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THE POSTFIRE ANALYSIS AS A METHODOLOGY FOR PREPAREDNESS IN WILDFIRE MANAGEMENT

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OBJECTIVE

In the field of wildfire strategic analysis, it is proposed to identify the lessons learned about the conditions that influence fire behaviour, and to use them to improve wildfire preparedness and management procedures through the elaboration of post-fire analysis reports.

METHODOLOGY

The methodology followed for the writing of the post-fire reports is divided into 3 interrelated phases: (1) **data collection**, (2) **analysis** and (3) **debriefing**. Phase 1 identifies all the variables that may affect fire behaviour, as well as other conditioning factors that may determine the spread and influence decision making. This is the phase in which most of the time is spent in the search and preparation of data, including mapping data, photographs and videos and remote sensing or remotely piloted aircraft system products, which will be used in the fire reconstruction.

Figure 1. Pictures of field data collection and debriefing. Diagram of the methodology followed in the post-fire analysis and writing of the post-fire reports. Source: Forest Fire Prevention Service. Generalitat Valenciana

In phase 2, the fire behaviour is analysed in relation to all the variables identified in phase 1. This is used to determine the main fire driver, its phases, the evolution perimeters, the most critical moments and the most influential variables in each case. In this stage it is essential to identify the lessons learned to be incorporated in the management and analysis of fire behaviour.

Phase 3 consists of validation of the analysis carried out through debriefing with the firefighting operation, whose contributions are added again as data and included in the analysis. Finally, the post-fire report is drafted, formatted and published in a standardised file format and maps (*which can be browsed in the QR*).

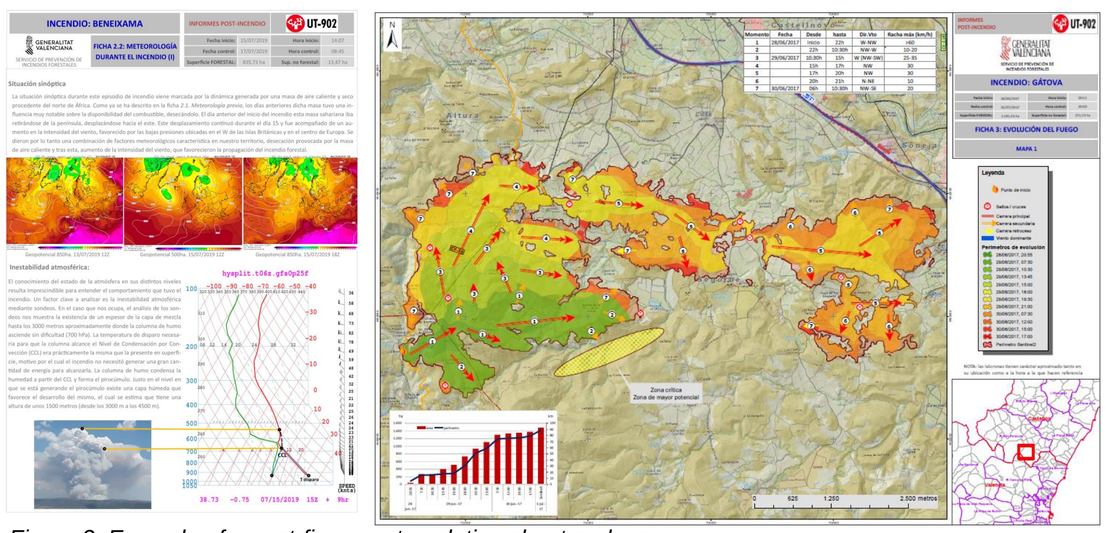

Figure 2. Example of a post-fire report evolution sheet and map

RESULTS

Through the analysis of fire behaviour and the compilation of post-fire reports, the most important variables and lessons learned from each fire have been identified.

Wildfire name	Date	Driver	Highlighted variable	Lesson learned
Lloc Nou de Sant Jeroni	12/06/2012	Convection and wind	Wind shear	Wind shear at altitude must be taken in consideration in order to predict the smoke plume behaviour
Cortes de Pallás	28/06/2012	Wind	Realignment with topography	Large forest fire management with simultaneity and population control
Andilla	29/06/2012	Wind and topography	Convective phases	Planning and equipment requirements for managing simultaneity
La Torre de les Maçanes	12/08/2012	Topography	Topography wind channelling	Identification of maritime winds and their capacity to penetrate the territory. High rate of spread in wind and slope alignment
Ayora	25/07/2013	Wind	Convective phases	High availability of fine fuel. Demand for live fuel moisture content analysis
Godelleta	22/04/2014	Wind	Wildland urban inteface	Population management. Prepair a detailed wildland urban interface mapping
Xàbia	11/09/2014	Wind	Maritime winds. Wildland urban interface	Study the wind regime in maritime areas. Identify similar behaviour in historical fires
Montán	07/07/2015	Topography	Temperature inversion	Use of soundings in thermal inversions identification, which affect the deployment of firefighter aircrafts.
Segorbe	16/05/2015	Topography	Local winds	Topography and plume suction effect on fire spread
Vall d'Ebo	14/05/2015	Wind	Maritime winds.	The wind regime in maritime areas conditions the fire evolution. Analysis of different scenarios must be made due to wind changes.
Poble Nou de Benitatxell	04/09/2016	Wind	Wildland urban interface. Wind and fire spots	Similar behaviour in historical fires. Integrate analysis reports into the operation as a training tool. Fire spotting behaviour. Influence of maritime winds
Bolulla	04/09/2016	Wind	Large forest fire risk window	High fuel availability associated with the large wildfire risk window. Identification of the large wildfire risk window situation
Carcaixent	16/06/2016	Convection	Pyrocumulus	Post-fire severity analysis allows correlating higher severity to convective behaviour.
Culla	29/12/2017	Wind	Fire leaps	High fuel availability in winter fires
Gátova	28/06/2017	Convection and wind	Instability	Stability/instability changes associated with fire behaviour patterns are identified.
Llutxent	06/08/2218	Wind and convection	Storm	Abrupt changes in fire behaviour related to the interaction between convective plume and storm. Interface management, anticipation of population evacuation.
Beneixama	15/07/2019	Wind	Fuel availability	High fuel availability, flashovers. In fires with high severity it is necessary to reclassify the "high" category to distinguish the effects.
Vall de Gallinera	08/08/2020	Wind and topography	Topography	Topography accelerates the wind. Influences the front alignment with positive and negative effects.
Soneja	14/08/2021	Wind and storm	Down burst	Identifying an atmosphere conducive to warm downbursts occurrence
Vall d'Ebo	13/08/2022	Convection and storm	Storm	Storm tracking becomes key tool for anticipation
Bejís	15/08/2022	Convection and storm	Front passage. Storms	The change of drier air mass causes an abrupt change in fire behaviour. Mapping of critical infrastructures and points of interest

Table 1. Extract from the lessons learned identified in the post-fire reanalysis process.

Based on the lessons learned, areas for improvement in integrated fire management have been identified, with the aim of increasing the level of knowledge, preparedness and anticipation of a forest fire emergency. These improvements are being addressed through :

- *Research:* modelling of live fuel moisture; study of wind climatology; classification of synoptic meteorological situations.
- *App development:* analysis of high-resolution weather forecasts from the Harmonie-AEMET model.
- *Training:* in atmospheric profile analysis from forecast weather soundings; in fire simulators; in applied remote sensing.
- *Data:* updated fuel model mapping; canopy parameter mapping; critical infrastructure mapping; meteorological data sources.
- *Protocols:* operational mapping design and fire analysis; integration of the fire prevention personnel in fire evolution data collection.

CONCLUSIONS

Since 2012, the Technical Unit for Analysis and Fire Prevention of Generalitat Valenciana has carried out a total of 36 post-fire reports. This work has made it possible to compile a large amount of documentation and information associated with the most important fires that have occurred in the territory of the Valencian Community.

The reports are useful for capitalising the experience and are used in training and preparation of the fire prevention and firefighting organizations, especially for the analyst team in all phases of integrated fire management and planning. Also during emergencies and post-fire actions. The lessons learned identified are integrated into the preparedness phase, so that they can be applied during the emergency management.

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