



**An Innovative Approach of Integrated Wildland Fire Management**  
**Regulating the Wildfire Problem by the Wise Use of Fire:**  
**Solving the Fire Paradox**

**The paradox of fire**

Man has always used fire in nature but its misuse can end in catastrophe and, as a Finnish proverb says, "fire is a bad master but a good servant". Contemporary trends of fuel accumulation on the landscape caused by land abandonment are aggravated by efficient fire suppression, with the paradoxical effect of increasing the risk of large and devastating wildfires in the Mediterranean Basin. No matter how sophisticated it is fire fighting technology cannot cope with fire events occurring under extreme weather conditions, as the summers of 2003, 2004 and 2005 have shown.

Past European research and practical experience in various countries highlight the need to design fire management and wildfire hazard mitigation policies adapted to the European situation. It is the ambition of FIRE PARADOX to contribute actively to set the bases for a fire management policy that would prevent the current disastrous social, economical and environmental consequences of wildfires in southern Europe.

**A comprehensive perspective of wildland fire**

The overall goal of FIRE PARADOX is to create the scientific and technical foundation for practices and policies consistent with the concept of integrated wildland fire management, i.e. allowing an adequate balance between the management of natural resources and the management of unwanted fires. Fire is viewed from 4 complementary sides, for the sake of integration, coherence and completeness, corresponding to a sequence from its use in prevention to its use in fire fighting:

1. **Prescribed burning**, a broad resource management tool, used especially to reduce fuel hazard. This technique has already been studied and developed in some European countries, but requires additional research in some areas (namely sociology), as well as adequate cooperation for professional training with demonstration facilities adapted to each country / region.
2. **Wildfire initiation**, from ignition to initial attack. The outcome of early fire detection and suppression is crucial to the success of policies focused on preparedness and response.
3. **Wildfire propagation**, with a special emphasis on important issues related to large wildfires and that only recently started to be studied in Europe, such as the spread by spotting or the threat to structures and people in the wildland-urban interface.
4. **Suppression fire**, the deliberate fire use in firefighting, which is not sufficiently employed in Europe, requiring research and cooperation to use the practical knowledge dispersed throughout southern Europe. Also, cooperation with regions

where the technique is widely used will be pursued and considered in the planning of the proposed professional training.

A coordinated development of knowledge on the four sides of fire is beneficial for the understanding of each single aspect. A significant change in fire management policies in Europe is only possible if trained professionals are able to understand and to use fire in a comprehensive way, from proactive management with prescribed burning to counter-firing in a wildfire.

### **The FIRE PARADOX domains and modules**

The FIRE PARADOX work programme reflects equilibrium between three domains, respectively Research, Development, and Dissemination. The work effort is oriented towards innovation, but it is also focused in putting in motion sound solutions already known and questioning ineffective policies and practices. Specific attention will be given to fields not directly linked with wildland fire but that are affected by fire or that affect fire and thus require further attention: urban planning, tourism and recreation, forest management and bioenergy (with its impacts on climate change).

The **Research** domain is based on the understanding of the basic processes associated with fire, obtained from experimental, sampling and modelling efforts according to the nature of the investigated processes:

1. The physical mechanisms module will improve the ability to understand the basic processes involved in fire behaviour and effects, and will develop methods and tools to predict these phenomena under various conditions. An important goal is to build a 3D fire behaviour and effects model through computational and experimental (to improve physics and validation) procedures.
2. The biological mechanisms module will expand the knowledge involved in the various aspects of fire, at different spatial and temporal scales. Innovation will be seek in (i) physically and biologically based modelling of fuel accumulation and live and dead fuel moistures to establish relationships under climate change conditions, (ii) fuel modelling (structure and flammability) based on remote sensing data, and (iii) modelling of tree resistance to fire to assess vulnerability to different fire regimes.
3. The social sciences and humanities module will assess the socio-economic impacts of fire, including the direct economical effects and the overall social value. A range of different techniques will be employed, namely market values, non-market valuation models and choice modelling approaches. The main goal is to explore and model the socio-economic factors which influence fire occurrence and fire management

The **Development** domain will use knowledge either predating the project or produced by FIRE PARADOX. The domain is structured in the following modules:

- Risk assessment and mapping, with an emphasis on achieving greater spatial accuracy;
- technological development, including a landscape fire growth simulator;
- policies and practices assessment, evaluation of regulations, policies and practices pertaining to fire management in Europe with the corresponding analysis of operational costs, damage costs, and benefits from the social, economical and ecological perspectives;

- real time fire monitoring and analysis of past fires, globally committing the consortium resources in sharing, compiling and analyzing information;
- demonstration for prescribed burning and suppression fire, mainly through a network of demonstration sites.

The **Dissemination** domain, consistent with the concept of integrated wildland fire management, adapted to each target / user group and including:

- academic and professional training, developing training strategies and tools;
- public awareness strategies, making use of the participants competences in the evaluation of current strategies for communication;
- decision support for policies, developing strategies for reviewing community policies related to wildlands, forests and fire, especially at the wildland-urban interface, and including regulations for management fire uses at national and European levels.

### Integration for solving the fire paradox

FIRE PARADOX is an ambitious multidisciplinary approach that claims for a strong effort of integration. The FIRE PARADOX matrix (Figure 1) depicts the overall structure of the project, with its 13 interrelated modules. The scientific and technological accomplishments of the project will be integrated in the following domains: (i) professional practices and academic courses, (ii) technical guidelines for wildland areas managers and operational procedures for firefighters, (iii) stakeholders' decisions, and (iv) regulations produced at regional, national and European levels.

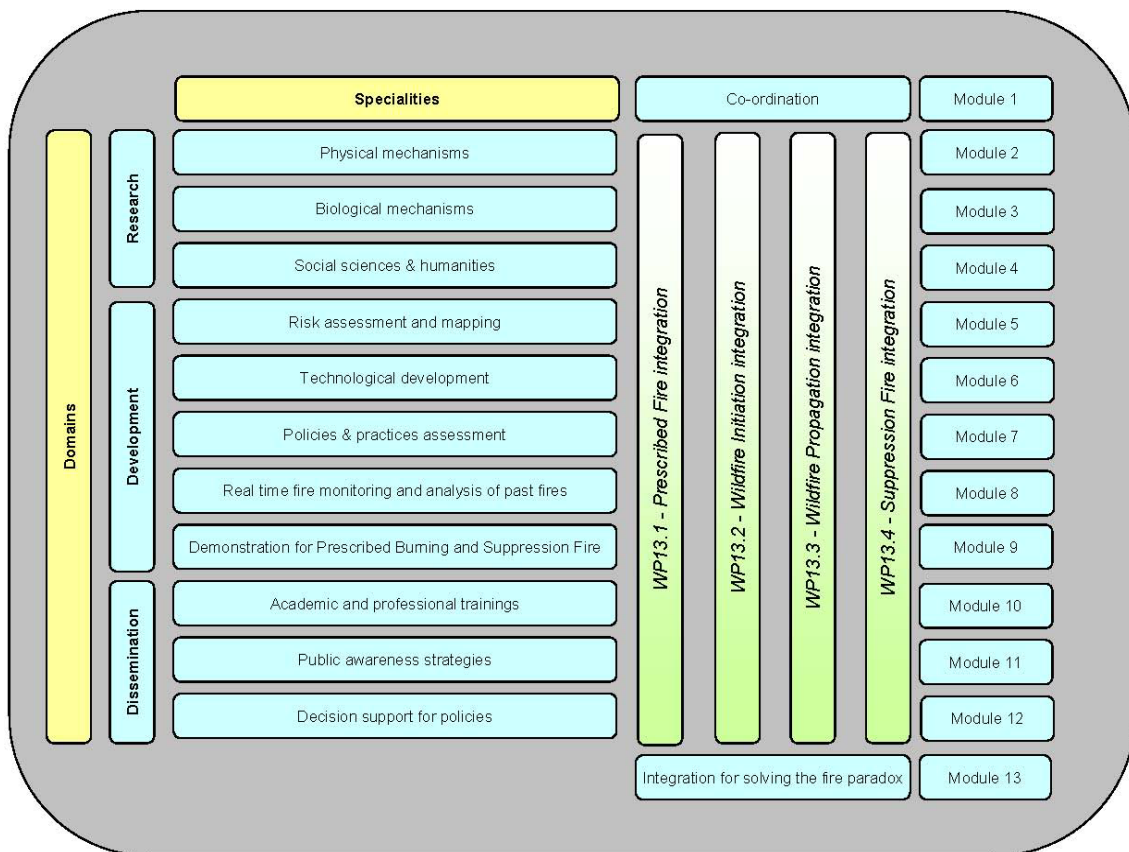


Figure 1. The FIRE PARADOX matrix.

Two dimensions of integration are considered, respectively horizontal – ensuring coherence of the work done on the Research, Development, and Dissemination domains – and vertical – guaranteeing achievement of the objectives for the Prescribed Fire, Fire Initiation, Fire Propagation and Suppression Fire aspects. Integration will consequently warrant the sectorial integration of research, development and dissemination activities related to the four aspects of fire, promotion of knowledge exchanges between the work packages pertaining to each aspect, generalization of the sectorial outputs, and development of comprehensive guidelines, policies and recommendations for an effective integrated wildland fire management.

### **The FIRE PARADOX consortium**

Fire research funded by the European Union has traditionally been based on teams from Euro-Mediterranean countries, i.e. those more affected by wildfires. FIRE PARADOX succeeds in attaining a true European dimension for the first time, by joining together teams from the temperate and boreal regions and including new EU members, as well as neighbours from the African side of the Mediterranean (Figure 2). The partners are complementary in their expertise and skills, and include end users and SME's. For its research and development components FIRE PARADOX is keen to integrate the outcomes of previous and on-going EU projects. For information exchange and communication the project will make extensive use of existing networks at the European level (such as the European Forest Institute) or even extending to the southern border of the Mediterranean basin (such as the International Association for Mediterranean Forests).

Working at the European level integrating other research initiatives and existing networks into FIRE PARADOX will result in synergies and confer added value to the project results. The creation and sharing of knowledge between professionals with different backgrounds is a very important step towards integration and a consensual position regarding fire management. The dialogue between Northern and Southern perspectives will allow innovative approaches. The use of European and regional networks will enhance transfer of the research and technological results in order to contribute to define integrated wildland fire management policies at National and European levels.



Figure 2. The FIRE PARADOX consortium: 31 partners from 13 countries.