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A wildfire risk management concept based on a social-ecological approach in the European Union: *Fire Smart Territory*

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ABSTRACT

The current wildfire policies in European Union countries have not solved the wildfire problem and probably will not be effective in the future, as all the initiatives focus on suppression and minimize the use of fire embedded in the Traditional Ecologic Knowledge of European communities. The traditional fire use as a tool for land management has been handled and almost criminalized by an urban-centric perspective and anti-fire bias. These policies are poorly adapted to, and cannot cope with, the complex nature of the wildfire phenomenon since they neglect its social roots. This paper presents a forward-looking and innovative model of wildfire management focused not at the landscape, or community, or forest level but at the territory scale. *Fire Smart Territory* (FST) is the proposed theoretical, the context specific, and place-based operational framework. The grounding assumptions of FST are that fire is a dual and ambiguous process, that it is not merely a biophysical process with social overtones but a social process, and it is a complex issue which can be understood only in the coupled human and natural systems where it occurs. FST advocates that the current wildfire challenges cannot be solved by a check list of theoretically adequate procedures, but through locally understanding the wildfire problem and strategically preparing each territory to be less wildfire prone, and its inhabitants to be less vulnerable, and more resilient, in the scope of economic valorization, sustainable development, and safety of the territory resources.

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1. Introduction: the human roots of wildfire in the European Union

The occurrence of wildfires in the European Union countries (EU28) is largely tied to human presence taking place on landscapes historically shaped by human activities, which *"have transformed most of the terrestrial biosphere into anthropogenic biomes (anthromes)"* [32, p. 1010]. European countries have a long culture of fire use, which spread across Europe from the Middle East between 7000 and 3000 BP [133], when populations with some ability to master fire [118] deeply modified the European territory [148] by widely using *"slash-and-burn"* to change forest into arable land [173].

Until recently, fire was an efficacious tool to transform the natural spaces by pushing back the vegetal cover, mainly forests, thus giving space to different forms of land-use including enlargement of agricultural lands [25,29,79]. The use of fire as a tool for land management is embedded in the Traditional Ecologic Knowledge (TEK) [48,61,131] of European rural communities, but the traditional judicious fire use has been handled and almost criminalized [74] by strict rules inspired by an urban-centric perspective and anti-fire bias. The term "criminalization" means the process by which behaviours and individuals are transformed into crime and criminals. In our perspective of research, it is *"the negative redefinition of a resource management practice, such as fire, in order to assert specific claims to resources"* [74; p. 2]. Fire, *ab immemorabili* a traditional resource management tool in many European countries, was demonized [119] and criminalized [74] under the alarmist anti-fire ideas disseminated by the National Forestry School of Nancy, established in 1824 in France, and soon dominating the arena of forestry at international level until the beginning of XX century and the WWII (Gifford Pinchot, Chief of the U.S. Division of Forestry, 1898–1905 and 1st Chief of the U.S. Forest Service, 1905–1910, attended courses in Nancy for one year in 1889–90 [97]). Such views of fire, as the chief enemy, and fire control as the most important task, were translated in laws in

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France (1870), and in other countries, e.g. in Italy (Royal Decree 3267/1923) prohibiting any fires within or adjacent to forests, even for prevention purposes. A powerful "*anti-fire received wisdom*" [74; p. 932] based on the ideology of bad fire and the need for fire suppression [75] persists today as a legacy of forestry forged in Nancy (whose solutions were "*strong codes, vigorous enforcement, punitive actions*" [119; p. 137]: foresters, in Europe, have always argued against vegetation burning practices, becoming true "*anti-fire technocrats*" [74, p. 947], currently still advocating a zero fire policy that prohibits the use of fire in most cases. Thus the criminalization of fire hampers the implementation of prescribed fire, which remains a controversial topic in many countries of Europe, even where allowed by current legislation, provided it complies with special regulations, as in some Italian Regions (Basilicata, Piedmont, Liguria; [3]). In addition, criminalization makes difficult the use of suppression fire [21] as the last resource in case of extreme fires, when current suppression techniques fail. This induced the loss of traditional fire use capabilities and/or their rough implementation by peasants, who burn at night or out-of-sight, letting fire do its own work, or authorized blazes escape and run their course [74]; by not maintaining adequate control and preventing fire from escaping into the adjacent vegetation, such fires turn into wildfires. This happens mainly in countries where stubble burning is still a current practice (Spain; France; Greece; Italy, specially the South and Center) and is often induced by the omission in preparing the compulsory fire break around any burn off. Shepherds also can covertly set fire (for pasture renovation; [166]) if ignition is done in the critical period when it is forbidden. This is important in some areas of Portugal and called the "*burn and run*" habitude [148].

The current wildfire control policies in Europe minimize the traditional fire culture, since all the initiatives focus on "aggressive suppression" activity, which is the dominant fire management paradigm [141]. As a result, the policies are poorly adapted to, and cannot cope with, wildfire complexity stemming due to the preeminent action of anthropogenic causes and activities. Origin and behaviour of wildfires are intimately related with the complex interaction between natural and human systems [84,85,108,94]. But this strong interaction contrasts with the scant importance attributed to human processes, components and factors, as opposed to physical ones in the analysis, research, planning, and management of wildfires [17,93,102,151]. This contrast does not depend only on the preferences of researchers, but is also due to the difficulty in spatializing and analyzing data related to human behaviour, whose results are very hard to validate.

The complex nature of the wildfire phenomenon in the social and ecological contexts where it occurs [102,112] is further complicated by the influence of climate change, via increased temperatures, reduced rainfalls, decreased soil moisture and changing vegetation types. This influence is dynamic, involving varying thresholds [2] in the way in which it is affecting the fire environment, potentially modifying the ecological effects of fires, and also having social ramifications by changing land-use and human settlement patterns. Considering this complexity, which has been poorly addressed with the current approaches [30], this paper proposes a forward-looking and innovative approach of wildfire management not at the landscape (e.g. [160]) or community (e.g. [1,111,106,107,41,49,51,103,143,39]), or wildland-urban interface (WUI) (e.g. [102]) levels but at the territory scale, able to accommodate uncertainty of a rapidly changing world.

Fire Smart Territory (*FST*) [149] is the theoretical, the context specific, and place-based operational framework proposed. It is supported by a transdisciplinary approach, covering the physical, biological, and cultural paradigms of fire as defined by Pyne [120].

The aim of the paper is to present and develop the original concept of Fire Smart Territory (FST) [149], a strategy of wildfire risk reduction, intended to be applied at the territorial level in the EU28 area or in other countries with similar problems. The concept is based on a shift from the suppression paradigm to another, more sustainable one, based on "*coexist with fire*" and on the enhancement of resilience. This paper argues for such a shift, which requires more participative and collaborative actions between the actors living, shaping, and governing the territory in order to sustain and promote an efficacious disaster risk reduction. Our proposal is an alternative to the prevailing fire management approaches which did not solve the wildfire problem and are "*unlikely to be effective in the future*" [109, p. 1], because they mainly focus on suppression and/or on preparedness for a wildfire event. FST also represents a possible response to the general demand for a more balanced approach between prevention and suppression [6,15,24,26,42,64,65,101,128,129,140].

The paper is organized as follows: a description of the wildfire phenomenon in the EU28, a detailed narration of the FST concept, assumptions, drivers and principles, and its implementation, description of activities, a SWOT analysis (i.e. the participatory assessment tool used for analyzing an activity or a program and for strategic planning and decision-making), and a conclusion with final remarks.

2. The dimensions of wildfires in the EU28: an unsolved problem

2.1. Wildfires as an anthropogenic phenomenon

In the EU 50,000 to 65,000 wildfires occur every year burning, on average, around 0.5Mha of land [101]. Approximately 85% of the total burnt area occurs in the Mediterranean countries (EU-Med; [137,156]), i.e. in the five Southern Member States (France, Greece, Italy, Portugal, and Spain), but occasionally significant wildfires also occur in Northern Europe and the Scandinavian countries [148]. In the 1980–2013 period, EU-Med experienced 15,754,189 ha of burned area and 1,689,771 fires; Portugal and Spain alone suffered 9,503,178 ha of area burnt (60.32% of total) and 1,150,138 fires, i.e. 68.06% of the total. Portugal with 3,727,776 ha of burned area (1980–2013) which represents about 41.88% of the country surface, is the most severely wildfire affected country in the EU [35].

Fire ignition causes in EU are rather complex and a high proportion of the fires, ranging from 50% up to 80% for the period 1999–2001 [80], have an unknown cause. More recent data report that unknown causes are 16% in Italy and 49% in Portugal [147], with a decreasing trend due to the introduction and application of better post-fire investigation methods. Over 95% of the fires in the EU are due to human causes [138,157,101,156]; the scanty minority of natural causes is mostly explained by lightning, with a percentage $< 4\%$, or, locally, by volcanic activity. The anthropogenic causes of wildfires, are numerous and complex, differing among countries and at regional scale. The most common cause is "negligence" followed by "arson" [147,157]. Negligence (Wildfire unintentionally caused by human using fire or a glowing object, not connected to fatality; [18]) is mainly related to agricultural or forestry burnings, e.g. fires aiming to remove unwanted biomass or residuals, to improve grazing and to clear land, or related to recreational activities [50]. Deliberate fires (Wildfires intentionally caused by humans with the use of fire; [18]) can be set for interest (or profit), either directly for monetary gain or for a goal other than money: e.g. fraud, insurance, liquidate property, dissolve business, inventory, employment, parcel clearance, to change land-uses, to get a job in the fire fighting profession, or to get a better salary as firefighter. Other groups of deliberate fires include:

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