

Map-based planning as a tool for improving forest fire control in Portugal

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Wildfires are a major problem the Portuguese government has to face every summer. In the last decades, forest fire incidence has been such that it can no longer be looked just as a natural element of the Mediterranean landscape ecology. In comparison to other Mediterranean member states, Portugal, together with Greece, has the highest burnt area, percentage of burnt area and fire severity index (see Table 1).

Table 1. Indicators of incidence of forest fires in Mediterranean member states obtained with data from 2000 (EC, 2001).

Member state	Burnt area (ha)	% Burnt area	Fire Severity Index (%)
Spain	146 801	24	0.49
France	23 700	4	0.08
Italy	102 355	17	1.26
Greece	167 006	28	2.06
Portugal	159 604	27	3.02
TOTAL	599 466	100	

The National Commission for Forest Fires (CNEFF) was created at the Ministry of Interior in 1987 as a response to the need of coordinating the entities responsible for forest fire prevention and control, such as:

- the National Directorate for Forestry;
- the National Service for Civil Protection;
- the National Fire Service;
- the National Institute for Nature Conservation;
- the Portuguese Association of Councils;
- the Meteorological Institute;
- the Ministry for Education.

In order to be flexible in this co-ordination, CNEFF has kept a light structure, with a National Co-ordinator in Lisbon, and three regional Delegations, that deal with the district and the council sub-commissions, from which the Fire Stations are also dependent.

Besides the co-ordination, the Commission is also responsible for providing financial support for the construction of forest infrastructures for wildfire prevention and control, for providing support to related activities promoted by other entities and for promoting public awareness campaigns. All these activities are organised into action programmes whose importance and funding are decided in periodic plenary sessions with delegates of all entities co-ordinated by CNEFF.

The financial investment done in each of these programmes is dependent on the susceptibility of the different regions to forest fires, which is higher in the north and in the central regions (Figures 1 and 2).

As it was previously mentioned, part of the CNEFF's funding has been applied to planning and supporting the construction of forest infrastructures for wildfire prevention and control, mainly roads, tracks and water points. Figure 3 evidently shows the tendency of higher investments at the central and northern regions.

In the action program for forest sappers, originally promoted by the National Directorate for Forestry but whose maintenance funding comes from CNEFF, the main mission of the brigades is to undertake preventive silviculture in order to keep the forest stands less prone to fires. Moreover, they have to do vigilance, fire fighting at initial stages, mop-up and promote public awareness in their contact with the local populations. These teams have been proposed to financial support by forest owners' organisations. In 2000 there were 60 teams in all national territory, in 2001 the number was raised to 99 and in a few years it is expected to rise to 500.

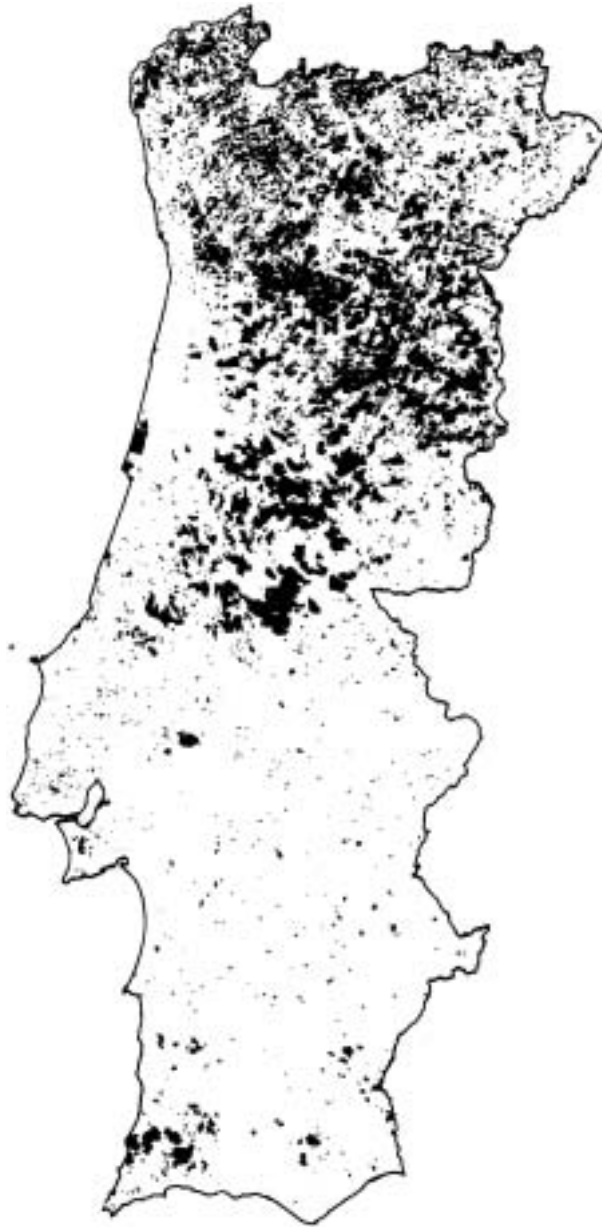


Figure 1. National distribution of the burnt area between 1990 and 1999
(source: National Directorate for Forestry).

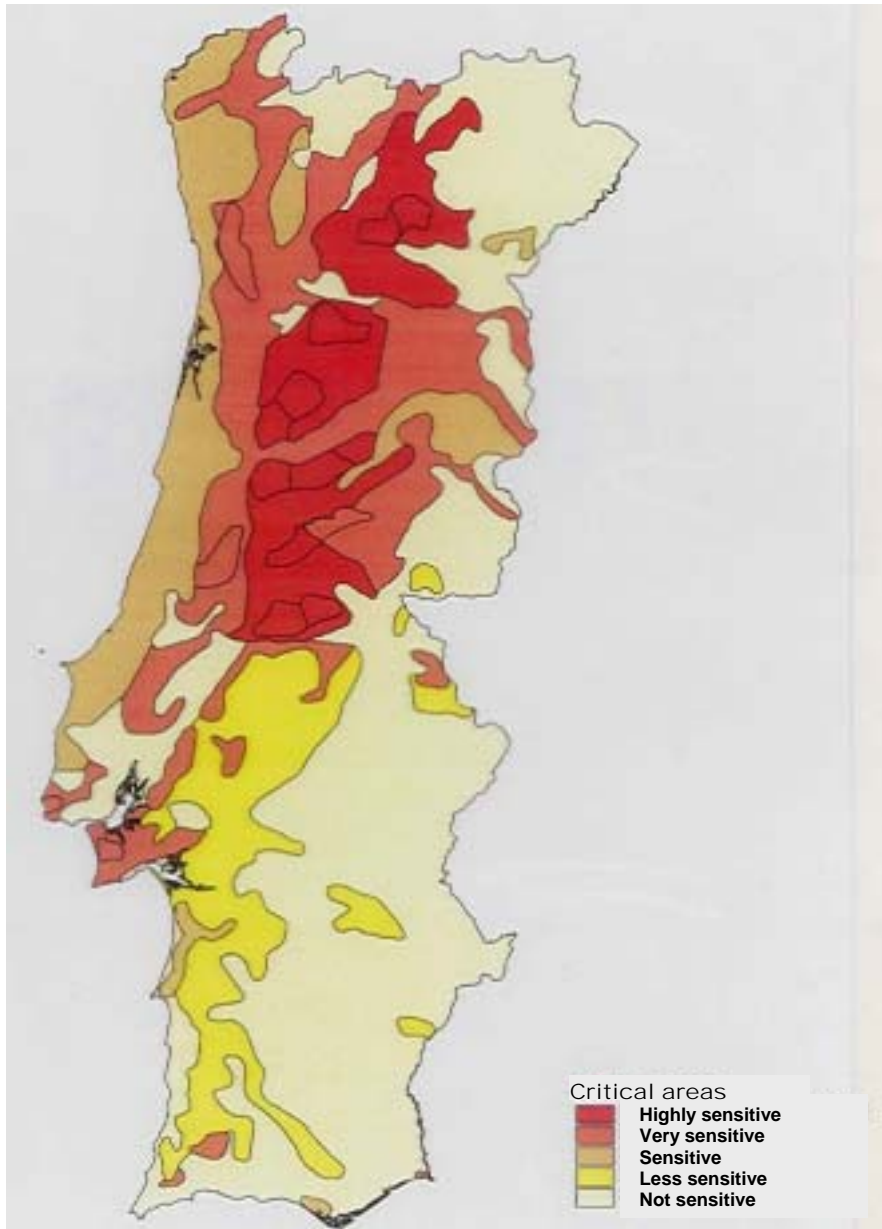


Figure 2. Regional variation of the susceptibility to forest fires (source: National Directorate for Forestry).

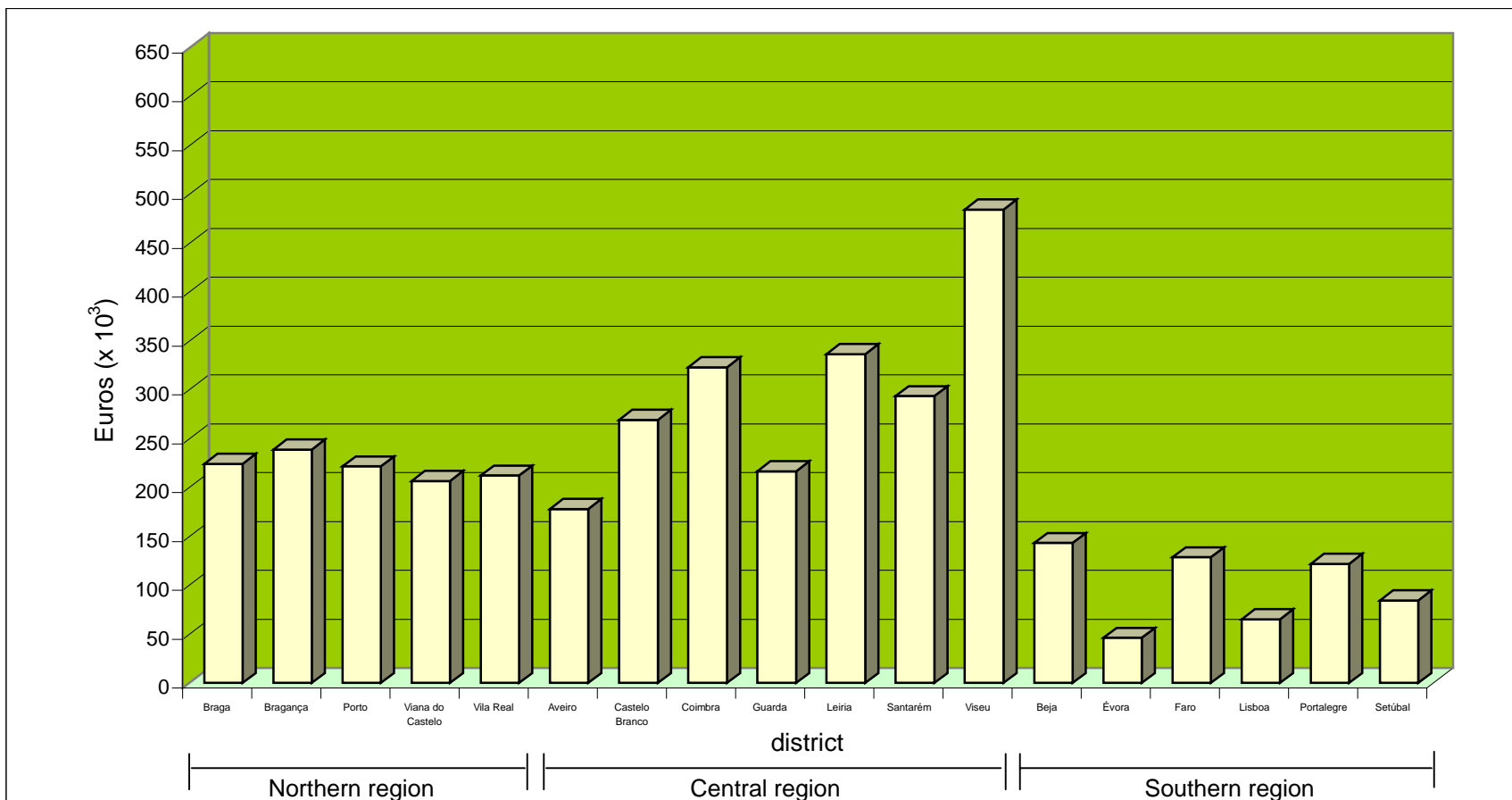


Figure 3. Investment done at each district in 2001 for the construction of forest infrastructures for wildfire prevention and control.

Two other programmes have been supported with the main aim of increasing vigilance. The program of forest vigilance has been dedicated to supporting the creation of teams of forest vigilants only active in the most critical months. In what concerns the mobile vigilance program, the vigilants cross the forest areas using motorbikes with the purpose of vigilance, first intervention, communication of occurrences and, again, for public awareness.

The program that has deserved less investment is the one supporting aerial vigilance, which is still under assessment in terms of efficiency in fire detection. Under this action program, CNEFF has been establishing protocols in order to use private aircrafts in aerial vigilance.

Besides these programmes, CNEFF has also been investing in education and environmental awareness, since 57% of the wildfires in Portugal are due to careless or criminal behaviour. Therefore, the Commission has been promoting a change of mentality and behaviour through support to school and outside-school activities, teacher training and public awareness campaigns.

A public awareness campaign was launched during summer 2001, which involved young people from the Portuguese Youth's Summer Activities and technicians from Forest Owners Associations in the update of databases with information on forest infrastructures for wildfire prevention and control. Collaborators were given GPS equipment, maps and field notebooks in order to collect information about the location and conditions of infrastructures such as water points, watch tours and forest houses. The amount of information collect did not fully meet the expectations but it was a starting point for the update and integration of three databases:

- the **National Centre for Geographic Information** (CNIG) database, with information on water points and watch tours, the latter originally provided by the National Directorate for Forestry;
- the **National Directorate for Forestry** (DGF) database with information on the burnt area and on the location of forest houses;
- the **Military Geographic Institute** (IGEOE) database with information on roads and tracks.

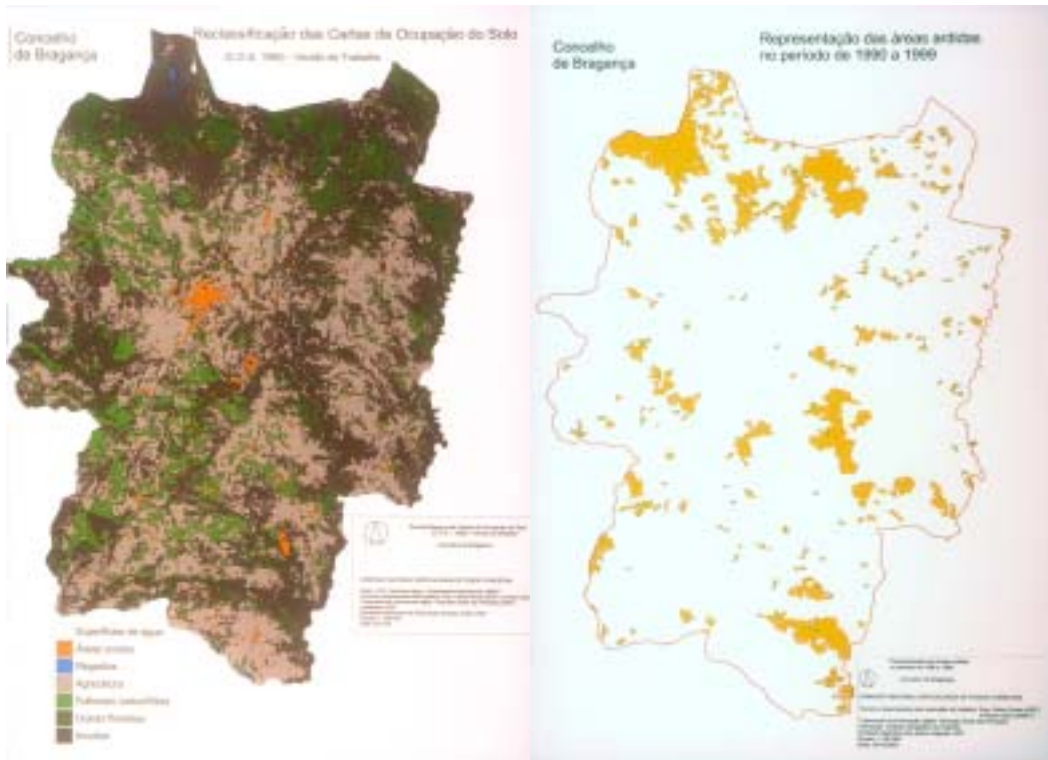
All these geographic data have been compiled and integrated into cartographic basis which are intended to be provided to Forest Fires Sub-Commissions and Fire Stations at districts and councils as tools for decision support and planning. As an illustration of this, Figure 4 shows the maps that have been produced for a council with the most recent information on land use, total amount of burnt area in the last decade, existent roads and tracks and existent infrastructures. These maps can be used for (1) planning the location, the type and the number of infrastructures whose funding has to be required to CNEFF in order to allow an effective wildfire prevention and control; (2) controlling the relevance of the investments that CNEFF has been doing and (3) allowing fire fighters to get a better knowledge about the location and the conditions of forest infrastructures which can increase the effectiveness of dispatching decisions, since it has been shown that total confidence on empirical knowledge, especially in what concerns the conditions of water points, has led to non-optimal decisions.

It has been decided to provide the maps in paper support, since the most part of the councils do not have both analysis tools such as GIS and technicians able to use them. However, the geographic information has been stored in digital format, which can be supplied if requested.

To conclude, it has to be stressed that the action programmes developed by CNEFF aim two main tasks – **improve detection and allow a faster intervention**. To achieve these tasks, the spatial and temporal efficiency of the detection systems associated with the action programmes has been under assessment to check the relevance of the investments that have been made. Results on this assessment are going to be made public by the end of January 2002. Moreover, CNEFF will carry on with the investments in the creation of forest infrastructures which once well planned allow a faster intervention and affect the effectiveness of dispatching decisions. This is part of an effort that CNEFF has been doing, with the help of the rest of the entities involved, in the assessment and correction of circumstances that affect dispatching and fire control.

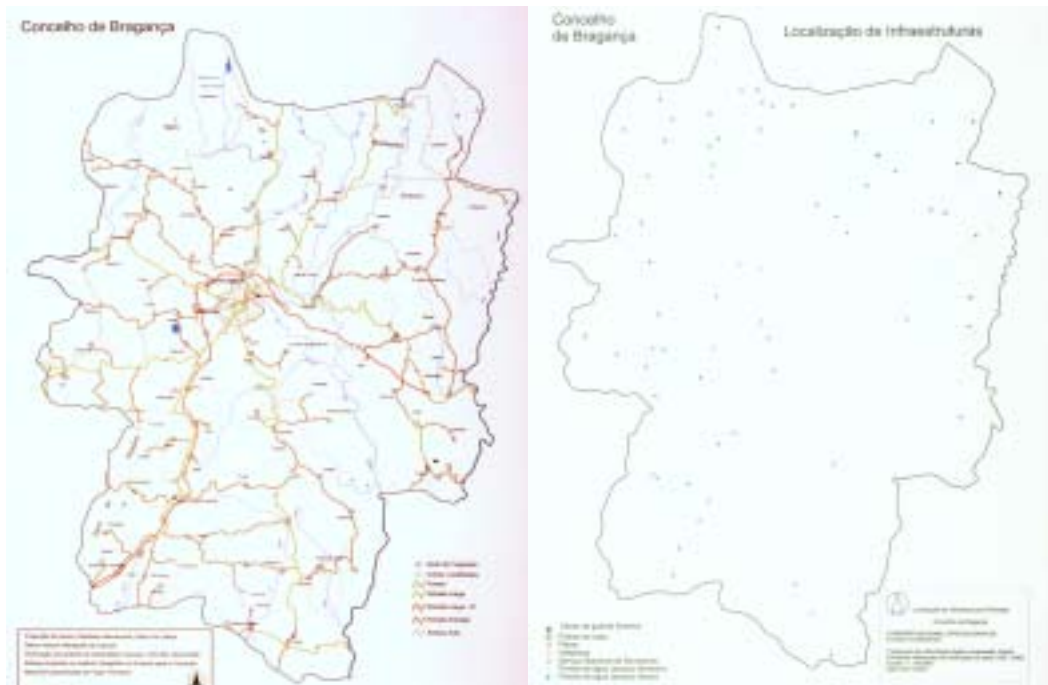
References:

EC (2001). *Forest Fires in Southern Europe*. Report n° 1. July 2001. 44.



a) Land use in 1990

b) Burnt area in the last ten years



c) Roads and tracks

d) Infrastructures

Figure 4. Illustration of the cartographic basis for decision support and planning.