers of wildfires, in order to build more resistant and resilient landscapes and societies.

4. Management choices have a crucial impact on a forest's vulnerability to wildfires. Therefore, landscape planning should take into account relevant species selection and management regimes to increase forest resistance and resilience.

5. Fuel management can reduce combustion risks. Well planned and executed in adequate areas, fuel management can also contribute to improve or preserve ecosystems.

6. People are often a cause and sometimes are victims of wildfires. As such, it is important to increase European-wide awareness and a common understanding of forest fires that is adapted to the reality of each region.

7. Best use should be made of EU funding opportunities.

8. When wildfires occur, a coordinated, rapid and effective international response is crucial.

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