

Forest Fire Risk Management and Public Participation in Changing Socioenvironmental Conditions: A Case Study in a Mediterranean Region

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Under current conditions of accelerated socioenvironmental change in the Mediterranean forested landscapes, fire is one of the most critical and difficult risks to tackle within the region. This article summarizes the lessons learned from a project based on the participatory integration of qualitative local stakeholders' knowledge with expert GIS fire simulations carried out in the County of El Bages, Catalonia, Spain. First, in this article, a theoretical model—the *forest fire circle*—is presented in order to explain the reasons for the rise in the damage and frequency of forest fires in this Mediterranean area. Second, it describes the methodology developed and the stages followed during the project. Results show that: (1) the advocacy of old forest reactive management paradigm assumptions and practices based on uncontrolled forest succession can put vast wooded areas of the Mediterranean basin at critical risk; and (2) forest fire management approaches that ignore the crucial role of long-term prevention and local capacity building strategies have failed. In the final section, the content and the specific dimensions of the old *reactive paradigm* that has characterized forest fire risk management in Catalonia are discussed and contrasted with the possibly emerging *preventative paradigm*.

KEY WORDS: Climate change; forest fire risk management paradigms; GIS and local knowledge integration; Mediterranean region; public participation

1. INTRODUCTION

Rapid socioenvironmental change presently in motion in the Mediterranean forested landscapes is increasingly putting fire at the forefront of environmental management issues. Fire has become one of the most critical and difficult risks to tackle in many rural areas of the Mediterranean basin. In this arti-

cle, we focus on the case of Catalonia, a region located in the northeast of Spain and, in particular, on one of its most recently affected counties, El Bages. This area suffered devastating forest fires during the dry seasons of 1986, 1994, and 1998, which stand out as some of the worst environmental disasters of the region in recent times. Between 1983 and 1998, 476 forest fires burned some 27,500 hectares, that is, 30% of the forest cover of the area. Our work will put forward the lessons learned from a recent project based on the participatory integration of qualitative local stakeholders' knowledge with expert GIS fire simulations leading to an innovative and dynamic approach to forest risk management. This approach is in tune with recent developments linking GIS analysis with environmental and risk analysis⁽¹⁻³⁾ and the growing understanding of the potentialities (and limitations)

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of involving citizens and local stakeholders in these fields.^(4–8) Our research produced a methodology and prevention plan that appear to be better suited to confront current forest fire risk situations and can be of application and relevance in other similar areas within the Mediterranean region.

The article is organized as follows. Section 2 summarizes, by means of a theoretical model, our interpretation of the reasons that have led to the increase and virulence of forest fires in Mediterranean rural regions. This model, *the forest fire circle*, stresses the importance of the social and environmental changes occurring in rural areas such as the county of El Bages in Catalonia and the dialectical and hybrid relations between the two sets of causes. Section 3 describes the methodology devised and the stages followed both for the integration of expert (GIS) and lay knowledge and for designing and implementing the forest fire prevention plan. In the final section, conclusions are drawn that interpret our approach within the possible changing paradigms in fire risk management in Catalonia and underline the crucial role and potential of information-rich participatory methodologies such as the one developed in this study.

2. FIRE RISKS IN CATALONIA. TOWARD A MODEL SYNTHESIS

The last two decades of the 20th century witnessed a dramatic increase in the occurrence and impacts of forest fires in Catalonia. Between 1983 and 1998, nearly 9,000 fires destroyed some 250,000 hectares of woodland (12.5% of the total forest land cover of the region), producing vast human suffering as well as important economic, social, and environmental upheaval. The tremendous episodes of 1994 (75,000 hectares burned) and 1998 (27,000 hectares) topped the list of forest fire disasters, which led the Catalan public to perceive forest fires as one of the most serious environmental problems of the region. Besides high social drama, these episodes also show blatant inadequacies of past and current decisions on forest and forest fire management. In this article we argue that these policies for the most part have failed due to their inability to take into account the changing socioenvironmental conditions of Catalan rural areas. Agricultural abandonment, rural depopulation, aging, and some restrictive policies on traditional fuel clearance management have generated uncontrolled growth of the forest biomass in most of the region. In Catalonia, forests cover 43% of the total area and between 1975 and 1995 the land covered by woods

increased by 20%. Increasing climatic variability, producing longer and hotter dry seasons, have added further conditions to this forests scenario making it ripe for combustion. Lack of institutional attention to such socioenvironmental change has generated a situation worsened by a policy attitude in which matters regarding forest management have been left to “experts” without input from the potentially affected populations, especially the local farming and forestry communities.

Our approach to the explanation of the increase in the number, magnitude, and virulence of forest fires in the study area emphasizes the role of changing socioenvironmental conditions in the rural landscape where fires develop. Fires have taken place in a socioterritorial context characterized by the demographic and economic decline of rural communities and this social and economic situation has created new environmental conditions that have been added to other global ones, such as climate change. However, and acknowledging the fact that fires may have important functions in the regulation of ecological regimes, in our context, forest fires have become a hazard because they take place in a very humanized area and directly affect human wants and needs. Forest fires in the Mediterranean landscape both affect important human stakes and are mainly the result of human action. Far from being a purely “natural” phenomena, their causes must be understood and their consequences must be dealt with in relation to the social and historical changes occurring in the area.

In the county of El Bages, with regard to the socioeconomic factors, several forces have caused a rise in the potential for forest fire risks. First, demographic changes indicate a decline in total population numbers and the aging of the population. In some municipalities, the proportion of persons of 64 years or more is twice that of young persons and reaches figures of between 20–25% of the total population. Second, regarding economic issues, the productive base of these municipalities shows a strong dependence on a stagnant agricultural sector with an increasingly important presence of retirement pensions as income sources. Globalized agricultural markets tend to put pressure on intensifying existing agricultural crops while at the same time leaving large extensions of little productive forested areas idle and unattended. And third, given the scarce access to new technologies by local populations, those technologies available are only applied to intensify the most productive crops. Areas where intensive agricultural technologies cannot be applied, for example, due to the particular

topography of the terrain or to the existing property regimes, are being abandoned. To a large degree, the process is the result of a nondecision policy, for forest masses expand and local communities lag behind public service provision—including human and material resources—for fire control. As a consequence, these rural areas are undergoing a process of marginalization that increases their vulnerability to forest fires. In turn, burned areas reduce their possibilities for rural restructuring and development. Damaged forests cease to be attractive for the tourist and leisure sector activities that are sought by many rural families unable to subsist on agriculture and forestry alone. This accelerates rural migration and crystallizes further the growth of unmanaged forests. In our study area, depopulation does not reduce the risk of fire ignition, and this occurs, mainly, for two reasons. First, rural depopulation does not imply that forests are absent of human presence because these areas are increasingly frequented by urban people and, second, rural populations have traditionally managed forests in ways that reduce the potential for biomass expansion, through, for instance, collecting undergrowth for fuel or introducing sheep and cattle for grazing.

The local environment is thus affected by these socioeconomic and demographic trends, and most significantly by the crisis of traditional agriculture, as well as by global climatic trends.⁽⁹⁾ El Bages is experiencing a long-term trend in the reduction of agricultural land and a parallel growth of the forest cover. In modern times, the process of reforestation began around 1860 when a minimum of forest cover (around 25,000 hectares) was recorded. The expansion of forest continued during the first half of the 20th century and has accelerated enormously since 1981. In 1981, the forest cover grew to 56,500 hectares, and in 1999, it reached 93,000 hectares, which is 72% of the total area. Most of this growth was at the expense of vineyards and, to a lesser extent, of cereal crops. Rugged terrain, low profitability of pine wood exploitation, and unfertile soils, coupled with a generally small size of holdings, have precipitated abandonment—now a very common process in the Mediterranean rural hinterlands.

Coniferous species and, most notably, *pinus halepensis*, have rapidly colonized former agricultural fields and in 1999 constituted about 98% of the forest area. Despite this, the economic activity generated by forestry in the region is small and continues to decline. In 1989, about half of the forest area was managed for timber and wood but this use has diminished since then due to the low productivity of

Mediterranean forest, the low quality of timber, the unfavorable cost/benefit ratio of the extraction process (especially because of mounting labor and mechanization costs), and a weak demand for local forest produce. In sum, despite the fact that the forest cover density in the Bages and in Catalonia is probably one of the highest in Europe, economic profitability is also one of the lowest on the continent, resulting in a general lack of incentives for appropriate management and uncontrolled expansion of woodland and biomass fuel.

These social and environmental changes can be graphically summarized in the model shown in Fig. 1. This diagram is intended to represent the socioenvironmental forces that increase the probability and frequency of occurrence of fires in Mediterranean forest ecosystems as well as the severity and scale of harm caused by these fires. In the case of El Bages, out of 443 fires studied between 1983 and 1998, only 39 affected more than 100 hectares. These 39, however, were responsible for 84% of the burnt area: only a small number of fires provoked the devastating consequences that had been unknown in the area before 1986. This suggests that specific social and environmental conditions, which did not exist in the local rural landscape before that time, need to be taken into account if one is to understand the reasons for the new forest fire risk situation. The growth in the range of the local fires is due to an augment of biomass undergrowth fuel, the increase in the unbroken forest spans, the replacement of traditional low productivity agricultural crops by spontaneous vegetation and eventually woods, and a reduced control capacity of forest fires once they have been ignited, given the reduction in local population in the area. Warmer and drier bioclimatic conditions, arguably due to climate change, have resulted in the increase in year mean temperature values and the number of days per year of high or extreme forest fire danger. Additionally, other factors, such as the presence of electric power and road infrastructure crossing the forested areas, the loss of traditional forest culture, and forest practices that used to promote undergrowth fuel clearance have also increased the probability of ignition and the frequency of forest fires. In turn, impoverished social and economic conditions of rural areas accelerate the speed of this vicious circle, a situation that becomes even more serious after forest fires have already occurred.

Changing socioenvironmental conditions increase the probability and frequency of occurrence of fire in Mediterranean forest ecosystems and augment

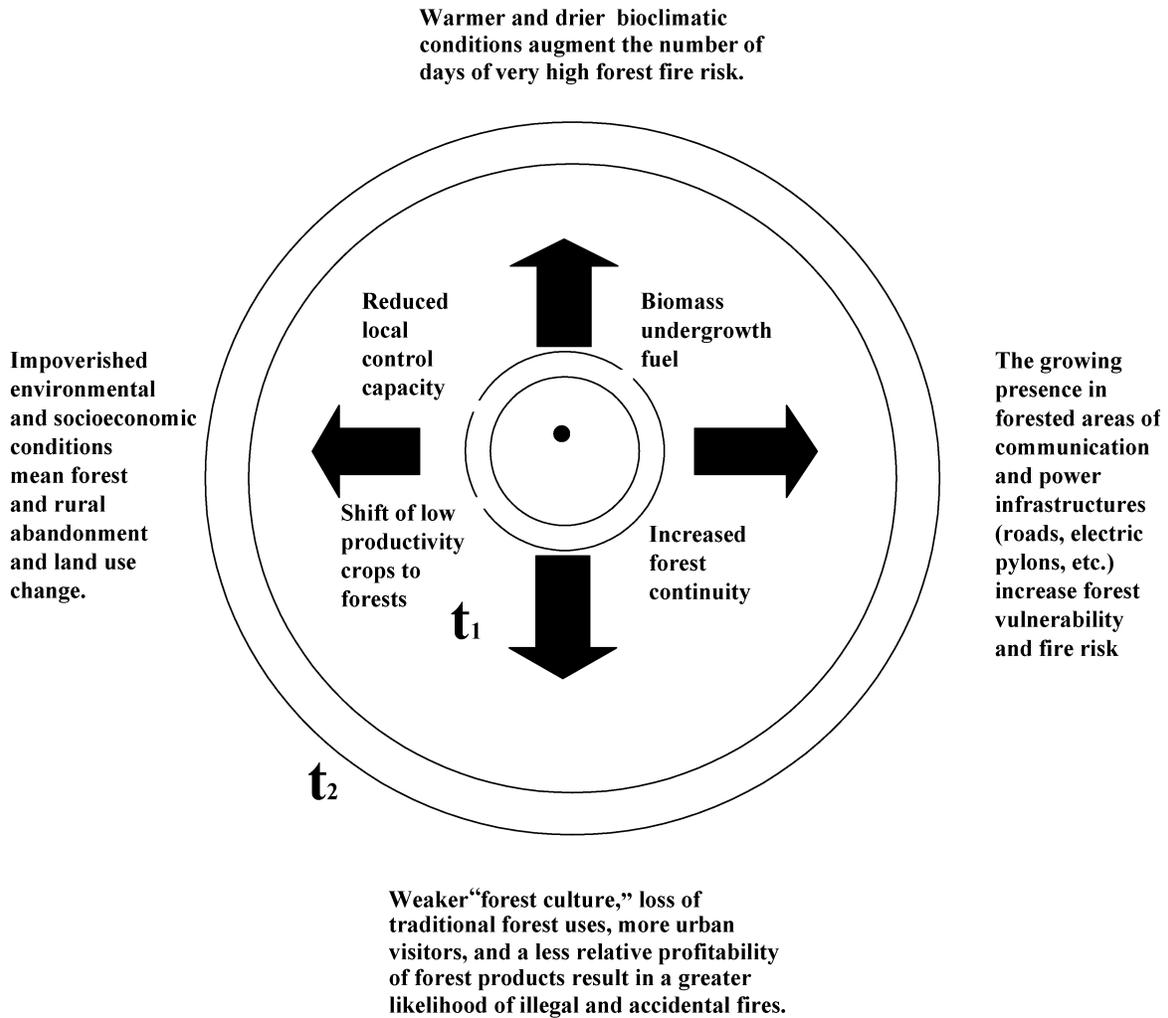


Fig. 1. The growth of the *forest fire risk circle*.

the severity and scale of harm due to the damage provoked by these fires. Adequate management of forest fire risks depends on the extent relevant social actors are able to anticipate and prevent such changes in the present dry season (Fig. 1, t_1) and maintain local control capacity to contain the potential growth of impacts *before* the next dry season arrives (Fig. 1, t_2).

3. RESEARCH-ACTION PROCESS

In response to the challenge represented by the type of risk confronted by our research, we decided to explore the new opportunities for knowledge integration and action offered by the latest developments in fire information technologies and in public management practices. On the one hand, GIS technologies and, in particular, the simulation computer program

FARSITE on fire propagation was used. On the other, dialogic participation procedures were employed to improve the expert forest fire assessments, to devise and implement the prevention plan, and to decide on the provision of human and economic resources accordingly.

Although related ideas and concepts coming from areas like *ecosystem management*, *integrated assessment*, or *action-research* have been used to assess and manage complex environmental risks and issues in other contexts,^(10–14) our research does not strictly follow one sole theoretical and methodological approach; rather, we have incorporated several currents of thought at once. In relation to ecosystem management, we have tried to integrate the risk component, which has usually been neglected in this field. Moreover, with regard to integrated assessment, we have

also placed scenarios and other computer program information in dialogic settings as a means of enhancing the qualitative participatory process. Specifically, our strategic methodological decisions have been influenced by those lines of research that at least acknowledge the importance of the following three elements.

1. The design of assessment procedures that use the best information technologies and scientifically agreed-on procedures available to obtain the most policy-relevant knowledge about a particular risk.
2. The inclusion, at early stages of the research-management process, of participatory approaches that allow the adequate framing, rectification, and improvement of expert assessments as well as the empowerment of local stakeholders in deciding the appropriate measures to be taken accordingly.⁽¹⁵⁻¹⁷⁾
3. The indivisibility and the dialectical, retroactive, and hybrid nature of social and environmental factors in the increase or contention of forest fire risks.

The project had three main interrelated objectives. The first aimed at the *assessment of risks* and intended to produce a spatial account of the potential forest fire risks occurring in the county by analyzing each of the identifiable dimensions that contribute both to the increase of likelihood of fire and the negative impacts once the fire has started. This implied a detailed analysis, using a mixture of sources, of the distribution and causes of fire within the forested territory. GIS analysis was generated by the FARSITE program and GIS maps were produced by the ARC/INFO© program.⁽¹⁸⁻²⁰⁾ The variables under consideration to measure the potential risks in each of the different areas of the county were: (1) the extension of unbroken forested masses, (2) the height of such masses, (3) the slope of the territory, (4) north/south/east/west directions, and (5) altitude and solar radiation. The aim was to produce a territorial representation of risks in order to proceed with the assessment, the second objective, of the *human and technical resources* available to minimize both the risk and the eventual harm of forest fires in the county. The purpose was to estimate the correspondence between fire risk and control capacity in the different locations. In turn, such resources were divided into fire *prevention, detection, intervention, and infrastructure*. The variables taken into account in this respect were: (1) structure of fire protection barriers, (2) distance to fire brigade stations, and (3) number and visibility

of look-out posts. Third, the overall aim of the project was to yield and implement a *strategic plan* to deal with such risk. This plan was the outcome of the dialogic integration of expert and relevant stakeholder knowledge carried out during the empirical research. Local managers, forest owners, and many other actors representing 35 associations in the county intervened in a consultation process structured in a series of 14 meetings. The composition of stakeholders was decided upon the findings of Stages I and II, problem definition, and data collection. The number of times each participant was called to contribute to the dialogic integration process varied depending on the problems and locations studied in each occasion, with a maximum of 10 times. Each meeting lasted three hours. These participants were selected by nonrandom criteria following the maximum representativeness of diversity of local stakeholders and also with regard to being relevant in the evaluation and management of local forest fire risks. Each participant was shown and asked to react to the results of the GIS analysis of the county forest fire risk analysis so that expert computer input could then be improved accordingly. All discussions were recorded by audio and transcribed on paper for qualitative content analysis.

Eventually, specific measures were debated, actors' roles identified, and the actions to be pursued agreed upon with regard to fire prevention, fire provision, and fire extinction. Thus, the crucial role of local populations was underlined during the whole process of the research and policy action. Participation was carried out during the assessments of fire risk, the estimation of control capacity resources, and at the implementation stage. The meetings were composed of individuals representing the following actors and agents: voluntary Forest Protection Patrols (FFP), forest landowners, local public officials, fire brigade, the local environmentalist group, a local environmental consultancy company, a local expert on environmental issues, and the local media. Regional and state administration did not participate directly in the consultation process. These bodies were informed only when necessary, mainly at the beginning and at the end of the different stages of the research, as their role was mainly to provide information and the human resources when necessary (e.g., fire brigade and foresters). Electric power companies were also included in the meetings, but later in the process, once it was identified that their lines were an important source of local fires. In addition, other frequent multilateral and regular informal contacts with all these groups were maintained throughout the project.

Q1

Q2

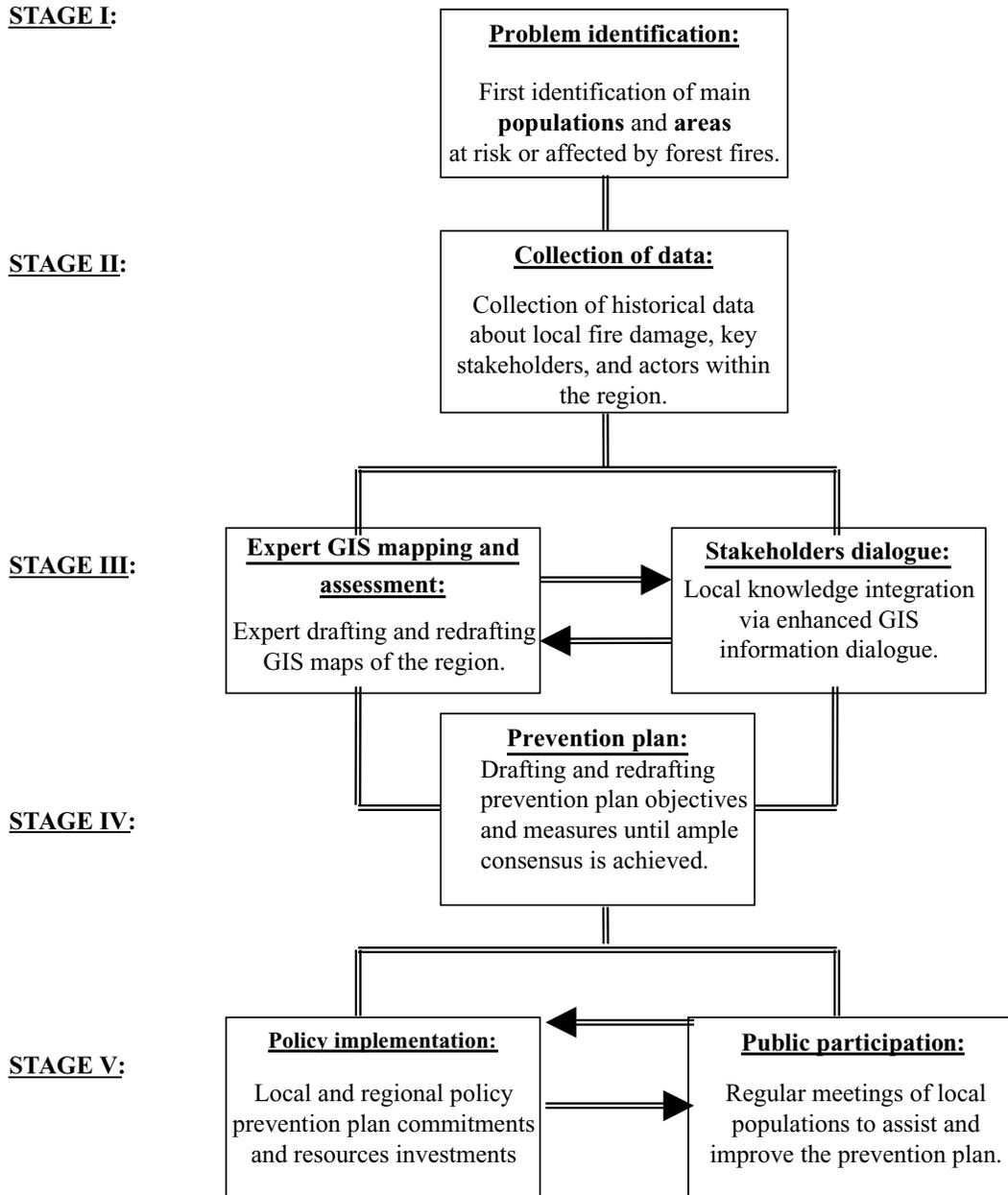
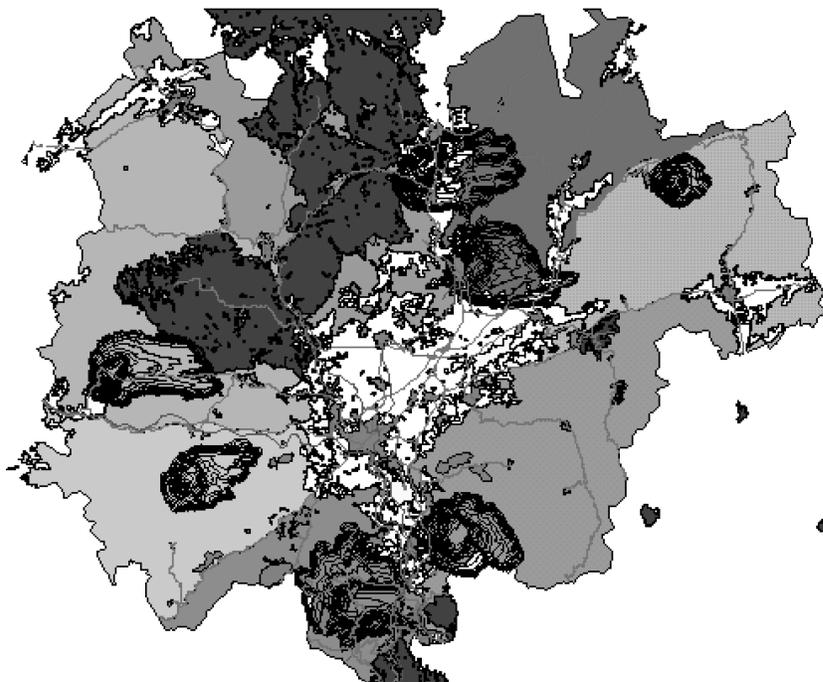


Fig. 2. Five stages in the forest fire participatory research-action project of El Bages, Catalonia.

The project lasted 14 months, from September 1998 to December 1999, and was divided into five main stages (see Fig. 2.). Stages I and II, *problem identification* and *collection of data*, focused on the general depiction of the fire risk situation in the area, as well as on specification and classification of the populations at risk and the actors most relevant for our research. These first two stages permitted, among other things, the elimination of some of the deficien-

cies of the existing risk warning protocol, which until then had been characterized by redundant communication steps, multiple layers of administrative responsibility, and a lack of institutional integration, a situation that used to provoke critical delays and inefficiencies in the fire extinction system. Stages III and IV consisted of an interactive loop procedure between GIS experts, relevant stakeholders, and policymakers. The aim was to produce an accurate and spatial

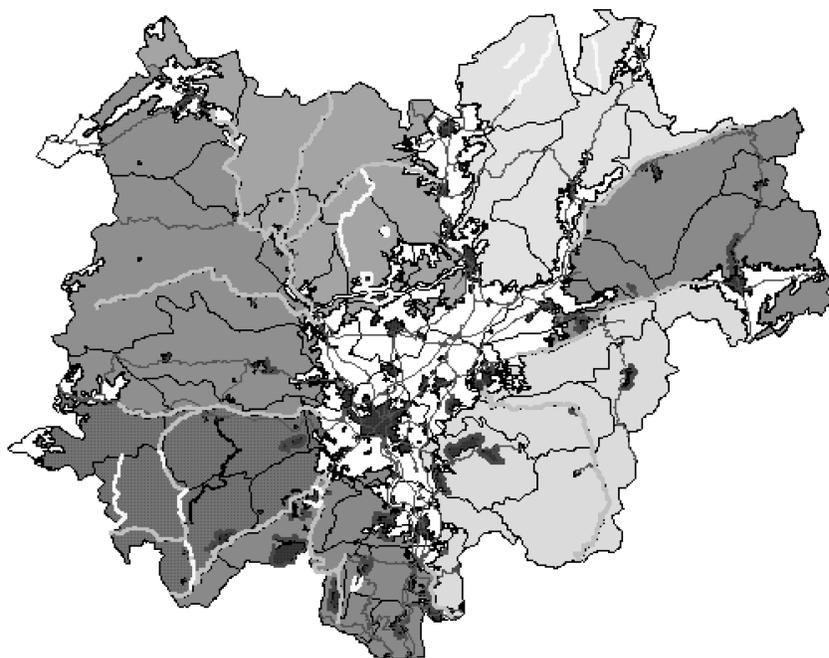
Map 1. Computer simulation of the effects of Westerly wind in the forest fire evolution of 1994 with FARSITE. This map compares the simulated burnt area during a period of 48 hours, represented in dark lines. Each concentric dark line represents the simulated progression and speed of forest fire in time in the different areas of the county of El Bages.



assessment of the fire risk situation in the county and to design a prevention plan that would be agreed to by the maximum consensus possible. At these stages, and also with the help of the NETWORK module from the program ARC/INFO©, it was possible to find three new optimal locations for the fire brigade

posts in order to gain efficiency and time in case of a fire emergency. Furthermore, with the FARSITE© module it was possible to simulate the strategic protection lines that would ensure the necessary discontinuity of the forested masses to prevent large fires such as those of 1994 (see Maps 1 and 2). The final stage, the

Map 2. GIS computer representation of the mass forest structure of the county of El Bages. The areas with darker colors represent the most vulnerable zones. The clearer lines represent the simulated firebreaks.



prevention plan, which was sent to and approved by the Catalan Autonomous Government, has been regularly revised and updated in a participatory fashion so that the most relevant actors identified at the beginning of the process are still involved. As a result of this plan, a large amount of new economic and human resources have been deployed to the benefit of local populations. Furthermore, this strategy has produced other important institutional changes. The organization of fire prevention and extinction teams, which before our action-research intervention had worked independently, are now integrated and working together. In addition, new voluntary agreements have been signed between electric power companies and other private actors and forest landowners in order to prevent risk from electric lines (see Table I).

Of particular interest for the purpose of our research was the integration of qualitative local knowledge with quantitative and graphic knowledge produced and represented with the available computer information systems. However, much of the kind of knowledge produced within the dialogues of the qualitative participatory process was difficult to transform or operationalize in quantitative terms so as to be included in the computer simulations. Mainly, the conversations focused on the sociostructural change that was at the root of new forest fire risk situation. For instance, in the words of the President of the Forest Protection Patrols:

We understand that the pace of economic change which has transformed the rural landscape and the livelihoods of farmers are much faster than the social adaptations needed to keep up with the functions that are now required in these areas. We need to find systems which regulate the new socio-economic conditions in order to prevent the disappearance of [local] populations who are the best guarantee for conservation. (Meeting, October 21, 1998)

In the opinion of most of our participants, forest fires contain a human and a socioeconomic dimension that needs to be incorporated in any serious attempt at trying to deal with the new rural conditions now existent in the Mediterranean landscapes.

4. DISCUSSION

This article has presented the results of a participatory experience addressed at designing and putting into practice a fire prevention plan to cope with forest fire risks in the county of El Bages, central Catalonia. Our experience illustrates how the interrelation be-

tween science, policymakers, and stakeholders can yield a successful strategy to tackle complex forest fire risks at the local level, risks that have their roots in social and environmental transformations occurring both at the regional and global level. The use of GIS technologies proved to be of particular relevance in this respect as these technologies allowed us to obtain a useful, comparative, and analytical representation of the changing socioenvironmental conditions occurring in our research-action selected area. However, at the same time, we are aware of the limitations of over-relying solely on such information technologies. This is why we considered that a close and permanent involvement of local and regional stakeholders was crucial for the approval and success of the forest fire risk prevention plan. Given the multiple and interrelated objectives of our research and the results obtained so far, our methodological assumptions and decisions seem to have been, to a large extent, well suited to deal with the complex risk situation that our case study posed.

The main lessons learned from our project relate to what works or what fails to work in the management of forest fire risks in a Mediterranean rural region such as the county of El Bages. In our view, there is a growing recognition by a mounting number of actors of the need to replace a set of principles and values that characterize an old type of forest fire risk management paradigm dominant in Catalonia during the last two decades with a new paradigm based on prevention and anticipation. Table II summarizes the content of these two opposing paradigms.

In particular, each of these dimensions can be further specified as follows.

- The emerging preventative paradigm acknowledges the unstable equilibrium of forest behavior in Mediterranean landscapes and tries to anticipate the intrinsic tendency of fire ignition. The reactive paradigm is based on the belief that ecological succession will eventually lead to a climactic situation in which forest fires will be naturally self-regulated. The preventative paradigm rejects the “ecological *laissez-faire*.”
- The reactive paradigm tends to favor solutions and strategies of an expert and military kind, while the preventative, in the first place, promotes socioeconomic developmental and dialogical strategies when dealing with forest fire risks in these areas.

Table I. Fire Prevention Plan Matrix

<i>Policy Implementation Plan</i>						
Research-Action Tasks						
Fire	GIS Analysis	Expert and Stakeholder Risk Assessment	Proposals for Action	Main Agents Involved	Resource Provision	
Causality	Spatial distribution of fire causes.	Identification of deficient infrastructures by means of field and dialogic work.	Repair of obsolete infrastructure. Information campaigns on good agricultural practices.	Electric power companies, FFP, National Administration.	Economic resources. Agreements for direct action with FFP. TOTAL: \$1.5 million infrastructure and \$0.25 million/year maintenance.	
Vulnerability	Comparative analysis of fire behavior based on meteorological scenarios from the FARSITE program.	Specification of vulnerable zones near or in human dwellings and of forested areas.	Creation of self-protection belts close to human populations. Fuel control in such self-protection belts. Fire breaks.	FFP, Autonomous Regional Administration, National Administration, European Union rural development program, and fire brigade.	Economic funding. Direct action of Regional and National Administrations. Direct action and economic resources for maintenance from landowners. TOTAL: \$2.7 million infrastructure and \$1 million/year maintenance.	
Detection	Visibility analysis of forested masses.	Identification of "dark zones" (little visibility), which are most frequented.	Permanent vigilance posts and mobile vigilance patrols and routes.	FFP and Province Administration.	Economic resources. Personnel. TOTAL: \$150,000 for personnel/year	
Extinction	Cartographic analysis of available resources (vehicles, water points access, etc.) based on the ARC/INFO program.	Identification, localization, and prioritization of areas needing urgent action.	Improvement of off-road network access. Building new water points. Creation of new fire brigade stations.	FFP, Local Administration, and National Administration.	Economic resources. Planning. Infrastructure provision and maintenance. TOTAL: \$2.4 million investment and \$1 million/year maintenance.	
Simulation and anticipation	Computer model simulations combining meteorological trends on the most vulnerable areas.	Coordinated alert protocol design.	Ground-based "mock fire situations."	FFP, Local Administration, and forest fire brigade.	Annual programs Documentation. TOTAL: \$65,000 million investment and \$100,000 maintenance.	

Note: This matrix shows the list of tasks carried out within the project to design and implement the management plan to minimize the risk of forest fires within the county of El Bages, the actors involved, and the control resources invested. Research activities and aims were closely interlinked with policy ones.

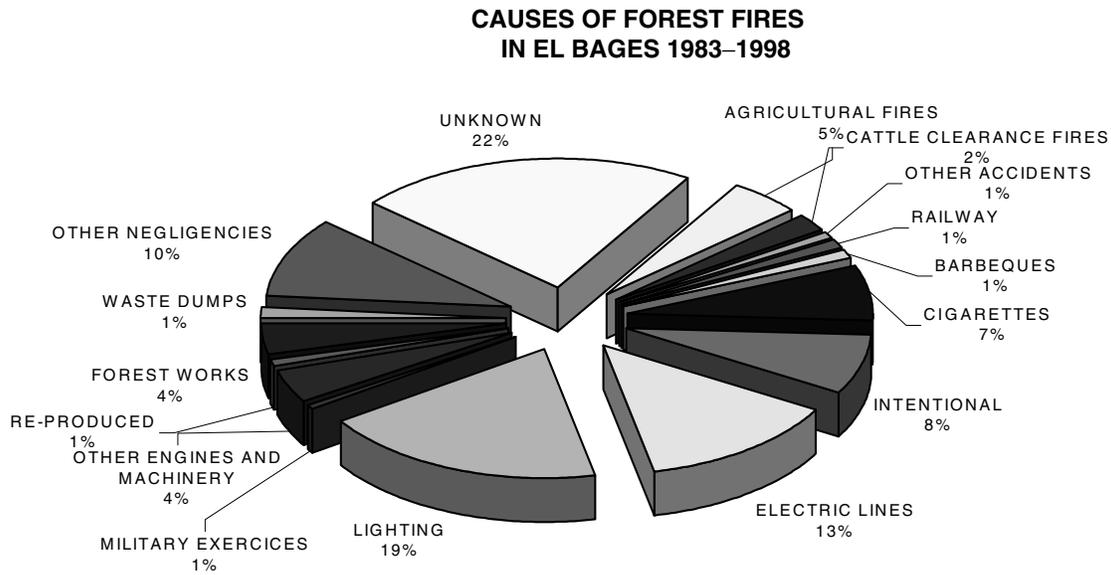


Fig. 3. Causes of forest fires in the county of El Bages during the period between 1983 to 1998.

- Under the reactive paradigm, management decisions tend to be evaluated under a shorter time span, whereas preventative approaches aim to create *decision structures* based on criteria of mid- and long-term integration as well as on multiple stakeholder participation.
- In the reactive paradigm, resources tend to be invested in fire extinction. In the preventative paradigm, a great deal of resources are directed toward infrastructure facilities that can compensate socioenvironmental change and contain the growth and acceleration of the “forest fire circle.”
- Under the preventative paradigm, the role of public participation is crucial and acknowl-

edged. Local populations are understood as playing a decisive role not only in providing relevant knowledge for framing and complementing expert assessments but also in leading the process of definition and implementation of the attendant preventative measures. This principle results in promoting an *endogenous leadership* of local populations both in the risk assessment research process and in the related policy activities.

- Inaction and nondecision are no longer contemplated as options under the new emerging paradigm. Proactive and strict planning, under dialogic and democratic premises, is seen as a necessary institutional attitude to cope

Dimension	Reactive Fire Risk Management Paradigm	Preventative Fire Risk Management Paradigm
Management guiding principles	Reaction, ecological succession, “ecological <i>laissez-faire</i> ”	Anticipation, unstable equilibrium, strong intervention
Type of strategies most favored	Technical, “expert” and “military”	Socioeconomic, dialogical, and developmental
Strategic time frame under consideration	Short term	Mid-/long-term
Main focus of resources investment	Extinction and provision	Prevention
Role of public participation	Rarely acknowledged	Understood as crucial
Institutional attitudes	<i>Inaction</i>	Active and strict planning
Dominant perception	Fire risk as a problem	Fire risk as opportunity
Risk communication emphasis	About what not to do	About what to do

Table II. Changing Paradigms in Forest Fire Risk Management in Catalonia

efficiently with the new forest fire risk situation. Under the new paradigm assumption, fire is neither seen as “good” or “bad” but as an intrinsic part of forest and forest fire risk management. Fire is used and ignited under controlled conditions to avoid the worst unwanted effects of uncontrolled forest fires.

- Within the new paradigm, fire risks are no longer seen as an insurmountable problem that somehow and inevitably have to be dealt with by public officers, but as a situation in which new opportunities for local development and institutional innovation arise.
- Public risk communication strategies that follow the reactive paradigm tend to emphasize prohibitions and constraints to individual action, whereas efforts oriented under the preventative paradigm search for mutual learning and a broad engagement of the public in the control and understanding of the forces that increase the risk of forest fires.

In Catalonia, the paradigmatic change in attitudes and practices in dealing with fire risks was made very clear in the publication of two very different policy reports edited by the Catalan Government, the first in 1991 and the second in 1999. In none of the 300 pages of the first report is reference made to the need of controlling biomass fuel and, also, very little importance was given to the preventative structural measures to minimize the occurrence and the harmful effects of forest fires. The work of 1999, on the contrary, dealt extensively on structural measures such as territorial planning and underlines the decisive role of local actors. Despite the short time-span these new principles have been put in practice, evidence so far suggests that the growing tendency in the change in socioenvironmental conditions that lead to an increase in fire risks has been reversed.

The advocacy for adopting the preventative fire risk management paradigm can be sustained on many grounds. First, preventative strategies tend to produce more socially equitable results by promoting the participation of local populations and by giving a greater stake to individuals with greater exposure to fire risk in deciding the role and functions of the forest of their own lands. Second, by adopting an anticipatory attitude, the most devastating effects on ecosystems and rural livelihoods that are the direct consequence of large fires can be avoided. In comparison with the reactive paradigm, preventative management practices are economically more efficient and profitable, as they can provide a greater control of forest wealth and

avoid the unexpected, uninsurable, and catastrophic losses that occur under present practices. And third, the need to find ways to ensure sustainable livelihoods for rural areas that incorporate the forest fire risk component as an opportunity for meaningful public participation and development opens a whole new area for applied research that other areas, such as ecosystem management, have not so far sufficiently dealt with.

In the case of Catalonia, unawareness of changing socioenvironmental conditions, the lack of realization of the crucial importance of preventative strategies, and little attention paid to the need for local participation in risk decision making led to an insurmountable situation that caused the devastating forest fires of the 1980s and 1990s. From our experience, actions that now *prevent and contain* the forces that increase the number and potential harmful effects of fires are the only successful strategies in the long term. Therefore, by contrasting the two paradigms we have attempted to summarize the changing nature of a multitude of different fire strategies, assumptions, and practices that have been carried out in Mediterranean regions such as Catalonia by means of an “ideal type” classification. This archetype classification, because of its ideal character, necessarily has many old and new variations, according to the social and political context in which they have developed. To our view, it is important to underline the commonality and distinctness of each paradigm as a guideline both for action *and* for research when dealing with fire risks in areas like those of Mediterranean forests near urban settlements.

In sum, in Catalonia, the institutional and political fire regime based on the reactive forest fire risk paradigm, with its priority in technical and *a posteriori* solutions, is progressively being replaced by a new paradigm that puts in the foreground the new preventative dimensions. Indeed, the public, when offered a meaningful opportunity to participate in hazard management, seems to prefer a preventative approach to a reactive strategy. The reasons for this paradigmatic change must be as simple as they are evident. In the current situation, reactive paradigm principles and practices are not only increasingly recognized as less relevant but also as the most inefficient and dangerous.

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