



The bioeconomy as an opportunity to solve the structural problem of forest fires in southern Europe

Key messages

- In Mediterranean Europe, society seems to have lost the capacity to generate value from large portions of the landscape. This leads to land abandonment and the expansion of unmanaged forests. Landscapes are increasingly dominated by continuous, high density young forests, an extremely favourable setting for the rapid propagation of high intensity fires.
- The cumulative effects of global warming, fire-prone landscapes, changes in urbanisation patterns as well as the lack of perceived value from local populations and the high number of fire ignitions, create the perfect storm for catastrophic forest fires. The situation is now exceeding fire suppression capabilities in many countries, including those with sophisticated aerial and ground equipment, well-prepared fire brigades and substantial budgets.
- The cost of fire mitigation and control amounts to several billion euros each year and jeopardizes forest policy implementation in Southern Europe. Forests have become a sink for already tight public resources. Under the current approach, maintaining suppression effectiveness levels will require significant additional resources.
- A new paradigm is needed. The focus must be shifted towards resource management in order to reduce fuel loads and fuel continuity at large, landscape scales. Only then will suppression efforts become feasible. This can be made possible through the creation of functional value chains based on wood, non-wood products, agroforestry and ecosystem services. Developing the bioeconomy vision in the Mediterranean not only has the potential to reduce fire risk, but also to help convert forests into a source of income.



1 The perfect storm: rural abandonment, urbanisation patterns and climate change

Four key factors are increasing forest fire risk in southern Europe to the point that it is now outpacing fire suppression capabilities: 1) the expansion of forests; 2) the increase in fuel loads; 3) the high number of fire ignitions; and 4) climate change and increasing weather risk conditions.

Forests in Europe's southern regions have expanded rapidly in the past few decades, with forest cover at the highest level in centuries. Across the region, forest cover fell to a minimum of approximately or even less than 10% during the 19th and early 20th centuries. Today is set to surpass the 50% mark. Portugal reached a minimum forest cover of 3% to 7% relatively early due to the high demand for wood during the development of the country's maritime empire. Today, Portugal's forests and wooded areas extend over 54% of the country. In Spain, agricultural expansion reached its peak in the 1950s. At this time, forests were reduced to just 13% of the country with an additional 9% as open and highly degraded woody areas. Now, forested and woody areas comprise 55% of the land. Similarly, Italian forests have expanded from 19% to 38% of the total land area over the past 50 years, while French forests have grown from 9 million ha in 1850 (16% of land cover) to 17 million ha in 2014 (31% of land cover). The change has been even more dramatic on a regional scale. Today forests cover 63% of Catalonia, while in 1900 they barely covered 10% of the land area. In Mediterranean France, forest cover is approximately 45%, well above the overall national average.

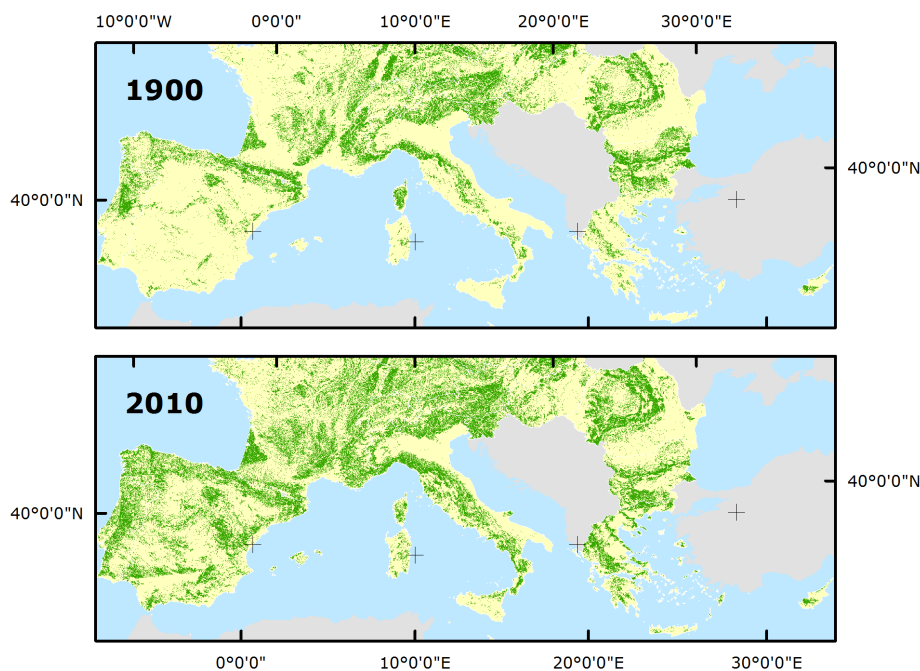


Figure 1. Estimated expansion of European forests since 1900. Based on data from Fuchs, *et al.* (2013).

While in Atlantic and temperate regions forest expansion has been mainly due to conscious afforestation efforts in support of forest based value chains, the main driver in Mediterranean Europe is spontaneous afforestation of abandoned agricultural and pasture lands. Outside plantation dominated areas, there is little active management and wood extraction is typically between 0% and 50% of the increment. The lack of competitive value chains and the underutilisation of resources causes a very rapid build-up of fuels. As a consequence, millions of hectares of young, expanding and largely unmanaged forests present high fuel loads and favourable conditions for rapid fire spread.

2

Forest fires: a formidable threat for European forests

For good reason, European citizens perceive fire as the number one threat to forest. Forest fires have proven to be a serious structural problem with enormous ecological and economic consequences.

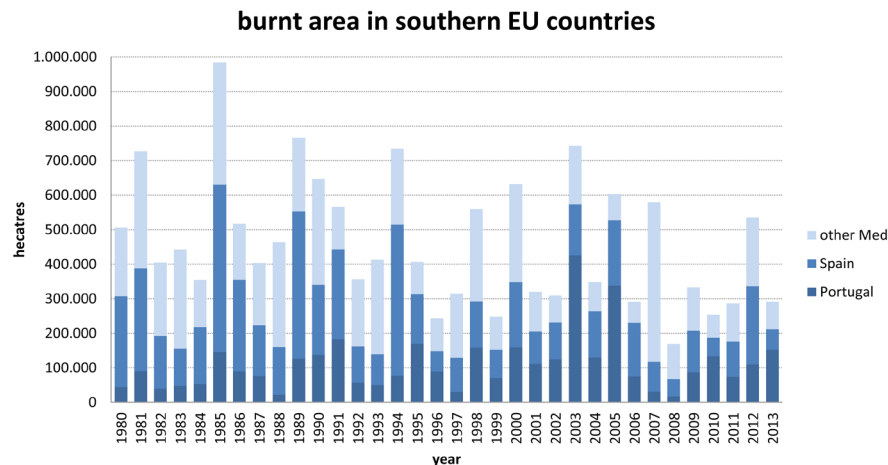


Figure 2. Total burnt area in southern EU countries (PT, ES, FR, IT and GR). Total average for 1980-2014 is 454 000 ha/yr. Data from Greece after 2009 is incomplete. Source: JRC.

On average, almost 500 000 hectares of forest land is burnt each year in the EU. The majority of this area, 85%, is in the Mediterranean region. The Iberian Peninsula alone accounts for 60% of the total burnt area. These figures remain quite stable despite technological and economic development.

Some 65 000 fires are reported every year in the EU. Most of them are small and are extinguished in the early stages, as substantial efforts are placed in early detection and fast responses. Despite a reduction in recent decades, this is still a high figure. The main causes of fire ignition are runaway agricultural fires and other human negligence. They are related to the low perceived value of forests. Fire ignition is a social problem and must be addressed as such.

The high number of fire ignitions puts a heavy toll on suppression capabilities. Most of the damage, however, is caused by a small number of large fires that escape suppression efforts. As a consequence, the reduction in the number of fire ignitions achieved in the last decade has not translated into an equivalent reduction of burnt areas.

Increasingly, a small number of large-scale fires account for a very high proportion of burnt areas. Just 2% of (large) fires account for 80% of total burnt area. Efficiently suppressing 98% of fire starts it a remarkable, but insufficient achievement.

Large and high intensity fires sometimes become catastrophic, causing significant economic damage and the loss of human lives. These megafires are driven by extreme weather conditions in landscapes with high forest cover continuity and high fuel loads. In Europe, megafires are not single events but clusters of large fires that burn simultaneously in a given region for days or weeks. Megafires occurred in Portugal (2003, 2005), Spain (2006) and Greece (2007), causing damages of up to €2.8 billion.

In cumulative terms, over 16 million hectares have been burnt since 1980 and over 1 million hectares of Natura 2000 sites since 2000. At an estimated cost of €3 000 per hectare, the average annual damage amounts to some €1.5 billion. In addition, well over €2 billion are spent each year on fire suppression.

3 Forest management efforts are hampered by fire risk and control costs

This enduring situation takes place despite remarkable technological development, deployment of sophisticated technologies and availability of professional, very competent human resources and enormous budgets dedicated to fire combat.

In a context of climate change, fire prone landscapes and an increased expansion of the urban-forest interface, budgets will need to increase substantially in order to maintain suppression efficiency. In the United States, the Federal Forest Service (FS) allocated \$1.7 billion to combat forest fires in 2014. This represents 52 % of the total budget, up from 16 % in 1995. If left unchecked, this number could reach 67 % by 2025, hampering the ability of the FS to fulfil its mission.

The situation in Europe is similar. Unfortunately, however, there are no reliable or comparable figures for the total cost of fire suppression. This is because costs are spread across different budget lines at various administrative levels - national, regional, provincial and local - and are not fully disclosed. The total European expenditure is estimated to be in the order of billions of euros per year. The majority of funds are allocated to fire control activities, with a smaller proportion allocated to fire prevention actions. France alone has a direct yearly expenditure exceeding €500 million, with a 60 % increase over the past decade. Spain and Portugal together are thought to spend over €1.4 billion each year.

In July and August 2007, under extreme weather conditions, two megafire events took place in Greece. Enormous firefighting capabilities were mobilised in maybe the biggest airborne operation in Europe since Second World War, involving over 18 000 people, 43 airplanes, 24 helicopters and 1 500 trucks. Despite all efforts, some 200 000 hectares were burnt and fires could only be controlled when climatic conditions improved, as happened for the previous megafires in Portugal and Spain.

Urgent action is needed to ensure that responsible authorities across Europe are not further hampered by the increasing costs of wildfire suppression activities.

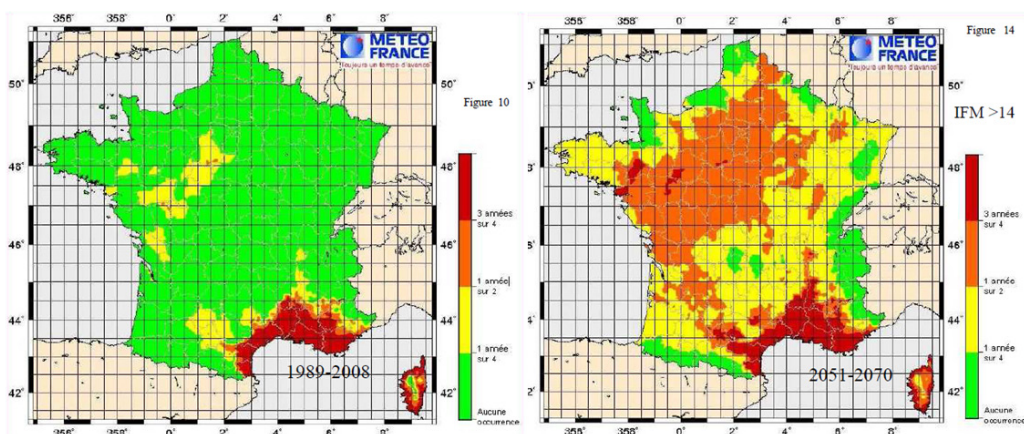


Figure 3. Projected change in the average duration of high fire risk period (Fire Weather Index >14) for France as a consequence of climate change. Source: Ministère de l'écologie, de l'énergie, du développement durable et de la mer (Ed.) 2010.

4 The bioeconomy is part of the answer

A key lesson from science and experience is that forest fire mitigation efforts cannot be effective without a new approach based on resource management and the reduction of fuel loads and fuel continuity at large territorial scales.

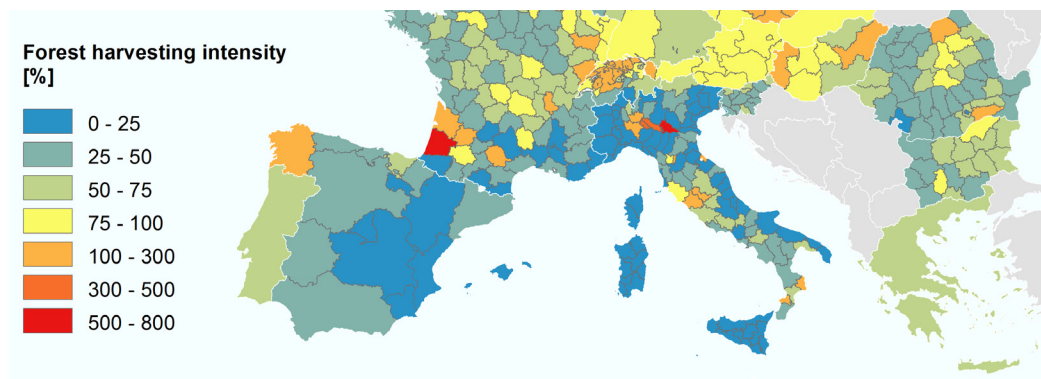


Figure 4. The wood harvest rate of forest in southern Europe is very low. Source: Levers, *et al.* (2014).

There is increasing knowledge available on fire behaviour and its links with landscape structure, forest condition and weather. It is now possible to design smart landscapes that are far less prone to catastrophic fires. The difficulty lies not so much in identifying what to do, but rather in understanding how to make it happen.

Activating forest management in the Mediterranean is a major challenge that requires the development of competitive value chains on wood, non-wood products, agroforestry and ecosystems services. The bioeconomy presents promising opportunities that can be exploited through market-pull and innovation in bioenergy, engineered wood products for sustainable construction, and biomaterials based on cork and resin. Edible products can also play a role, leveraged through territorial marketing and other accompanying actions.

Implementing this vision will require a sustained effort in several areas. It will require greater policy coherence, notably in agriculture and rural development, but also in other areas such as renewable energy, urban planning, research and innovation or even green procurement. Progressively balancing the budgets allocated to fire suppression and to prevention (through active management) could be a first step to start building less fire prone landscapes.

This transition will require a much better understanding of cost-efficient forest fire prevention approaches. It will also require the involvement of forest owners and managers, improved knowledge flows and the identification and mainstreaming of effective business models and successful multi-level governance approaches.

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