



Collection and Mapping of Prescribed Burning Practices in Europe: A First Approach

Abstract

In the history of land-use in Europe, fire has been an important element in forestry, agriculture and pastoralism, and an important process in shaping landscape patterns of high ecological and cultural diversity. However, crisis taken part over rural areas during the second half of the 20th century caused the loss of the notion of fire as a useful tool and changed its perception from tool to threat, resulting in the complete elimination of traditional burning practices in some areas. At present new opportunities and challenges are underway for the development of the use of fire for management purposes in Europe. The aim of this document is to present a first approximation for the development of prescribed burning in Europe, in order to show the existing diversity of fire use practices within the continent as well as to infer possible temporal and spatial patterns for its development in space and time.

1. Introduction

Fire can be a destructive force and, conversely, be a natural and vital component in ecology as well as a useful tool for improving people live. It can also be both at the same time. These are the two faces of fire, an issue which is receiving recent and growing interest due to changing paradigms in ecology and nature conservation. Its international dimension has become evident in forums such as the 4th International Wildland Fire Conference (Sevilla, Spain, May 2007), through the recognition of the critical role of fire within the overreaching framework of the Strategy to Enhance International Cooperation in Fire Management and its Fire Management Voluntary Guidelines.¹

Nonetheless, the fire paradox has not achieved the same development in all parts of the world, neither has the same characteristics. Long term changes in vegetation caused by successful fire exclusion as well as escalating suppression costs launched the use of prescribed fire (PF) for fuel management and ecosystem management in the USA, Australia and Canada, which have recognized the need to focus on the core issue of fire in land management rather than the suppression of wildfire.² Thus the introduction of PB practices is largely derived from the functional role that natural fire has played in ecosystems through historical and contemporary fire regimes.

In Europe, this fire paradox is presented as a substitution tool for traditional land-use and management systems, and hence is to be applied in cultural landscapes rather than natural fire ecosystems. Twenty five years after its introduction the operational implementation of fire as a management tool remains very limited due to different types of constrains (e.g. fire bans, land structure, lack of professional experience and negative public perception) (Xanthopoulos et al., 2006). However new opportunities and challenges are underway for the development of the use of fire for management purposes in Europe. On the one hand, regarding wildland fire management, particularly in Mediterranean countries, the increasing risk of high-severity wildfires and the impossibility to continue increasing suppression efforts at high economic costs, is requiring new approaches to improve their prevention and suppression strategies.³ On the

¹ Fire Management Strategy <http://www.fao.org/forestry/site/firemanagementstrategy/en/>

² Self Assessment, conclusions and recommendations of the *Regional Session: Australasia and North America*, held at the 4th International Wildland Fire Conference (Sevilla, Spain, 2007): <http://www.fire.uni-freiburg.de/sevilla-2007/sessions/Session-B-Australasia-N-America-Report.pdf>

³ Self Assessment, conclusions and recommendations of the *Regional Session: Europe, Southeast Europe, Mediterranean North Africa and Caucasus*, held at the 4th International Wildland Fire Conference (Sevilla, Spain, 2007): <http://www.fire.uni-freiburg.de/sevilla-2007/Session-C-Europe-Report-en.pdf>

other hand rapid socioeconomic changes taken place during last decades have resulted in the abandonment of traditional practices which have shaped many valuable landscapes and ecosystems; a situation which is now leading to reconsideration of fire-exclusion policies in certain sectors of nature conservation, forestry and landscape management (Goldammer et al., 2007).

The aim of this paper is to present a first approximation of the development of prescribed burning (PB) in Europe, in order to show the existing diversity of fire use practices within the continent as well as to infer possible temporal and spatial patterns for their development in space and time. For this purpose, a review of fire use practices at the national and regional for different EU member-states was developed taking into an original approach, based not only in the objectives for the use of fire, but adding the importance of the degree of standardization. Results obtained have been developed within FIRE PARADOX, a European Integrated Project which is part of the 6th Framework Programme (2006-2010).⁴

2. Methods

The main source of information for the approximation of the diversity of PB in Europe was a questionnaire designed within the FIRE PARADOX project where qualitative data information regarding fire use practices, referred to each country and geo-referenced at regional scale⁵, was compiled through an excel sheet structured in three categories of fire use practices:

- i) Traditional burning practices: present uses and historic references
- ii) Prescribed burning: management purposes, personnel involved in this tasks, the role of PB for wildfire prevention, pros and cons for using prescribed burning as a management tool in their country or region.
- iii) Suppression fire: techniques, the role of SF in fire suppression, pros and cons for using suppression fire as a wildfire fighting tool in their country or region.

In order to achieve these objectives, the questionnaire was addressed to EU member states, through the European Commission, to the members of the Working Group of Forest Fire Prevention Experts⁶ (WGFFP), an informal working group composed by experts from the national authorities nominated by the EU Member States and the European Commission, which deals mainly with operational issues related to wildfire prevention and fighting in their countries.⁷

Moreover, information compiled through the questionnaire was complemented through an extensive search in literature databases, scientific journals of high impact based on a systematic alarm-search, expert networks, governmental and non-governmental agencies, international and European scientific research projects as well as EU and national/regional legislation and policy instruments.

Once the information was obtained, the existing fire use practices related to the EU member-states were classified through their incorporation in a matrix where two main classification criteria were considered (Figure 1). The first classification criteria, refers to the objectives for the use of fire (C1), which includes the following: i) reduction of wildfire incidence and severity, ii) silviculture, iii) nature conservation, iv) rural activities (e.g. agriculture, grazing improvement) and v) others (e.g. landscape maintenance, improving access, improving habitats for hunting)

The second classification criteria, degree of standardization (C2), requires considering three levels:

- Traditional practices: developed by rural population, without any technical and administrative regulation or intervention

⁴ www.fireparadox.org

⁵ For this purpose the territorial units established by the European Community (NUTS) were used at the NUTS3 scale (NUTS 2 in the case of Holland, Belgium and Germany)

⁶ <http://ec.europa.eu/environment/forests/wgffp.htm>

⁷ Responses to the questionnaire received till the date, correspond to the following countries: Austria, Bulgaria, Cyprus, France, Latvia, Lithuania, Poland, Portugal, Spain and Sweden. For the German case, although not having received the complete questionnaire a partial response was obtained which has allowed to include relevant information for this country in the assessment.

- Management practices (renovated or innovative): regulated and developed by forest/civil protection services, with the possible intervention or assistance of professionals. They might be executed either to incorporate new objectives and/or techniques of PB in forest management or as an instrument to deal with clandestine burnings.
- Experimental practices: tests carried out by national or regional Administrations or scientific institutions.

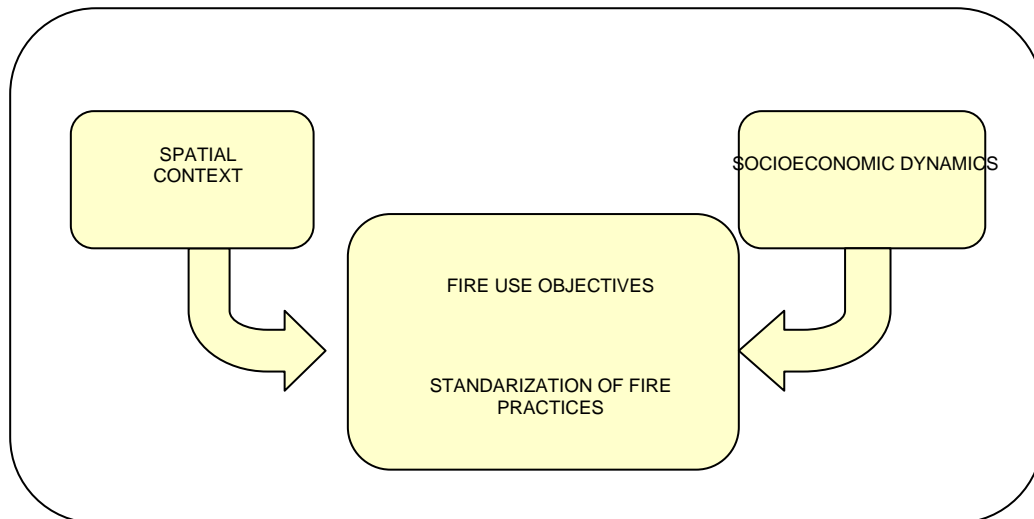


Figure 1. Core elements and influencing factors in fire use practices. Source: A. LÁZARO (Universidad Complutense de Madrid, 2007)

Finally, in order to illustrate the different patterns followed in the development of PB in Europe, the mapping of fire use practices at the regional level for the UE 27 Member-States was developed taking as a reference scale the Nomenclature of Territorial Units for Statistics (NUTS) established by the European Union.⁸ The cartographic base used was the vector layer for the NUTS 3 administrative limits for Europe (shapefile format), joining the corresponding NUTS 3 units for those cases where NUTS2 levels need to be used (Belgium, Netherlands and Germany). The mentioned layer corresponds to 1:3,000,000 scale, and was kindly supplied by the European Commission Statistical Office of the European Communities (EUROSTAT).

3. Results

3.1. Comparative analysis of fire use practices in European countries

Information compiled through the questionnaire and the complementary literature review, is synthesized below in a comparative assessment on fire use practices for the European countries analyzed throughout the document⁹. In particular the analysis is focused on the current situation of fire use in traditional rural activities and the development of prescribed burning in each country, with emphasis in: (i) the objectives for its use, (ii) the extent of development within the country, and (iii) the degree of standardization.

Austria

Regarding PB, the use of fire for management purposes is used in this country. However, several Austrian agencies and science institutes have expressed interest in the use of prescribed fire but have not yet practiced active burning.

⁸ The Nomenclature of Territorial Units for Statistics (NUTS) provides a single uniform breakdown of territorial units for the production of regional statistics in the European Union. See http://ec.europa.eu/eurostat/ramon/nuts/home_regions_en.html

⁹ Italy has not been included in the comparative assessment since the process of receiving the regional questionnaires, where the main responsibilities of forest and fire management lie, has not been yet completed.

Bulgaria

Fire use for agricultural purposes and grazing improvement has a long tradition in this country. Although forbidden at present, people continue to use it as most cheap and traditional way to clean his lands. However, the use of PB for different management purposes is not practiced.

Cyprus

Farmers have traditionally used fire for burning of grass-gorse or stubble for clearing and preparing their land for agricultural purposes. However the structure of forested areas and agricultural lands does not favour the use of PB as a management tool. In exceptional cases, the Department of Forests applies prescribed fire in areas adjacent to the State Forests only for the purpose of reducing fire hazard (Hadjikyriakou, 2000).

France

Fire is an ancient tool in mountain areas and the Mediterranean region of France used for grazing improvement, management of wetlands and improvement of habitats for hunting. The use of fire in suppression has also a long-standing tradition in some areas of the Mediterranean region, where local communities use backfires to protect their assets from a wildfire event (Coste, 2004).

PB is used as a tool for various management purposes: fuel management, habitat improvement, to facilitate grazing, landscape maintenance and wetland management. Several groups are involved in its development: Forest and Fire Services, pastoral technicians, civil protection intervention units and nature agents of protected areas. From 1989, the different teams constitute a Prescribed Burning network in the Mediterranean region coordinated by the INRA (Barets, 1995). At present, experimental research on PB is being developed for land management, conservation and wetland management.

Germany

Slash and burn cultivation was maintained into 20th century in some places (Goldammer et al., 1997). The burning of heath and grasslands was widespread, but since the 1970s there is a complete burn ban for these traditional practices.

However, since the second half of the 1990s PB is increasingly used for various management purposes: landscape maintenance, habitat management, vegetation management, fuel reduction (Goldammer et al., 1997b; Goldammer et al., 2004). Although most burns are operational measures they are still under the umbrella of experimental research burns that require special permits due to the general ban of using fire in vegetation management (in all States). Some museum-type initiatives have been realized showing traditional slash-and-burn cultivation in SW Germany.

Latvia

Slash and burn cultivation was maintained till 19th century (Goldammer, 1998). Today, fire is still used for burning of agricultural residues and grass lands during spring season. The use of PB as a management tool is not practiced in Latvia. However there have been experimental tests (e.g. Vidzeme and Zemgale) to apply PB within a project Management of Woodland Key Habitats in Latvia developed by the State Forest Service of Latvia in collaboration with the Regional Forestry Board of Östra Götaland (Sweden).

Lithuania

Grazing improvement is a widespread traditional practice maintained in the country. Burning of old grasses is also a very old tradition which is a big problem for forest fires (Peleckas, 2004). PB is not practiced in this country.

Poland

Rural communities burnt fen mires for a long time and the use of fire was used as a management tool in pastoral activities. However, at present, there are few places where traditional fire use practices maintained in this country due to a total ban for using fire in open landscapes imposed by different legal acts (Nature Conservation Act, Forest Act and Farmers Subsidies and Direct Payment Act) which should be overcome for the development of PB in this country in Poland is in force since several decades.

Portugal

The use of fire is a widespread practice for the elimination of agricultural residues, pasture renewal and grazing improvement in most Portuguese provinces.

PB was introduced in North Western Portugal during the 1970s for fire hazard reduction (Fernandes and Botelho, 2004). Nowadays, PB is used for various purposes: fuel management, facilitate regeneration of certain vegetable species, plant succession control, habitat improvement and to facilitate grazing. The regions where this technique is more consolidated are Northern and Central Portugal. Several organisms are involved in its development: Forest services agents, conservation agents responsible in the protected areas, several municipalities and specialized groups with wildfire prevention duties (Sapadors Florestais)¹⁰. Experimental prescribed burning programs are being developed by the Forest Services in collaboration with the University Trás-os-Montes e Alto Douro (UTAD).

Slovenia

Fire is used as a traditional management practice for grazing improvement and vegetation clearance. The use of PB in this country is limited to the reduction of fuel accumulation along the railway tracks executed by the Railway Company.

Spain

The use of fire by rural population is a long-standing tradition in Spain which remains an important tool for grazing improvement and for elimination of forest and agricultural residues. The use of fire in suppression is also an old tradition which lasts in some northern regions, where local communities use fire to protect their assets from a wildfire event (e.g. Galicia and Cataluña).

Since every region has the responsibility for forest and fire management, the development of PB differs quite a lot from one another. When used, PB is applied mainly for wildfire prevention: either fuel management (to difficult propagation) or to deal with pastoral uncontrolled burnings (to avoid wildfire initiation). The northern regions are the area where this technique is more consolidated (i.e., Galicia, Asturias, Castilla y León and Cataluña). Several groups are involved in its execution: forest and civil protection services, forest guards and specialists groups trained in fire use (i.e. developed by the State (EPRIF) as well as by the Autonomous regions [GRAF, Cataluña]). Experimental burning is being carried out by scientific institutions (e.g. INIA, Centro Forestal Lourizan) as well as universities (e.g. University of Lleida and University of Córdoba) and Forest Services.

Sweden

Traditionally Sweden used burning for forest and agricultural purposes. However since the 1970s these practices began to disappear and nowadays no areas are burned for these purposes. Present fire use is merely the burning of old grasses in spring by farmers and families with summer houses.

PB is being developed for conservation purposes: (i) In protected areas, developed by Environmental Managers. Promising signs of this work are Jämtgaveln and Stromyran-Lommyran natural areas in Västernorrland county (Goldammer et al., 2007; Rydkvist, this issue of IFFN), and (ii) PB developed by major private forest companies to comply with conservation requirements established by the Forestry Stewardship Council (FSC) to meet certification standards (achieve 5% of the annual clear-cut area). Fire research is mainly concentrated in the north (Umeå) with studies on succession, fire behaviour (pilot-studies) and fire history (Niklasson and Granström, 2004).

3.2. Classification and Mapping of fire use practices in EU member-states

A classification of the existing fire use practices for the analyzed countries is proposed based on the consideration of two main criteria: the objectives for the use of fire and the degree of standardization. For this purpose, both aspects have been incorporated into a matrix to give fifteen categories. The interpretation of the information contained in the matrix, requires taking into consideration the premises followed during the filling in process:

- A country is included in as many categories as types of practices are present within the country.
- A country's incorporation into one category does not imply the national representativity of a practice, but its existence at least in one region. This issue is especially relevant for those federal or decentralized countries which show greater diversity in this sense.

¹⁰ Decreto-Lei n.º 38/2006, de 20 de Fevereiro, Constituição, reconhecimento e funcionamento das equipas de sapadores florestais

- In particular for PB, it is frequent to find situations where the application of this technique pursues simultaneous objectives. For these situations the main objective considered was the one provided by countries.

Table 1. Classification of fire use practices in European countries. Source: Replies to the Fire Paradox questionnaire. Author: A. Lázaro (Universidad Complutense de Madrid, 2007)

	Traditional Fire Use	Restored or Innovative Use of Fire	Experimental Fire Use
A. Rural Activities	Bulgaria Cyprus France Latvia Lithuania Portugal Spain Slovenia Greece	France Germany Spain Portugal	Germany Spain
B. Wildfire Prevention		France Germany Portugal Spain Slovenia	Germany Italy Portugal Spain
C. Wildfire Suppression		Poland Portugal Spain Sweden	
D. Silviculture		France Germany Portugal Spain Sweden	France Germany Italy Latvia Spain Sweden
E. Nature Conservation	France Germany	France Germany Spain	France Germany
F. Other			

Finally, in order to infer the possible temporal and spatial pattern in space and time for the development of PB practices, three different maps have been obtained as a result of geo-referenced information compiled through the questionnaire at the NUTS3/2 level for the different countries analyzed throughout the paper (Figures 2-4).

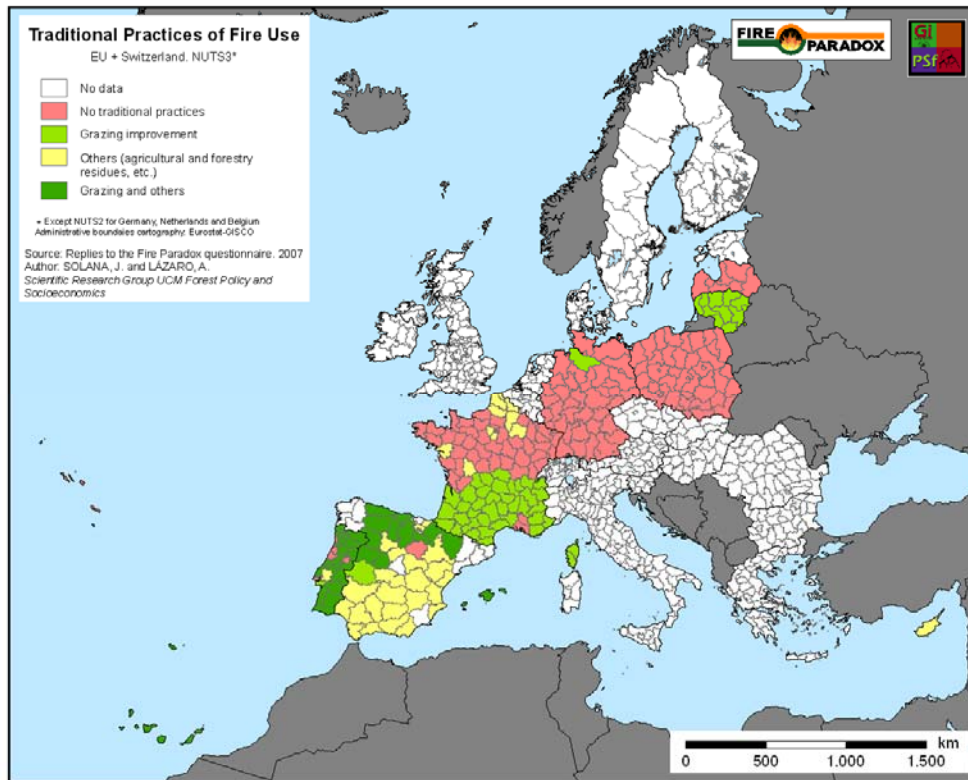


Figure 2. Map of traditional fire use practices in European countries.

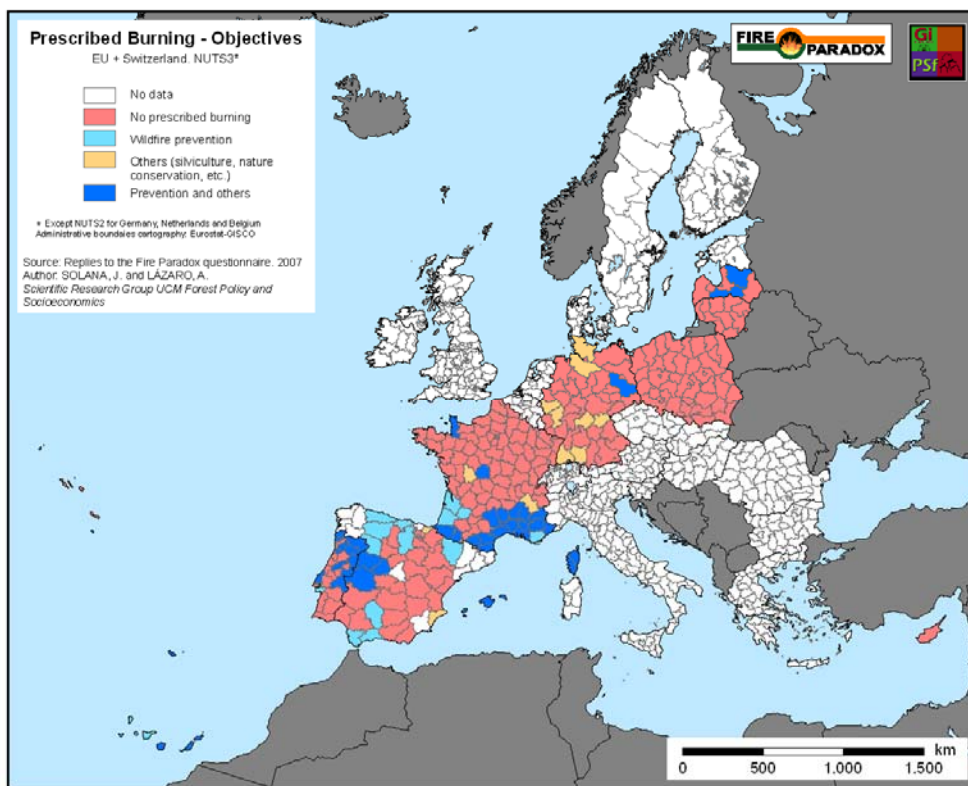


Figure 3. Map of prescribed burning objectives in European countries. Different objectives: wildfire prevention, vegetation management, others or none.

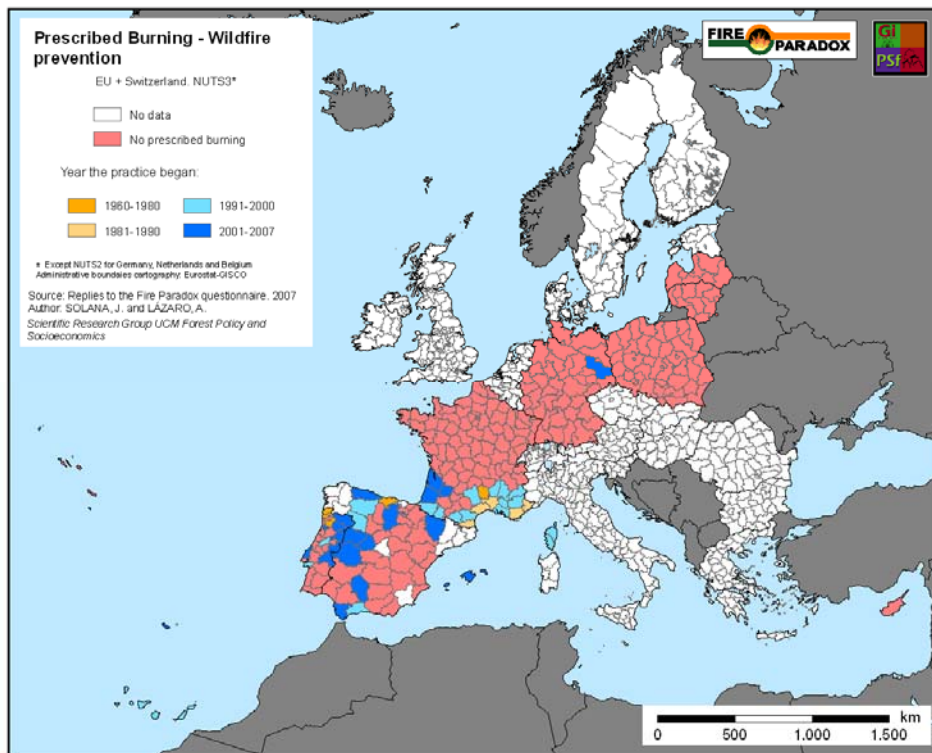


Figure 4. Map of prescribed burning for wildland fire prevention in European countries. Incorporates years of initiation.

Discussion

Results presented in this paper provide a first approximation of the diversity of fire use practices in Europe and a starting point for the future assessment of the potential development of PB as a tool for wildfire management as well as for other management purposes. Some of the common findings obtained in this direction are the following:

- Fire has been an ancient tool for rural Europe. However there is a general abandonment of rural fire practices in Central Europe and Baltic countries vs. a deeply rooted use of fire as a tool for agriculture and livestock activities in the Mediterranean Basin and other European member-states of recent incorporation.
- The incipient development of PB practices in Europe has taken place in different areas and with different objectives: in Mediterranean countries its introduction refers mainly for wildfire prevention purposes, while in Northern Europe silviculture and nature conservation are the main objectives. However these tendencies have shown to evolve with time since some southern countries (e.g. France and Portugal) have started to widen its objectives to forest and biodiversity management, while the increase of wildfire risk in North and Central European countries might entail the development of PB initiatives for wildfire prevention in a near future (e.g. Germany).
- The introduction of PB for wildfire prevention took place in the early 1980s in northern Portugal followed by the French Mediterranean departments. Its development acquired relevant progress towards the end of the 1990s and beginning of the 21st century, especially in South Western Europe.
- Spatial contexts and on-going socioeconomic dynamics have been identified as determinant influencing factors for the existence and nature of fire use practices in the different countries and regions. Their identification is fundamental since only an appropriate application of the fire use techniques according to regional specificities will have the possibility to achieve a necessary social and political agreement allowing the use of fire for management purposes.
- Among these influencing factors, the existence of traditional fire use and knowledge has been identified as one of the main factors, which is going to determine and guide the strategies and recommendations to be applied over a given context.

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