MEFISTO
MEDITERRANEAN FOREST FIRE
FIGHTING TRAINING STANDARDISATION

Civil Protection
Humanitarian Aid

B.2	**Similarities and differences between EU Mediterranean Countries in forest fire fighting: a challenge for improvement**

MEFISTO	**Mediterranean Forest Fire Fighting Training Standardization**

MEFISTO Deliverable B.2

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MEFISTO consortium

CO
Università degli Studi di Firenze - Dipartimento di Gestione delle risorse Agrarie, Alimentari e Forestali (UNIFI)
Italy

BE1
Escola Nacional de Bombeiros (ENB)
Portugal

BE4
Centro de Servicios y Promoción Forestal y de su Industria de Castilla y León (CESEFOR)
Spain

BE3
Entente pour la Forêt Méditerranéenne (ENTENTE)
France

BE4
Regione Toscana (RT)
Italy

Similarities and differences between EU Mediterranean Countries in forest fire fighting: a challenge for improvement

Coordinating lead authors:

Andrea Laschi and Enrico Marchi

Authors:

Blanco Lago Elena	CESEFOR, Spain	**Gomes** Artur	ENB, Portugal
Blanc Jean-Pierre	ENTENTE, France	**Laschi** Andrea	UNIFI, Italy
Biscay Jean-Frédéric	ENTENTE, France	**Marchi** Enrico	UNIFI, Italy
Bonfils Louis	ENTENTE, France	**Pacini** Giacomo	Tuscany Region, Italy
Calvani Gianluca	Tuscany Region, Italy	**Pasquinelli** Paola	Tuscany Region, Italy
Catarino Verónica	ENB, Portugal	**Reis** Vitor	ENB, Portugal
Chirici Gherardo	UNIFI, Italy	**Rey Van Den Bercken** Enrique	CDF (Centro para la Defensa del Fuego). Junta de Castilla y León, Spain
de Saint Germain Ronan	ENTENTE, France	**Tonarelli** Luca	DREAM Italia, Italy
Fabiano Fabio	UNIFI, Italy	**Tosello** Philip	ENTENTE, France
Fernández Huertas Víctor	CDF (Centro para la Defensa del Fuego). Junta de Castilla y León, Spain	**Travaglini** Davide	UNIFI, Italy
Ferreira José	ENB, Portugal		

Summary

List of Abbreviations

AERO	Aerial means officer - France (officier AERO)
AM	Environmental agent, Forest Ranger or Forest warden - Spain (Agente medioambiental de guardia, (incluye celadores, con idénticas funciones))
ANPC	National Civil Protection Authority – Portugal (Autoridade Nacional de Protecção Civil)
CA	Fire engine driver- Spain (Conductor de autobomba)
CAM	Regional Command Center – Spain (Centro Autonómico de Mando)
CCB	Fire Department Command - Portugal (Comando do Corpo de Bombeiros)
CCF	Fire truck - France (Camion citerne feux de forêts)
CCOD	District Operational Coordination Centres – Portugal (Centro de Coordenação Operacional Distrital)
CCON	National Operational Coordination Centre – Portugal (Centro de Coordenação Operacional Nacional)
CDOS	District Relief Operations Command~~s~~ - Portugal (Comando~~s~~ Distrital~~is~~ de Operações de Socorro)
CECOPI	Integrated Operational Coordination Center - Castilla y León, Spain (Centro de Coordinación Operativa Integrado - Castilla y León, Spain)

CELOG	Logistics Cell - Portugal (Célula de Logística)
CELOP	Operations cell – Portugal (Célula de Operações)
CEPLAN	Planning cell – Portugal (Célula de Planeamento)
CETAC	Tactical Command Center – Portugal (Centro Tático de Comando)
CF	Forest police – Italy (Carabinieri Forestale)
CFS	Italian forest service – Italy, now forestry police (Corpo Forestale dello Stato, ora Carabinieri Forestale)
CLIF	Committee for Forest Fire Fighting – Spain (Comité de Lucha contra Incendios Forestales)
CM	Heavy machinery driver - Spain (Conductor-maquinista de maquinaria pesada)
CMCP	Municipal Commission for Civil Protection - Portugal (Comissão Municipal de Proteção Civil)
CMDF	Municipal Forest Defence Commissions - Portugal (Comissão Municipal de Defesa da Floresta)
CNOS	National Relief Operations Command - Portugal (Comando Nacional de Operações de Socorro)
CNVVF	National Fire Corps – Italy (Corpo Nazionale dei Vigili del fuoco)

COAU	Unified Air Operations Centre - Italy (Centro Operativo Aereo Unificato)
CODIS	District Operational Commander – Portugal (Comandante Operacional Distrital)
CODIS	District Operational Commander – France (Officier salle opérationnelle de feux)
COGIC	Operational centre of crisis management – France (Centre Opérationnel de Gestion Interministériel de Crise)
COM	Municipal Operational Commander - Portugal (Comandante Operacional Municipal)
COP AIB	Local control room - Italy (Centro Operativo Provinciale)
COPAR	Air Operations Coordinator – Portugal (Coordenador de Operações Aéreas)
COS	Incident Commander – Portugal (Comandante das Operações de Socorro)
COS	Incident Commander - France (Commandant des opérations de secours)
COZ	Zonal Headquarter – France (Centre Opérationnel de Zone du Sud-ouest)
CPM	Profincial Command Centre – Spain (Centro Provincial de Mando)
CPS	Campbell Prediction System

CT	Brigade foreman - Spain (Capataz de cuadrilla de tierra)
CVT-AIB	Volunteer Coordination agency of Tuscany – Italy (Coordinamento Volontariato Toscano)
DFCI	Defense of the forest against fires – France (Défense de la forêt contre les incendies)
DIOPS	Integrated System for Protection and Rescue Operations – Portugal (Dispositivo Integrado das Operações de Proteção e Socorro)
DO AIB	Incident commander - Italy (Direttore delle Operazioni – Toscana)
DTE	Incident Commander - Spain (Director Técnico de Extinción)
EDM -	Scale of Forest Fires Meteorological Danger – France (Échelle de Dangers Météorologiques feux de forêt)
ERAS	Recognition and Situation Assessment Team - Portugal (Equipa de Reconhecimento e Avaliação da Situação)
ERCC	Emergency Response Coordination Centre
FWI	Fire Weather Index
G.A.AR.	Armed air patrols – France (Guet aérien armé)
GIFF	Forest Fire Intervention Group - France (Groupe d'intervention feux de forêts)

GIL	Heavy Forest Fire Group – France (Groupe d'intervention lourde feux de forêts)
GNR	National Republican Guard – Portugal (Guarda Nacional Republicana)
IBIMET	Institute of Biometeorology of the National Research Council – Italy (Istituto di biometeorologia, Consiglio Nazionale delle Ricerche)
IC	Incident Commander
ICNF	Institute of Nature Conservation and Forests – Portugal (Instituto da Conservação da Natureza e das Florestas)
ICS	Incident Command System
IFM	Forest Weather Index – France (L'Indice Forêt Météo)
INFOCAL	Civil Protection Plan for Emergencies by Forest Fires in Castilla y León - Spain (Plan de Protección Civil Ante Emergencias por Incendios Forestales en Castilla y León)
INRA	French National Institute for Agricultural Research (Institut national de la recherche agronomique)
LAMMA	Laboratory of Meteorology and Environmental Modelling Consortium –Italy (Consorzio Laboratorio di Meteorologia e Modellistica Ambientale)
MAPAMA	Ministry of Agriculture and Fisheries, Food and the Environment - Spain (Ministerio de Agricultura y Pesca, Alimentación y Medio Ambiente)
MIR	Rapid intervention module – France (Module intervention rapide)

NEP	Level of ignition probability and propagation - France (Niveau d'Eclosion et de Propagation)
OPAR	Air Operations Officer – Portugal (Oficial de Operações Aéreas)
ORMIS	Mission Order – Portugal (Ordem de Missão)
PA	Fire engine assistant - Spain (Peón ayudante de autobomba)
PC	Command Post - France (Poste de Commandement)
PCA	Advanced Command Post – Italy (Posto di Comando Avanzato)
PCO	Operational Command Post – Portugal (Posto de Comando Operacional)
PEA	Strategic Action Plan - Portugal (Plano Estratégico de Ação)
PH	Helitack operator - Spain (Peón de cuadrilla helitransportada)
PHT	Helicopter pilot - Spain (Piloto de helicóptero)
PNDFCI	National Plan for Prevention and Protection of Forest Against Fires - Portugal (Plano Nacional de Defesa da Floresta Contra Incêndios)
PPE	Personal protective equipment

PROF	Regional Forest Plan - Portugal (Planos Regionais de Ordenamento Florestal)
PT	Brigade worker - Spain (Peón de cuadrilla de tierra)
RDFCI	Forest Fire Defence Networks – Portugal (Redes de Defesa da Floresta Contra Incêndios)
RH	Helitack officer - Spain (Responsable de cuadrilla helitransportada)
SGIF	information system on forest fires - Portugal (Sistema de Gestão de Informação de Incêndios Florestais)
SGO	Operations Management System – Portugal (Sistema de Gestão de Operações)
SMEIF	Forest Fire Emergency Management System –Spain (Sistema de Manejo de Emergencias por Incendios Forestales). It corrspond to ICS
SMPC	Municipal Civil Protection Service - Portugal (Serviço Municipal de Proteção Civil)
SOUP	Unified permanent operational room – Italy (Sala Operativa Unificata Permanente)
TO	Operational Theatre – Portugal (Teatro de Operações)
UME	Military Emergency Unit - Spain (Unidad Militar de Emergencias)
VCOC	Command and Communications Vehicle – Portugal (Veículo de Comando e Comunicações)

VCOT	Tactical Command Vehicle – Portugal (Veículo de Comando Tático)
VGEO	Strategic Management and Operations Vehicle – Portugal (Veículo de Gestão Estratégica e Operações)
VI	Fire lookout - Spain (Vigilante de incendios)
VLTT	Light all terrain vehicle - France (véhicule léger tout terrain)
VPCC	Planning, Command and Communications Vehicle – Portugal (Veículo de Planeamento, Comando e Comunicações)
ZA	Support Zone – Portugal (Zona de Apoio)
ZCR	Reserve and Concentration Zone – Portugal (Zona de Concentração e Reserva)
ZI	Intervention Zone - Portugal (Zona de Intervenção)
ZRR	Reinforcement Reception Zone – Portugal (Zona de Receção de Reforços)
ZS	Incident Zone - Portugal (Zona de Sinistro)

Foreword

Fire is the most important natural threat to forests and wooded areas of Southern Europe (Mediterranean France, Greece, Italy, Portugal and Spain). In the last decade (2007-2016), the average annual number of forest fires throughout Southern Europe exceeded 41,500, i.e. 33% less than the previous decade (1997-2006). In the same period, the annual average burned area reached a value higher than 309,000 hectares, i.e. 28% less than the previous decade. The averages for this period showed about 36 fires per 100 km^2 for an average burned area of about 27 ha per 100 km^2.

The reduction of both fire number and burned area in the last decade means that the prevention and suppression organization is getting better. Nevertheless, forest fires still continue to represent a menace to forests and infrastructures. Moreover, as we experienced more and more frequently in the last summers, forest fires may be a very dangerous threat for the communities living in the rural areas and in the wildland urban interface.

The improvement of the efficiency in forest fire suppression and effectiveness continue to play a key role, together with prevention actions. The MEFISTO project aims at increasing the efficiency of forest fire suppression improving knowledge and developing the efficiency of European response capacity by mean of international collaboration among the countries of the Mediterranean area.

The specific aim of this Report is to analyse, describe and compare procedures, methods and techniques applied in partner's countries, including training activities and health and safety measures. Increasing collaboration networking and good practices may allow each country to move forward a new vision and collaborating approach, that may became strategic for the common goal to reduce fire number and burned areas in Europe.

An intense collaboration among project participants made possible the production of this report. They have a wide array of skills and many years of combined experience in forest fire prevention and suppression. The quality of this report is the result of the professionalism and competence of the authors in different aspects of their work.

Executive Summary

This document includes the result of a survey made by MEFISTO Partners on the state of the art in fire fighting organization and activities in Partner's countries/regions in Mediterranean area. Similarities and differences regarding the organization, techniques and procedures are described and summarised. A mutual better knowledge about the organizational systems applied in forest fire fighting in the different countries allow to improve collaboration and the ability to work together. Thanks to the understanding of existing differences between countries, this report focuses on similarities as starting points for developing common approaches and procedures at Mediterranean level.

1. Introduction – Mediterranean forest fire fighting: state of the art

MEFISTO aims to improve the preparedness level against forest fires in Mediterranean area and in Europe in general. In particular, an important aspect to be developed in MEFISTO is the possibility to standardise operative procedures in fire fighting in order to facilitate cross-border collaboration during big fires. In fact, in some cases, the possibility to operate with the support of expert from other countries, and the collaboration of fire fighting crews arriving from other countries, could be a fundamental resource to contrast big events with higher efficiency and reduced operational time, especially in the areas close to the country borders.

In this context, it is fundamental to have a deep overview of the activities, procedures and training courses made at present in the countries involved in the project. The aim of this deliverable has been to collect most of the information regarding fire fighting organizations in all the countries involved in MEFISTO project. Moreover, this information have been analysed, resumed and organised in order to highlight the similarities and the differences between national approaches on this topic. The awareness of the similarities and the differences among countries in relation to forest fire fighting collaboration is fundamental for the development and improving reciprocal collaboration. Results are the basis for developing next steps of MEFISTO project in order to create common standards of training activities.

2. Data and information collection

The survey has been carried out asking to all Partners, and to other stakeholders, to compile a questionnaire prepared by ENB, ENTENTE and Tuscany Region with the collaboration of the other partners (Annex 1). The questionnaire has been filled in by Partners obtaining information for Portugal, Tuscany Region (Italy), France and Castilla y Leòn (Spain). The questionnaire has been sent for compilation also to the civil protection of Slovenia, Croatia, Montenegro, Austria and Macedonia. Despite the first positive answer, only Croatia have compiled the questionnaire as requested.

The questionnaire was divided into four main parts:

- **Part I** – Analysis, understanding and comparison of procedures, methods and techniques;
- **Part II** – Analysis, understanding and comparison of the national/regional forest fire training organization;
- **Part III** – Analysis and assessment of training methods, and related inter-operational problems;
- **Part IV** – Individual and collective safety measures.

The Part I was developed with the aim of having an overview of the organization of forest fire fighting structure developed in each country/region. This part took into consideration the following main aspects:

- Forest fire prevention and suppression strategy at national and/or regional and or /local level;
- The level and the type of agencies responsible for drafting the procedures and the management system;
- Incident command structure, availability of operational rooms;
- Availability and type of the resources used in fire fighting;
- The main approach to forest fire in terms of methods of suppression/suppression tactics;
- The availability and use of fire prediction systems;
- The availability of specific organization/procedures to be used for big fire event.

The Part II had the aim to collect information about the structure and organization of the training activities carried out in each country/region. This part was divided in the following sections:

a) Qualification – this section was included for collecting information about the qualification need in relation with the responsibility position, the competence framework associated with each qualification and how the qualification is obtained;
b) Training organization – information about the legal framework, organization and certification of training were collected in this section. Info about training levels were also collected;
c) Forest fire training courses – a description of the objective, content, length and evaluation of each course was requested.

The Part III had the aim to collect information about training methods, educational resources used in training activities. The description of training difficulties and constraint was also requested.

The Part IV was developed for collecting information about the personal protection equipment used in fire fighting together with info about the needs of medical examination and physical tests.

After the first analysis of the questionnaires, in order to have consistent information for all the partner's countries, the missing or unclear or incomplete information were added by means of direct interviews.

In the following chapters, a description of results and information collected is reported.

3. Procedures, methods and techniques applied in fire fighting

3.1 Italy – Tuscany region

3.1.1 Forest fire protection organization

In Italy, the aspects related to forest fire prevention and suppression are regulated by the national framework law N.353 of November 21th 2000. This law has confirmed that the responsibilities in the field of forest fire are in charge of each Regional Administration, which should organize and manage forest fire prevention and suppression activities by means of the development of specific plans. For this reason, in Italy, each Region has its own organization and operative framework. Only the national aerial fleet is managed by the State for the whole territory. Based on the national framework law, each Regional Administration approved its own law on forest fire prevention. Sometimes the aspects related with forest fire are included in the regional forest law. This legal framework led to different organization systems among Regions with different efficiency and effectiveness in contrasting forest fire.

Tuscan regional forest fire protection organization

In Tuscany, fire prevention and suppression activities are competence of the Forestry Office of Tuscany Region, which is also responsible for fire fighting organisation and improvement. Several other agencies and institutions are involved in forest fire prevention and suppression according to the guidelines established by the Region, as described in the Regional Operational Plan for forest fire prevention and suppression and in the "Operational procedures" document. In Tuscany the responsibility of forest fire prevention and suppression is in charge of the "*Forestazione – Antincendi boschivi (AIB)"* office of the regional administration. The activities of the "*Forestazione – Antincendi boschivi (AIB)"* office are implemented in the framework and according with the following regulatory tools:

- Tuscany forest law, N. 39, March 21st 2000 and subsequent amendments and additions;
- Tuscany Forestry Regulations N. 48/R, approved by the Decree of the President of the Regional Council on August 8th 2003, coordinated by decree of the President of the Regional Council of March 16, 2010, no. 32/R;
- Regional Operational Plan 2014 – 2017 approved by the Regional Council, resolution N. 50, January 28th, 2014.

In details, "*Forestazione – Antincendi boschivi (AIB)"* office is responsible for the forest fires prediction, prevention and fighting. The AIB organisation is also in charge to drown up the regional multi-years operational plan (the current one is "*Piano Operativo Antincendi Boschivi* 2014-2017") in order to plan and define the forest fire prevention and fighting activities. Fire statistics, risk and hazard indexes, general prediction, prevention and

fighting activities relating to forest fire, operational procedures, and training and information activities are included in the operational plan.

The Regional Administration has the responsibility to organize and manage all the forest fire suppression and prevention activities, coordinating a multi-level system based on administrative competence on territories. The scheme of the organization for forest fire protection is drown in Figure 1.

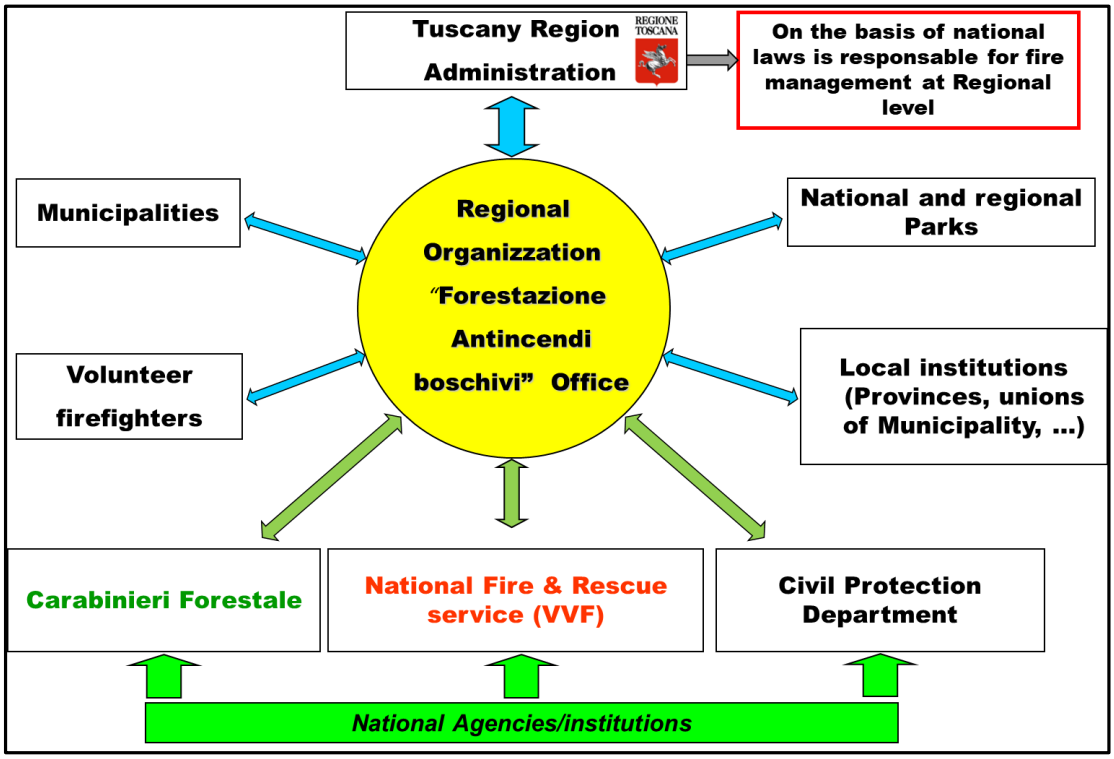

Figure 1 - Scheme of forest fire protection organization in Tuscany Region

The regional office "Forestazione – Antincendi boschivi (AIB), manages the forest fire protection organization involving:

- *Local public bodies*

The activity of the Regional Administration is supported by Provincial and local public bodies that, according with the regional law and Regulation has some specific responsibilities. Municipalities (or Union of Municipalities) and Parks have administrative duty and responsibilities concerning planning, implementation and management of structures and infrastructures for the forest fire prevention and fighting in their own competence territory, including:

• Fuel management practices in order to reduce flammability and to improve forest resilience to fire;

• Planning, implementation and maintenance of post-fire safeguarding structure for avoiding indirect impacts (such as soil erosion, mudflow, landslide);

• Restoration of the burned areas;

• To provide and manage forest fire fighting tools and equipment;

• To make available forest technical staff and forest fire fighters to be used in fire fighting operations;

• Planning implementation and management of fire detection and patrolling services, prevention and the active fight against forest fires;

• Drafting and yearly updating the local Operational Plan.

- *Volunteer firefighter*

In Tuscany Region, there is a long tradition of volunteer fire fighters. Since the '70 of the last century, several private no-profit organizations have been founded with the aim to give support in fire suppression operation. In the last decade, a coordination structure of these organizations (Coordinamento Volontariato Toscano - CVT-AIB) has been established for improving their efficiency and effectiveness. Citizens with the aim of contributing for free in fire prevention and suppression are involved in these organizations. The volunteers do not receive any salary for their work. The Region administration and the municipalities may financially support the activity of these organizations by means of specific agreements. The money received from these agreements is used for buying machines and tools, personal protection equipment (PPE), and for other organizational purposes. All volunteers have to pass a medical evaluation, have to be trained and have to be equipped with PPE before starting their activity. Moreover, each volunteer must have an accident insurance.

- *National organization and support*

Department of Civil Protection, through the Unified Air Operations Centre (COAU), guarantees and coordinates the interventions of the state aerial fleet, also providing for its upgrading and modernization. COAU manages the state fleet's airline contest in the extinction of forest fires and their relations with the regions, based on specific procedures revised yearly. Various airplanes (Canadair and Airtractor) and helicopters (such as Ericson S64, Agusta Bell AB 412, Boeing CH47) positioned in different bases on the national territory are used in the national fleet. The deployment of the aerial means at nationwide level is planned by the national civil protection administration.

The National Fire Corps (CNVVF) provide support activities during forest fire events through a specific agreement with the Regional administration and has the responsibility of wildland-urban interface and wildland fire (forest fire excluded).

Carabinieri Forestale (CF) is a military police with a division specialized in forestry. CF are in charge of the investigation of the fire causes on each fire and, by means of a specific agreement with the Tuscany Region, they carry out surveillance of the forest area.

Fire danger indexes

The management of fire prevention and fighting are based on the daily danger conditions. The ignition probability and possible propagation of forest fires are determined by monitoring and forecasting the meteorological conditions, thus calculating a daily specific hazard indexes. The fire danger forecast is made at short-medium term and it is used for implementing a more effective organization of prevention interventions and services, as well as to optimize the allocation of firefighting resources in the territory of the region.

At the end of a period of experimentation, the Tuscany Region decided to adopt the Fire Weather Index (FWI and its sub-indexes) as a forecast for forest fire risk. FWI and its sub-indexes for Tuscany have been developed in collaboration with the "*Consorzio Laboratorio di Meteorologia e Modellistica Ambientale*" (LAMMA) and the Institute of Biometeorology of the National Research Council (IBIMET). The Danger Classes used in Tuscany are:

- Low risk - unlikely propagation of the flame front;
- Moderate risk - slow propagation. Easy fire extinction;
- High risk - moderate rate of spread. Effective extinction if timely;
- Very high risk – High rate of spread. Difficult extinction;
- Extreme risk - very difficult conditions. Very difficult extinction.

3.1.2 Incident Command System (ICS)

In this context, the incident command system in Tuscany is organised as follow (Figure 2):

Regional control room (SOUP – permanent unified operational room)

The National framework law N. 353 of November 21st 2000 has introduced the implementation of the SOUP (*Sala Operativa Unificata Permanente* – Unified permanent operational room) in each region. For this reason, the SOUP is the main control room for the forest fires suppression in each Italian region. In Tuscany, the SOUP is open all the year, 24 hours a day and give support for each forest fire in the whole Tuscany region. The SOUP carries out the risk assessment and information collection regarding logistics and communications and air assets management. It has specific operational procedures that allow the coordination at regional level of all fire fighting activities. It is directly managed by the Tuscany Region, Regional Civil Protection service.

Local control room (COP AIB)

The local control rooms are turned on in each Province during the main fire season (i.e. in summer). COPs are opened from July 1st to August 31st between 8 AM to 8 PM. The COP have to manage forest fire incidents at local level coordinating fire fighting resources at provincial level, while SOUP may give them support managing the regional aerial fleet and re-allocating (if necessary) the fire fighting resources among provinces.

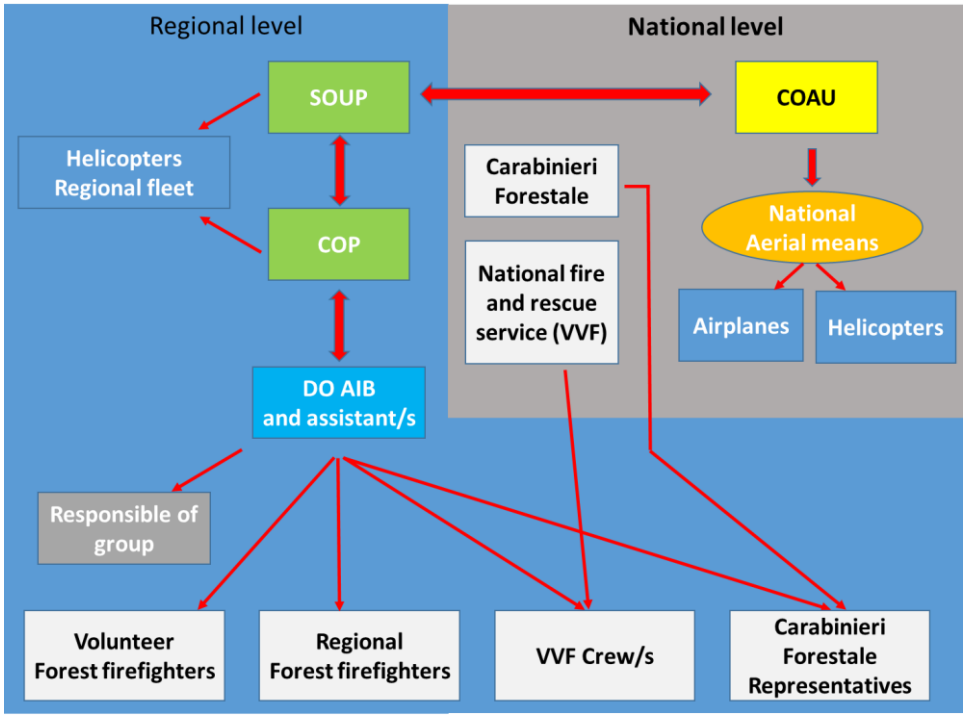

Figure 2 – *Structure of the Incident Command System of Tuscany Region*

Incident commander (DO AIB – Director of operation)

DO AIB has the responsibility to organize the suppression operation on each fire. When necessary (i.e. on big fire) he/she can be supported by: i) one or more Assistant DO AIB; ii) specialist in logistic; iii) Group leader. The SOUP and COP AIB support him/her to manage the suppression means (Regional ground team and helicopters; National aerial means). The incident commanders are selected among the staff of the Tuscany Region, the Union of Municipalities, the Metropolitan Area of Florence and the Municipalities. DO AIB decides about the attack tactic/strategy, including mop up and final surveillance (control). He/she develop an attack plan after assessing local threats for people and infrastructures, fire behaviour and resources availability.

Incident commander assistant (Assistant DO AIB)

He/She has to manage a sector of fire according with the recommendation received by the DO AIB. In its sector the Assistant DO AIB can manage both ground teams assigned to that sector and regional or national aerial means.

Logistic specialist

This is a person responsible for organizing both water supply to the vehicles and mobile tanks and teams replacement. He may also support the DO AIB in radio communications.

Group leader

This position of responsibility has the duty to coordinate the work of 2 to 4 teams working together along a fire sector, following the directives given by the DO AIB.

Fire fighters and other resources

In Tuscany, fire fighters are both volunteers and professionals of local public bodies and they are working under local and regional management. The available resources are ground means, managed at local and regional level, and aerial means, both regional and national.

Suppression methods

Both direct and indirect attack are applied in Tuscany: the first one is made by helicopters, ground teams and aerial means, while the second is made through suppression fire (fire back and tactical fire), heavy machines and hand tools (Chainsaw, axe etc.). The DO AIB have to decide the suppression method to be applied for putting out the fire. He may apply different strategies in different sectors of the fire. The suppression method to be applied depends on fire behaviour, weather condition, orography etc. Campbell Prediction System is used to help the DO AIB to make choices.

Regarding big fires, when operations last more than 2 hours and/or more than 5 hectares burned, the DO AIB and the Operating Room must activate the Assisted Coordination (*Posto di Comando Avanzato* - PCA), which implies the involvement of DO AIB Assistant, logistic man and Responsible Group (sector commander).

3.1.3 Fire fighting resources and their management

As mentioned above, both ground and aerial means are used in fire fighting in Tuscany. The ground teams (volunteer fire fighters and forest workers team) may be mobilized for fires spreading in whole Region and are managed by SOUP. The ground team are equipped with light, medium and heavy all terrain engines. In case of big fire events, the SOUP can decide to move some ground teams from a province to another, in relation with the fire risk level in the whole region and the availability of fire fighters.

The helicopters of the regional fleet may reach the maximum number of 10 during summer and are reduced to one in November and December. Their number is increased from one to 10 according with a predetermined

schedule developed on the basis of the historical fire susceptibility in Tuscany. The regional fleet is managed by the SOUP, that, on the basis of the request submitted by the Incident commanders (DO AIB), decides the priority and the allocation of the helicopters to the active fires on the basis of the risk for people and infrastructures, the fire behaviour and the number and distribution of the fire in the whole region. These helicopters are chartered from private companies and are equipped with helibucket (capacity 800 -1000 L). The helicopter of the regional fleet can also be used for transporting fire fighting teams in not accessible areas.

When the regional helicopter system is working at full capacity or when airtankers or helitankers with a greater water capacity are needed, the incident commander may ask for the cooperation and support of the national aerial means. In these casas, on request by the incident commander, the SOUP can ask for the national fleet support to the COAU, which has the responsibility to manage the national fleet.

The most common forest fire extinction methods is the direct attack. For low fire intensity, the direct attack is carried out with ground engines. In case of higher fire intensity, the ground suppression is supported by the aerial means.

When direct attack is not possible (due to orographic condition, low accessibility, etc.) or the fire fighters safety may be compromised, the indirect attack is usually applied. Indirect attack in Tuscany includes the preparation of firebreaks with the use of motor-manual tools (chainsaws) or earthmoving machines. Differently from other Italian regions, in Tuscany also backing fire and tactical fire may be used.

The incident commander (DO AIB) decides the suppression method and tactic to use on each fire, or sector of it, in relation with the risks for people and fire fighters, the weather condition, the fuel load and characteristics, fire behaviour etc. On the basis of these "fire condition", the DO AIB elaborates an attack plan also taking into consideration the available resources.

From an operational point of view, the territory of Tuscany is divided in 30 zone, called "DO AIB (incident commander) area of competence". On the basis of the value of the Fire weather index reached in each DO AIB zone along time, the "*Forestazione – Antincendi boschivi (AIB)"* Regional office decides for each DO AIB zone if it is necessary to establish the "state of alert", thus increasing the preparedness level of the ground teams:

- During the alert state the ground teams, in their territory of competence, have to carry out surveillance, patrolling and, in case of fire detection, they have to leave from their base in no more than five minutes;
- In the other periods, in case of fire detection the ground teams have the obligation to leave from their base in no more than 20 minutes.

3.1.4 Fire fighting organization in other Italian Regions

The Italian "framework law on forest fires" n. 353/2000 assigned the competences on forest fires to Italian Regions, including the possibility to delegate some aspects, through formal agreements, to the Forestry Authority (CFS - *Corpo Forestale dello Stato*) and National Fire Corps (CNVVF – Corpo Nazionale *Vigili del Fuoco*) depending on the different needs and organization approaches.

Many differences have always been among Regions in forest fire management. Until 2016, many Regions delegated the CFS for the management of the permanent unified operational rooms (SOUP). Often, the direction of the suppression operations and other fire fighting activities were delegated to CFS, as well. Other Regions requested limited services to CFS (e.g. collaboration with SOUP management, burnt areas survey, etc.). Regarding National Fire Corps (CNVVF), collaborations with this Entity have been generally limited to collaborations between operational rooms and the supply of few fire fighting teams.

Table 1 - Summary of fire fighting organization in the Italians regions

REGIONS	SOUP	DOS	Who operates in forest fire fighting
TUSCANY	Regional	Regional	In all Regions, volunteers from organised Associations operate in forest fire fighting. In Tuscany, some forestry workers from Public Entities are involved in fire fighting during fire season. Interventions by CNVVF teams depend on the requests of the Fire Boss during the emergency, depending on the operative capacity available at that moment.
LOMBARDY			
VENETO			
ABRUZZI	Regional	CNVVF	
EMILIA ROMAGNA			
MARCHE			
CALABRIA			
BASILICATA			
MOLISE			
LAZIO			
UMBRIA		CNVVF and Regional (the latter has limited competences)	
APULIA			
CAMPANIA			
LIGURIA	CNVVF	CNVVF	
PIEDMONT			
FRIULI VENEZIA GIULIA	Regional	Regional	In the Autonomous regions, a Regional independent Forestry Authority exists, and forest fire fighting is directly organized and managed by regional operators.
TRENTINO AND SOUTH TYROL			
SARDINIA			
SICILY			
AOSTA VALLEY			

In 2017, the CFS have been suppressed, and personnel have been moved to *Carabinieri Forestale* Corp (military) and, in limited number, to CNVVF. This important change in Italian Public Administration have caused heavy consequences in forest fire management. In fact, many Regions have had many problems in facing this new structure regarding forest fire management. The previous collaborations between regions and CFS have been mainly moved to CNVVF, even if some competences have attributed to the new Forestry section born inside the *Carabinieri* Corps.

Considering the actual new structure in Italian administration, the actual structure for forest fire management results more complicated than in the past. Some Regions have not signed new collaborations within this new layout. In this context, Table 1 resumes the actual situation for each Italian Region.

3.2 Portugal

3.2.1 Forest fire protection organization

Portugal has a decree-law (Decree-Law number 124/2006, of June 28nd) that establishes the measures and actions to be developed within the framework of the National System of Forest Protection against Fires, changed by the Law number 76/2017 of August 17th.

1. The Forest Fire Protection System provides for a set of measures and actions for institutional coordination, planning and intervention relating to the prevention and protection of forests against fire, on the compatibility of planning, awareness-raising, conservation and forestry planning, forestry, infrastructure, surveillance, detection, fighting, post-fire surveillance and surveillance, to be carried out by public entities with expertise in the defence of the forest against fire and private entities with intervention in the forestry sector.
2. In the framework of the Forest Fire Protection System, structural prevention plays a predominant role, based on concerted planning and the search for joint strategies, giving greater regional and national coherence to the protection of the forest against fire.
3. Within the scope of the Forest Fire Protection System, the following agencies are involved:
   a) The Institute of Nature Conservation and Forests (ICNF, I.P.) shall coordinate structural prevention actions in the areas of awareness raising, planning, forest area organization, forestry and infrastructure;
   b) The National Republican Guard (GNR) shall coordinate preventive actions related to the surveillance, detection and inspection aspects;
   c) The National Authority for Civil Protection (ANPC) shall coordinate the actions of fire fighting (combat), mop up and post-fire surveillance.
4. The Institute of Nature Conservation and Forests (ICNF, I.P.) is responsible for organizing and coordinating the structural prevention mechanism, which during the critical period is part of the operational structure coordinated by the National Authority for Civil Protection (ANPC).
5. It is also incumbent upon the Institute of Nature Conservation and Forests (ICNF, I.P.) to maintain an information system on forest fires (SGIF) at national level, through the adoption of a forest fire information management system and records of burned areas.
6. The system referred to in the preceding paragraph receives information on the systems for the management of occurrences, management of human, material and financial resources of all forest fire protection agents, with protocols ensuring confidentiality, transparency and sharing of information between all public and private entities.
7. All entities that integrate the Forest Fire Protection System have access to the SGIF (information system on forest fires) data needed to define the policies and actions of surveillance, detection, combat, aftermath, post-fire surveillance and surveillance.

Forest defence commissions

1. Forest defence commissions, at the district or municipal level, are articulation, planning and action structures whose mission is to coordinate forest protection programs.
2. The district forest protection commissions, which are responsible for district coordination of structural prevention programs and actions, liaise with district civil protection commissions responsible for district coordination as a structure for policy coordination on civil protection matters.

3. Municipal forest defence commissions (CMDF) can be grouped into inter-municipal commissions, provided that they correspond to a geographical area within the same regional forest management program (PROF), with a view to optimizing resources and actions.
4. The district commissions work under the coordination of the regional head of the ICNF, I.P., and the municipal commissions under the coordination of the mayor.

Planning Elements:

I. Rural fire risk index:
   - The fire risk index establishes the daily risk of occurrence of rural fire, whose levels are low (1), moderate (2), high (3), very high (4) and maximum (5), combining the information of the meteorological fire hazard index, produced by the entity in charge of the national meteorological authority function, with the conjunctural risk index defined by the ICNF, IP.
   - The rural fire risk index is prepared and disseminated daily by the national meteorological authority.

II. Classification of the continent according to the danger of rural fire:
   - For the purposes of the present decree-law and based on criteria for the evaluation of the index of danger of rural fire in mainland Portugal, the classification of the territory is established, according to the following qualitative classes:
     - a) *Class I* - Very low;
     - b) *Class II* - Low;
     - c) *Class III* - Medium;
     - d) *Class IV* - Registration;
     - e) *Class V* - Very high.
   - The numerical model for the definition of the rural fire hazard index of national and municipal scale is published by ICNF, I. P.
   - The classification of the continental territory according to the index of danger of rural fire is, nationally, annually published in the page of ICNF, I. P., after hearing the ANPC.

III. Critical areas:
   - Forest patches where priority is given to the application of more stringent forest fire protection measures, either in view of the high susceptibility or the hazards they represent, or in terms of their patrimonial, social or ecological value, are designated by zones critical, being identified, demarcated and the target of own planning in the Regional Forest Plan (PROF).
   - Critical zones are defined by ordinance of the members of the Government responsible for the forest areas and the environment.

Forest Fire Protection Planning

1. Ensuring the territorial consistency of policies, instruments, measures and actions, forest fire defence planning has a national, district and municipal level.
2. National planning, through the (PNDFCI), organizes the system, defines the vision, strategy, strategic axes, goals, objectives and priority actions.

3. District planning has a tactical framework. It is characterized by the organization and ranking of the actions and objectives defined in the PNDFCI at the district level, guiding by priority levels the actions identified at the municipal level.
4. Municipal planning has an executive nature and operational programming and should comply with the guidelines and priorities of the district and local, in a logic of contribution to the national whole.

National Plan for Prevention and Protection of Forest against Fires (PNDFCI)

- The PNDFCI defines the general objectives of prevention, pre-suppression, suppression and recovery in a systemic and transversal framework of forest fire protection.

The PMDFCI, of municipal or intermunicipal scope:

- Contain the necessary actions to defend the forest against fire and, in addition to the prevention actions, include the forecast and the integrated programming of the interventions of the different entities involved in the eventual occurrence of fires.

Relationship between planning instruments

- All forest management instruments should make explicit not only forestry actions to defend the forest against fires and infrastructure of rural areas, but also their integration and compatibility with the higher level forestry planning instruments, namely the PMDFCI and the PROF.

Organization of territory

Forest fire defence networks:

1. Forest fire defence networks (RDFCI) territorially implement, in a coordinated way, the infrastructure of rural areas resulting from the strategy of forest fire protection planning.
2. The RDFCI integrate the following components:
    a) Fuel management networks *(fuelbreak*);
    b) Mosaic of fuel management plots;
    c) Forest road network;
    d) Network of water points;
    e) Fire monitoring and detection network;
    f) Infrastructure to support fighting.

Networks of fuelbreak:

1. The management of existing fuels in rural areas is carried out by means of tracks and parcels, in strategic locations for the continuation of certain functions, where the total or partial removal and modification of the present biomass is carried out.
2. Fuel management bands *(fuelbreak)* shall comprise primary, secondary and tertiary networks**,** taking into account the functions they may perform, in particular:

a) Reduction of the surface covered by large fires, permitting and facilitating direct fire fighting intervention;
b) Function of reducing the effects of fire escape, passively protecting communication routes, infrastructure and social facilities, built-up areas and forest stands of special value;
c) Function of isolation of potential foci of ignition of fires.

Forest defence

Forestry, afforestation and reforestation

1. Forestry in the area of forest fire protection includes the set of measures applied to forest stands, bushes and other spontaneous formations, at the level of the specific composition and its structural arrangement, with the objectives of reducing the danger of rural fire and guarantees the maximum resistance of the vegetation to the passage of fire.
2. Forest management instruments should make explicit the measures of forestry and infrastructure of rural areas that guarantee the horizontal and vertical discontinuity of forest fuels and the alternation of plots with different flammability and combustibility, within the framework of the regional planning guidelines of the forest fire.

Use of fire

Technical fire

The actions of technical fire, in the modalities of prescribed burn and suppression fire, can only be carried out according to the technical and functional norms defined in regulation of the ICNF, I.P., homologated by the member of the Government responsible for the area of forests, heard the ANPC and GNR.

'Fire suppression' means the technical use of fire in the context of fighting rural fires comprising tactical fire and backfire when carried out under the responsibility of the Incident Commander (COS);

'Prescribed burn' means the use of fire in the management of forest areas under conditions, standards and procedures conducive to the achievement of specific and quantifiable objectives and which is carried out under the responsibility of an accredited technician;

'Fuel management fire' means the use of fire which, under suitable meteorological conditions, and in rural areas of low value, allows the development of the rural fire within a pre-established perimeter, with less commitment of means of suppression within the same;

'Tactical fire' means the use of fire in the context of wildland fire fighting. It consist in the ignition of a fire along a support zone with the aim of reducing the availability of fuel and thereby reducing the intensity of the fire, terminate or correct the extinction of a buffer zone so as to reduce the likelihood of recurrence or create a safety zone for the protection of persons and property;

'Backfire' means the use of fire in the context of wildland fire fighting , consisting of the ignition of a fire along a support zone, in front of a fire front in order to cause interaction of the two fire fronts and to change its direction of propagation or to cause its extinction;

Surveillance and fire detection

1. The monitoring of rural areas aims to contribute to reduce the number of occurrences of forest fires, identifying potential causative agents and dissuading behaviours that lead to the occurrence of fires.
2. The purpose of the detection is the immediate identification and precise location of the occurrences of fire and its rapid communication to the entities responsible for the combat.

Forest fire protection organization

There are different agencies carrying out different activities in forest fire prevention and suppression in Portugal (Figure 3). The most important are the Institute of Nature Conservation and Forests (ICNF, I.P.), which together with the Municipalities has important responsibilities in relation with fuel management and fire Prevention, and the National Authority of Civil Protection (ANPC), which is responsible for fire suppression activities.

AFOCELCA	Agência Portuguesa do Ambiente (APA)	Associações Humanitárias de Bombeiros (AHB)	Associações de Radioamadores
Sapadores Florestais	Autoridade Marítima (DGAM)	Câmaras Municipais	Corpos de Bombeiros (CB)
Corpo Nacional de Escutas (CNE)	Cruz Vermelha Portuguesa (CVP)	Força Aérea Portuguesa (FAP)	Empresa de Meios Aéreos (EMA)
Energias de Portugal (EDP)	Estradas de Portugal (EP)	Exército	Força Especial de Bombeiros (FEB)
Guarda Nacional Republicana (GNR)	Instituto da Água (INAG)	Instituto Conservação da Natureza e Florestas (ICNF)	Instituto Português do Mar e Atmosfera (IPMA)
Instituto Nacional de Aviação Civil (INAC)	Instituto Nacional Emergência Médica (INEM)	Instituto Portuário e dos Transportes Marítimos (IPTM)	Juntas de Freguesia
Marinha	Organizações de Baldios	Organizações de Produtores Florestais	Portugal Telecom (PT)
Polícia Judiciária (PJ)	Polícia de Segurança Pública (PSP)	Rede Elétrica Nacional (REN)	Rede Ferroviária Nacional (REFER)

Figure 3 – Scheme of the integrated system for fire and rescue operation in Portugal

The fire fighting operations against forest fires, as well as the following mop up operations necessary to guarantee the complete extinction conditions are carried out by entities with responsibilities in the fight against forest fires and by professionals accredited for this purpose and under the guidance of the National Civil Protection Authority (ANPC). Within the ANPC the Integrated System for Protection and Rescue Operations (DIOPS) represent the structure for institutional coordination and operational command. The institutional coordination and operation command structure of the DIOPS are shown in Figure 4.

Integrated System for protection and rescue Operations

Institutional Coordination	
National	National Operational Coordination Centre (CCON)
District	District Operational Coordination Centers (CCOD)
Municipal	Municipal Civil Protection Commission (CMCP)

Operational Command	
National	National Relief Operations Command (CNOS)
District	District Command Rescue Operations (CDOS)
Municipal	Municipal Operational Commander (COM)
Fire department	Commander of the Fire Department (CCB)
Operational theater	Incident commander (COS)

Figure 4 – Scheme of DIOPS institutional coordination and operation command structure

The responsibilities of the main figures operating within DIOPS are summarised hereafter.

1) **The National Operational Coordination Centre (CCON)** is responsible for:

a) Integrating, monitoring and evaluating all operational activity in the event of a major accident or catastrophe;
b) Ensure operational liaison and national articulation with civil protection and other operational structures in the planning, assistance, intervention and technical or scientific support in the areas of relief and emergency;
c) Ensure that entities and institutions that are part of the CCON, within their hierarchical structure, operate the means necessary for the development of operations as well as the reinforcement means;
d) Ensure the ongoing flow of strategic information with civil protection of the Autonomous Regions, in particular on imminence or in case of accident or catastrophe;

e) To disseminate communiqués and notices to populations and entities and institutions, including the media;
f) Evaluate the situation and propose to the National Civil Protection Commission to submit requests to the Government for assistance to other countries and international organizations through the competent bodies;
g) Ensure that action is taken as a result of the declarations of the situations of alert, contingency and calamity.

2) **The District Operational Coordination Centres (CCOD)**, in the respective districts, are attributed to:

a) Integrate, monitor and evaluate all operational activity in the event of a major accident or catastrophe;
b) Ensure operational liaison and district liaison with civil protection agents and other operational structures in the planning, assistance, intervention and technical or scientific support in the areas of relief and emergency;
c) Ensure that the entities and institutions that are members of the CCOD, within their hierarchical structure and at the district level, implement the necessary resources for the development of the actions;
d) Disseminate communiqués and notices to the populations and entities and institutions, including the media;
e) Assess the situation and propose measures to the district governor in the request for national aid.

The CCON and CCOD includes representatives of the National Civil Protection Authority, the Armed Forces, the National Public Security Police, the National Institute of Medical Emergency, the Portuguese Institute of the Sea and the Atmosphere, the Institute of Conservation of Nature and Forests, and other entities depending on the needs of each event. Moreover, the operational room for forest fire fighting activities exists at two levels: the District Command for Relief Operations (CDOS) and the National Command for Relief Operations (CNOS) that comprise three operating units led by operational unit heads: i) planning, operations, monitoring and risk assessment, ii) information, logistics and communications and iii) air assets management.

3) **The National Relief Operations Command (CNOS)** is responsible for:

a) To ensure the functioning, operability and articulation with all civil protection agents members of DIOPS;
b) Ensure timely mobilization and promptness of resources and resources allocated to the DIOPS, in accordance with the declared level of alert;
c) Operational coordination of district relief operations;
d) Ensure the command and control of situations that, due to their nature, severity, extent and means involved or involving them, require their intervention;
e) Ensure operational control of the air assets allocated to DIOPS;
f) Promote the analysis of occurrences and determine the appropriate actions and means for their management;
g) Ensure coordination and strategic direction of rescue operations.

4) **The District Command for Rescue Operations (CDOS)** in the respective districts is assigned of:

a) To ensure the functioning, operability and articulation with all civil protection agents that are members of DIOPS within the district;

b) Ensure command and control of incidents which, by their nature, severity, the extent and means involved or to be involved, require his/her intervention;
c) To mobilize, allocate and employ the staff and the means that are indispensable and available for the execution of the operations;
d) Ensure the tactical command of the air assets allocated to DIOPS at the district level;
e) Ensure coordination, with respect for its own direction and command, of all entities and institutions engaged in relief operations.

5) **Municipal Operational Commanders (COM)**. It is the responsibility of the Municipal Operational Commanders in the area of the respective municipalities:

a) To monitor permanently the protection and rescue operations that occur in the area of the municipality;
b) Reach the event area whenever circumstances require it;
c) Assume coordination of municipal rescue operations in the situations provided for in the municipal emergency plan, as well as when the size of the occurrence requires the use of the means of more than one fire brigade.

6) **Fire Brigade Commanders (CCB)**. It is incumbent upon the Fire Brigade Commanders in their respective areas of action:

a) Ensure the operation and operation of the operational structure of the respective Fire Department;
b) Ensure that an operational intervention force, based on the nature and level of hazards to be prevented, is maintained in the area of prevention and alert at the barracks;
c) Ensure timely protection and relief, as well as the readiness of the assigned operational costs;
d) To ensure, in its area of activity, the command and control of situations that by their nature, severity, extent and means involved or involved require their intervention;
e) Assume, as appropriate, the functions of Rescue Operations Commander in its area of operation or outside it by decision of the respective CODIS;
f) To mobilize, assign and employ the staff and the indispensable and available means of the Fire Department to carry out the operations;
g) To collaborate with the Port Captain of his area, within the scope of the maritime rescue, relief to castaways and assistance to bathers.

3.2.2 Incident Command System (ICS)

In Portugal, the management system of forest fires is under national level and it is identified with the acronym SGO (Operations Management System) (Figure 5). Three different levels of performance characterise SGO:

i) **Strategic level** – to ensure the management of the operation;
ii) **Tactical level** – for heading the operational activities, taking into account the objectives to be achieved in accordance with the strategy defined by incident commander;
iii) **Operational level** – to perform operational activities, under the direction of the tactical level, taking into account the defined objectives.

In Portuguese SGO, the higher rank officer on scene assumes the position of Incident Commander (COS), the others follow the hierarchical approach, where every subordinate takes orders only from his direct leader.

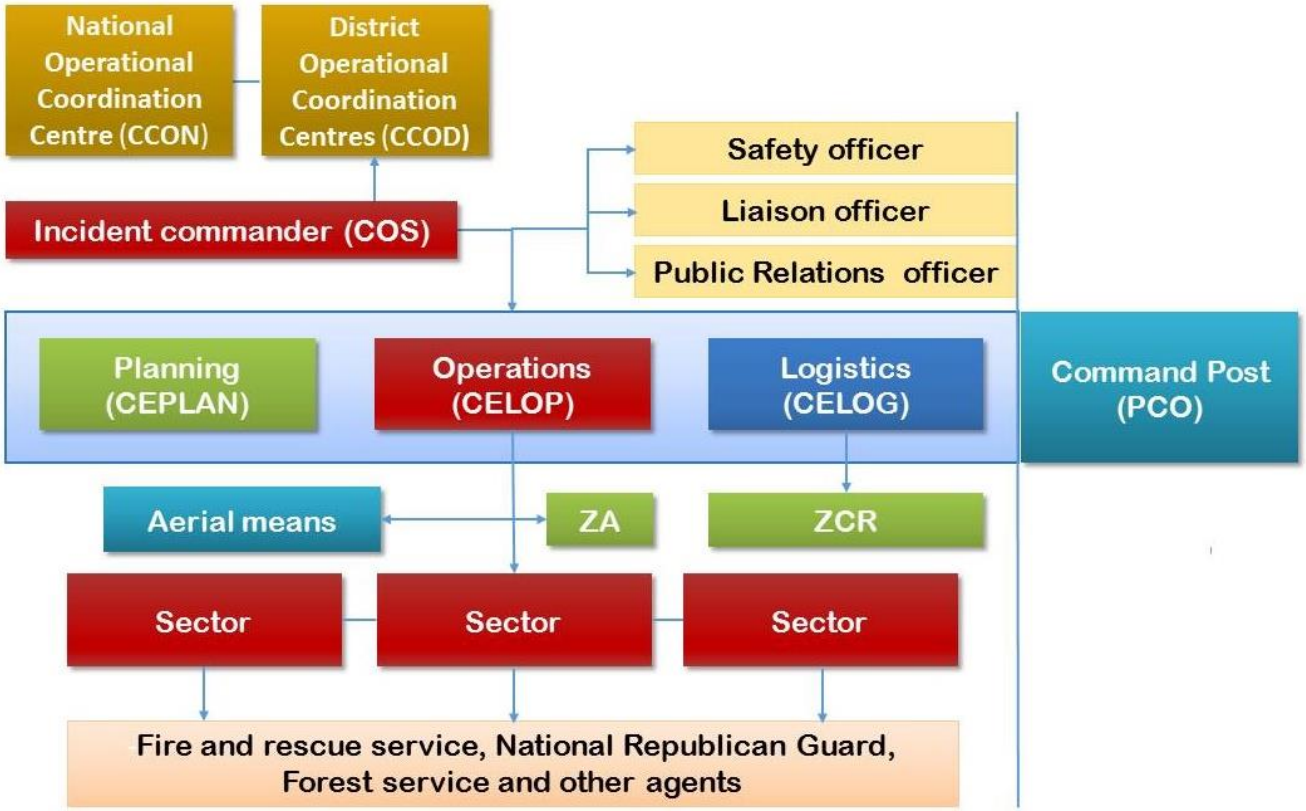

Figure 5 – Structure of the Incident Command System of Portugal

The functionality of SGO is guaranteed by a multi-agency Coordination: the National Operational Coordination Centre (CCON) and the District Operational Coordination Centres (CCOD), mentioned above.

The different figures involved in the activities are defined as follow:

Incident commander (COS)

Responsible for the entire operation, which at a given moment commands;

Safety officer

Evaluates all necessary measures for the safety of the forces involved in the Operational Theatre (TO), in accordance to the hazardous situations.

Liaison Officer

Ensure the integration, articulation and communication with the entities committed or supporting the operation, ensuring their participation in the planning and decision-making processes regarding the operational commitment of their forces, technical advice and/or support of the operations.

Public Relations Officer

Collects information relevant to advise the COS in its statements to the Media and to ensure permanent liaison with the Media and official entities that request information directly from the TO.

Air Operations Officer (OPAR)

Responsible for the coordination of aerial activities. Its duties are: assigning tactical missions to the air forces involved in the operation; transmitting the necessary instructions for the implementation of the missions; prepare and keep updated the air assets commitment map; ensure the linkage with the air assets; check the effectiveness of the means and proposing changes on its mission whenever necessary; and identify and alert the air assets and land resources to safety issues.

Air Operations Coordinator (COPAR)

Its function is to coordinate aircraft maneuvering in TO, ensuring compliance with the tactical objectives assigned to the air assets, ensuring connections ground-air and among sector commanders for validating the effectiveness of air assets and ensuring the aircraft safety conditions in the operational missions.

The Command Post (PCO) is a support structure at the scene to support the COS in decision-making and the articulation of the means in TO. The Command Post consists of:

Operations Cell (CELOP)

Ensures the implementation of operational decisions set out in the strategic plan and the preparation of decisions needed by the COS. Includes:

- Air operations nucleus;
- Geographical or Functional Sectors;
- Ground means.

The Operations Officer is responsible for the Support Zone (ZA).

Operational Sector

Corresponds to geographical zones or functional areas according to the type of occurrence and the strategic options considered. Each sector has a responsible that assumes the designation of Sector Command.

Logistics Cell (CELOG)

Guarantees the logistical support of operational theatre, in order to respond to all operational support, needs and resources involved in the operation. Includes:

- Means and Resources nucleus;
- Communications and Information technologies nucleus.

The Logistics Officer is responsible for the Reserve and Concentration Zone (ZCR).

Planning Cell (CEPLAN)

Responsible for the collection, evaluation, processing and dissemination of the information necessary for the decision-making process. Includes:

- Information nucleus;
- Anticipation nucleus;
- Specialists' nucleus.

3.2.3 Fire fighting resources and their management

Fire fighters and other resources

Fire fighters can be both professional and volunteer in Portugal. At operational level, ANPC is responsible for suppression activities. Ground means are managed at national, regional or local level depending on the intensity and severity of events, while aerial means are managed both at national and regional level. Heli-transported teams are managed at regional level.

All these means operates direct attack, while indirect attack to fire is made with backing and tactical fire, heavy machinery and hand tools. Obviously, depending on the characteristics of the fire and the actual conditions, together with the availability of structures and resources, the best suppression method is chosen.

The operations management system (SGO) includes four phases (I, II, III and IV) depending on the number of resources involved (Table 2).

Human resources are organised in Teams, Brigades and Groups:

- **Team** - 1 vehicle with 5 fire fighters;
- **Brigade** - 3 teams plus command;
- **Group** - 6 teams plus command.

The four phases defined by SGO depend on the number of resources involved:

- Phase I – up to 6 teams (i.e. 1 group or 2 brigades) - COS;
- Phase II – up to 18 teams (i.e. 3 groups or 6 brigades); COS and Operations Officer; 3 sectors;
- Phase III – up to 108 teams (i.e. 18 groups or 36 brigades) - COS and Operations, Logistics and Planning officers; 6 sectors;
- Phase IV – 216 teams (i.e. 36 groups or 72 brigades) - COS and Operations, Logistics and Planning officers; 6 sectors.

Campbell Prediction System (CPS) is applied in order to predict fire behaviour and optimize resource allocation.

Table 2 - Evolution of the operations management system

SGO Phases	Commander (minimum rank of COS)	Mandatory PCO cells	Maximum number of teams	Sectorization	SGO Support Tool*
Phase I	Higher rank in TO	None	6 Teams	Not Required	Command and Control Guide
Phase II	Fire Department Officer	Operational	Up to 18 Teams	Up to 3 Sectors	VCOT
Phase III	Fire Department Commander	Operational, Logistics, Planning	Up to 108 Teams	Up to 6 sectors	VCOC/VPCC
Phase IV	Strategic management by ANPC	Operational, Logistics, Planning	> 108 Teams	Up to 6 sectors	VCOC/VPCC VGEO/CETAC

*VCOT - Tactical Command Vehicle; VCOC - Command and Communications Vehicle; VPCC - Planning, Command and Communications Vehicle; VGEO - Strategic Management and Operations Vehicle; CETAC - Tactical Command Centre.

3.2.3 Organization and procedures used at big forest fires events

In order to ensure that suppression operations in large and complex forest fires, are carried out quickly and efficiently, safeguarding the safety of all fighters, persons and properties, it is essential a good organization of the Operations Theatre (TO) and Command Post (PCO).

Thus, in complex fire scenarios, the Operations Theatre (TO) and the Intervention Zone (ZI) are organized according to the diagram in figure 6.

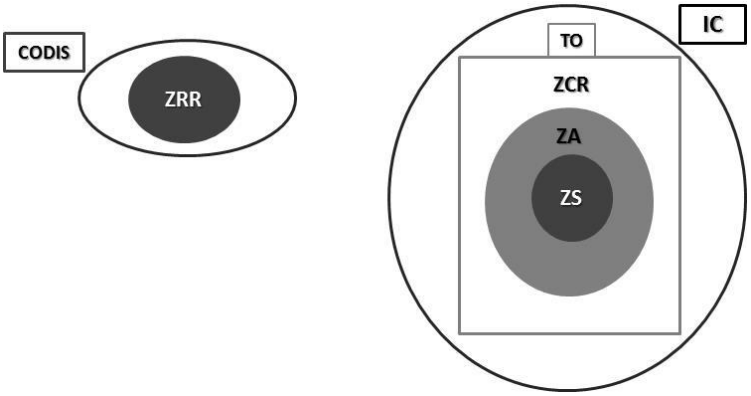

Figure 6 – Organization of the Operations Theatre (TO)

The Intervention Zone is characterized as an area with configuration and variable amplitude, adapted to the circumstances and type of occurrence and which may comprise the Incident Zone (ZS), the Support Zone (ZA), the Reserve and Concentration Zone (ZCR) and the Reinforcement Reception Zone (ZRR). The first ones are under the responsibility of the Incident Commander (COS) and the last one under the District Operational Commander (CODIS) responsibility.

The Operations Theatre includes the Incident Zone (ZS), the Support Zone (ZA) and Reserve and Concentration Zone (ZCR), being organized the Incident Zone (ZS) in sectors that correspond to geographical or functional zones, depending on the type of occurrence and the strategic options considered. The sectorization is a responsibility of the Incident Commander (COS) and each sector has a person responsible for that area which assumes the designation of Sector Commander.

The Incident Zone (ZS) is the area in which the occurrence occurs, with restricted access, where only the means necessary for direct intervention and assigned mission are located under the responsibility of the Incident Commander (COS).

The Support Zone (ZA) is an adjacent area to the Incident Zone (ZS) under the management of the Operations Cell, with conditioned access, where are concentrated the support and logistical means strictly necessary to support the means in operation, and where the intervention means for immediate response are located.

The Reserve and Concentration Zone (ZCR) is an area of the Operations Theatre (TO) under the management of the Logistics Cell, where the means and resources available without immediate mission are located temporarily, the strategic reserve and where the system of logistic support to the forces is maintained.

The Reinforcement Receiving Zone (ZRR) is located outside the Operations Theatre (TO) but within the Intervention Zone. It is a logistical control and support area, where the reinforcement resources assigned by the National Operational Coordination Centre (CCON) are addressed before reach to the Reserve and Concentration Zone (ZCR) in the TO.

As a consequence of the size of the fire and the complexity of the suppression operations, the organization must escalate to respond to operational needs and to provide adequate means and tools of command and control, namely through the different levels of development of the Operations Management System (SGO), corresponding to phases III and IV, being this phases indexed to the number of teams present in the Operations Theatre (TO) and not to the number of sectors.

Phase III

A fire in which operations tend to become complex, involving up to 108 teams, Phase III of the Operations Management System (SGO) must be applied, forcing the activation of the planning and logistics cells, beyond the operations cell in the command post (figure 7).

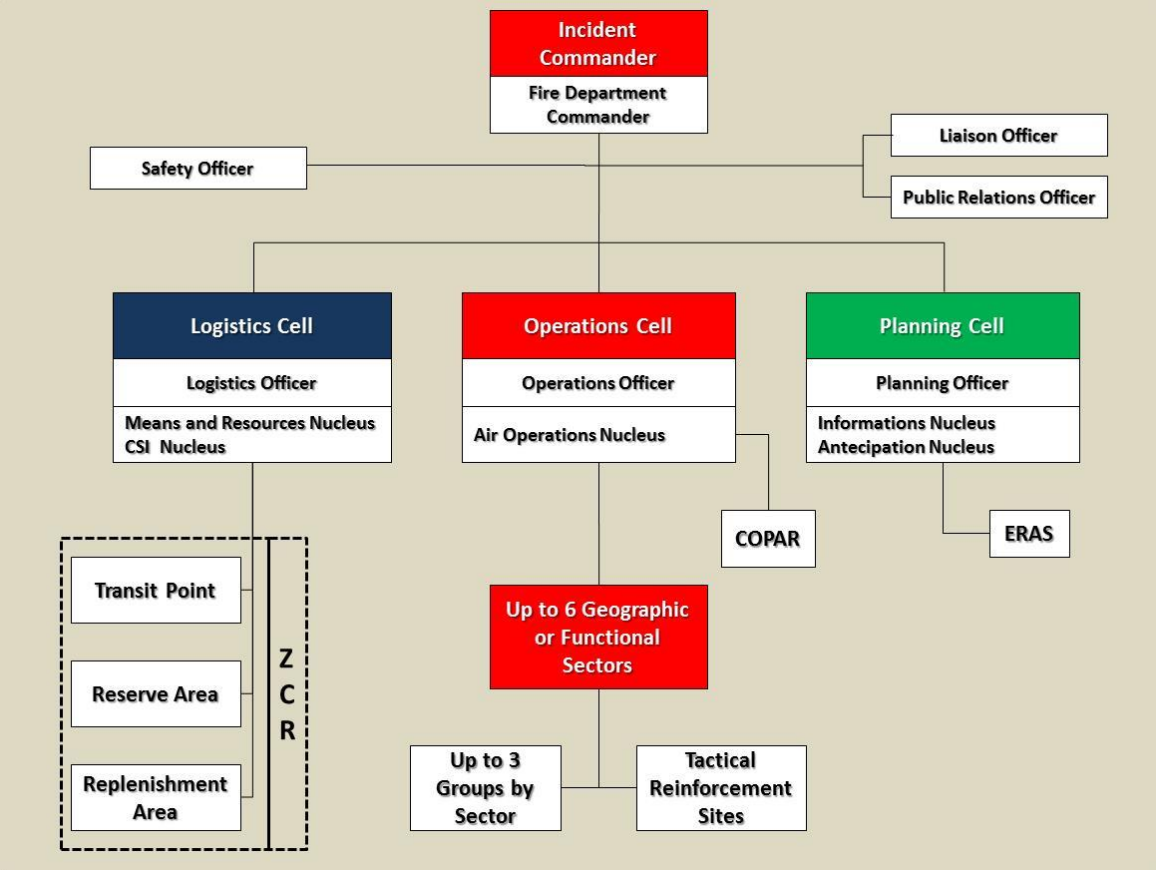

Figure 7 - Phase III of the Operations Management System (SGO)

In this phase, the Incident Commander (COS) function is performed by a Fire Department Commander. The Operations Officer should be preferably an officer of the Fire Department with responsibility for the operational area.

Operations Cell (CELOP)

It is led by the Operations Officer who can propose to the Incident Command the nomination of an Assistant. CELOP can integrate the nucleus of aerial means and the intervention sectors, which are activated according to the nature and development of the occurrence. The nucleus of air assets is led by the Air Operations Officer who can propose to the Operations Officer the nomination of an Air Operations Coordinator (COPAR) when the situation requires it (more than 2 air assets in the Operations Theatre).

It is incumbent upon CELOP to ensure the implementation and execution of operational decisions established in the EAP and the preparation of operational elements necessary for the Incident Commander decision-making.

CELOP should keep the general framework of the operation updated, as well the elaboration of the Tactical Situation scheme (Graphic SITAC) and keep it current. Propose to the Incident Commander the sectorization of the Operations Theatre, and transmit the Missions Orders to the sector commanders. It should propose to the Incident Commander the mobilization of reinforcement means according to the planning forecasts, ensuring the registration and permanent updating of the time tape. It should also guarantee the articulation with the air assets nucleus and propose to Incident Commander the evacuation of people.

Logistics cell (CELOG)

It is led by the Logistics Officer, who can propose to the Incident Commander the nomination of an assistant. The logistics cell can integrate the "Means and resources" and "Communications and information systems" nucleus and should be activated according to the nature and development of the occurrence. It must guarantee the logistical support of Operations Theatre (TO), in order to respond to all the needs to support the operationalization of the means and resources involved in the operation.

The logistics cell must activate the different areas of the Reserve and Concentration Zone (ZCR) and designate its responsible personnel according to the logistical plan validated by the Incident Commander (COS), as well as elaborate and keep update the means framework and the Communications Plan. It should also keep updated information related with the logistics areas installed in the Reserve and Concentration Zone (ZCR), as the development of a plan to support the evacuation of people.

The logistics cell should ensure the logistic support provided by the Municipal Civil Protection Service (SMPC) in the area of the accident, to victims and relief forces.

It is the responsibility of CELOG to prepare the logistical plan that should be approved by Incident Commander (COS), which should respond to the means and resources committed, to the strategic reserve of means and resources, to the support services (food, rest and hygiene, health support and maintenance), to refuelling and transport.

Planning cell (CEPLAN)

It is led by the Planning Officer who can propose to the Incident Commander (COS) the designation of an Assistant. It can integrate the information nucleus, anticipation and specialist nucleus, which are activated

according to the nature and development of the occurrence. CEPLAN shall collect, evaluate, process and disseminate the information necessary for the Incident Commander (COS) decision-making process.

It is the responsibility of CEPLAN to analyse the Intervention Zone (ZI), integrate the Strategic Action Plan and the Risk Analysis for the operation. Define early fire development scenarios and collect, evaluate, process, and disseminate the information needed to make decisions. It should also provide for the need to reinforcement or specialized means and resources, as well as to keep the information framework updated.

In phase III, sector commanders are nominated to perform this function exclusively. Sectors can hold up to 3 combat groups and tactical reinforcement sites should be created.

Areas of refuelling, reservation, transit points and others considered necessary are implemented in the Concentration and Reserve Zone (ZCR).

At least one Team of Recognition and Evaluation of the Situation (ERAS) should be activated, depending on the planning cell, preferably endowed with a specialist in the nature of the occurrence.

In this phase a security, liaison and public relations officers may be designated.

Phase IV

When at one Operations Theatre (TO) of great magnitude and/or complexity, in which the means of combat available in Phase III are not enough and there is need of reinforcement means, it is transposed to Phase IV of the Operations Management System (SGO), where it develops in the fullness of its organization (figure 8).

At this stage there may be up to six sectors, each of which may comprise up to six combat groups.

The planning and logistics cell performs differentiated tasks and can integrate specialists. The different areas of Reserve and Concentration Zone (ZCR) are activated.

The cells of the Command Post (PCO) are preferably provided by Command Post Teams, pre-formatted and properly trained for this purpose.

The Incident Command (COS) function is assumed by an element of the National Authority for Civil Protection (ANPC) operational structure or by a designated Fire Department Commander.

In order to guarantee a permanent flow of credible and synchronized information among all those responsible in the Operations Management System (SGO), regular briefings should be promoted according to the complexity and nature of the Operations Theatre (TO), in order to enable verification of the pursuit of the strategic objectives defined for the operation, contributing to effective command and control.

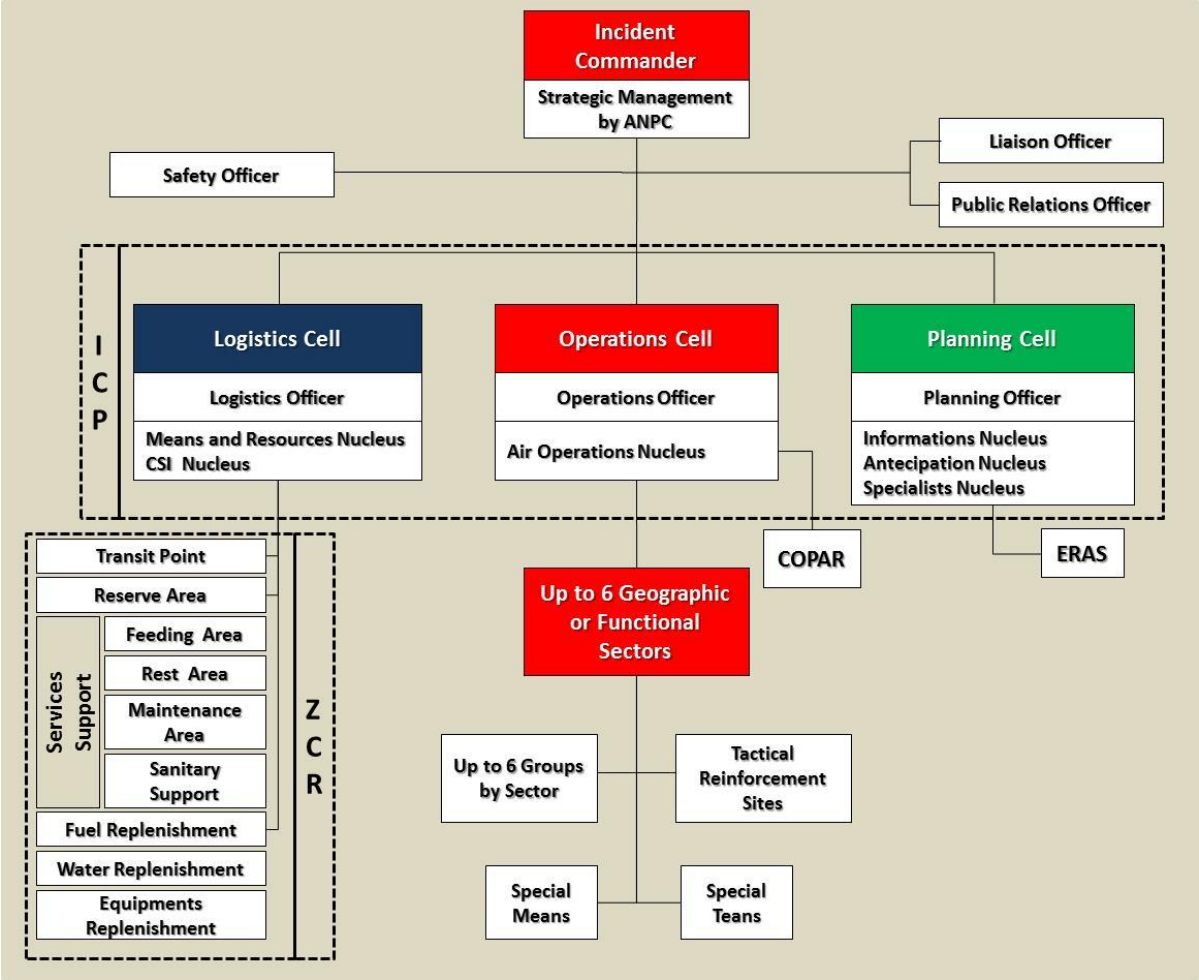

Figure 8 - Phase IV of the Operations Management System (SGO)

3.3 Spain - Castilla y Leòn

3.3.1 Forest fire protection organization

The Spanish Constitution (Art. 148.1.8ª and Art. 148.1.9ª) states that the autonomous communities may assume jurisdiction "in the forest and forest harvesting" and in the "environmental protection management". The Constitution also indicates that the State reserves "the basic legislation on woodlands, forestry, livestock trails and environmental protection, as regards the conservation of nature." Since the 1980s, the Autonomous Communities have received most of the forest fire management competencies. The central State establishes the basic guidelines from which the Autonomous Communities must develop their competencies and their own legislation. It is in charge of support activities in extinction, general coordination, basic standardization, management of the national database and international cooperation; all with the collaboration of the Autonomous Communities, which are responsible of drafting the specific procedures for fire fighting activities in their area of competences. The Autonomous Communities are responsible for the prevention, detection and suppression of fires in their region, while the role of the State is limited to support in the suppression of fires in complicated situations. The CLIF (Comité de Lucha contra Incendios Forestales) is responsible for basic coordination and standardization (at the national level).

Following is the main legislation on forest fires in Castilla y León:

STATE LEGISLATION ON FOREST FIRES

- Ley 17/2015, de 9 de julio, del Sistema Nacional de Protección Civil
- Resolución de 31 de octubre de 2014, of the "Subsecretaría", which publishes the Agreement of the Council of Ministers of October 24, 2014, which approves the State Plan for Civil Protection for Forest Fire Emergencies.
- Real Decreto 893/2013, of November 15, which approves the Basic Guideline for Civil Emergency Planning for Forest Fires.
- Ley 10/2006, of April 28, which modifies Ley 43/2003, of November 21 , of Montes.
- Ley 43/2003, of November 21, of Forestry; (Ley 43/2003, de 21 de noviembre, de Montes).

LEGISLATION ON FOREST FIRES OF CASTILLA Y LEÓN

- ORDEN FYM/ 534/2017, of June 26, which sets the time of high danger of forest fires in the Community of Castilla y León.
- ORDEN FYM / 510/2013, of June 25, which regulates the use of fire and preventive measures for the fight against forest fires in Castilla y León.
- Orden MAM/851/2010, of June 7, declaring areas of high risk of fire in the Community of Castilla y León.
- LEY 3/2009, of April 6, of Montes de Castilla y León

- Ley 4/2007, de 28 de marzo, de Protección Ciudadana de Castilla y León
- Decreto 113/2007, of November 22, which modifies Decree 89/2004, of July 29, which establishes the operation to fight forest fires in Castilla y León and regulates the guards system.
- Decreto 89/2004, of July 29, which establishes the Operation to combat forest fires in Castilla y León and regulates the guards system.
- Decreto 274/1999, of October 28, by which the Plan of Civil Protection before Emergencies by Forest Fires in Castile and Leon is approved.

ORGANIZATION OF THE FIRE SUPPRESSION OPERATION IN CASTILLA Y LEÓN

In Castilla y León, the forest fire prevention and extinction responsibilities belong to the Junta de Castilla y León (Castilla y León Administration), which is a Public Entity.

When it is necessary to request means of reinforcement, the Regional Command Centre (CAM), which is part of the Defence of the Natural Environment Service (see diagram), contacts the Ministry of Agriculture and Fisheries, Food and the Environment (MAPAMA) (Figure 9). Requests through MAPAMA the means it needs and it is the MAPAMA that contacts the Ministry of Defence and the Ministry of the Interior, depending on what is required. In addition, the Ministries of Defence and Ministry of the Interior are coordinated with each other.

The regional administration also manages coordination and collaboration with other institutions and administrations (neighbouring autonomous communities, local administration, and the neighbouring country: Portugal, etc.).

Characteristics:

- The fire suppression operation in Castilla y León is a unique regional operation, that is, 9 Provincial Command Centres (CPM) coordinated by the Regional Command Centre (CAM).

- It is coordinated and in cooperation with the rest of the Administrations with competence in forest fires.

- It is permanent and flexible, adapted all year round to the risk conditions existing at each moment, being measured weekly in times of low risk, and with its maximum deployment in times of danger.

- The personnel that composes the operation of suppression of fires is a personnel titled and with permanent formation in the extinction of forest fires

- The work is linked to the forestry sector, and not to the existence or not of fires.

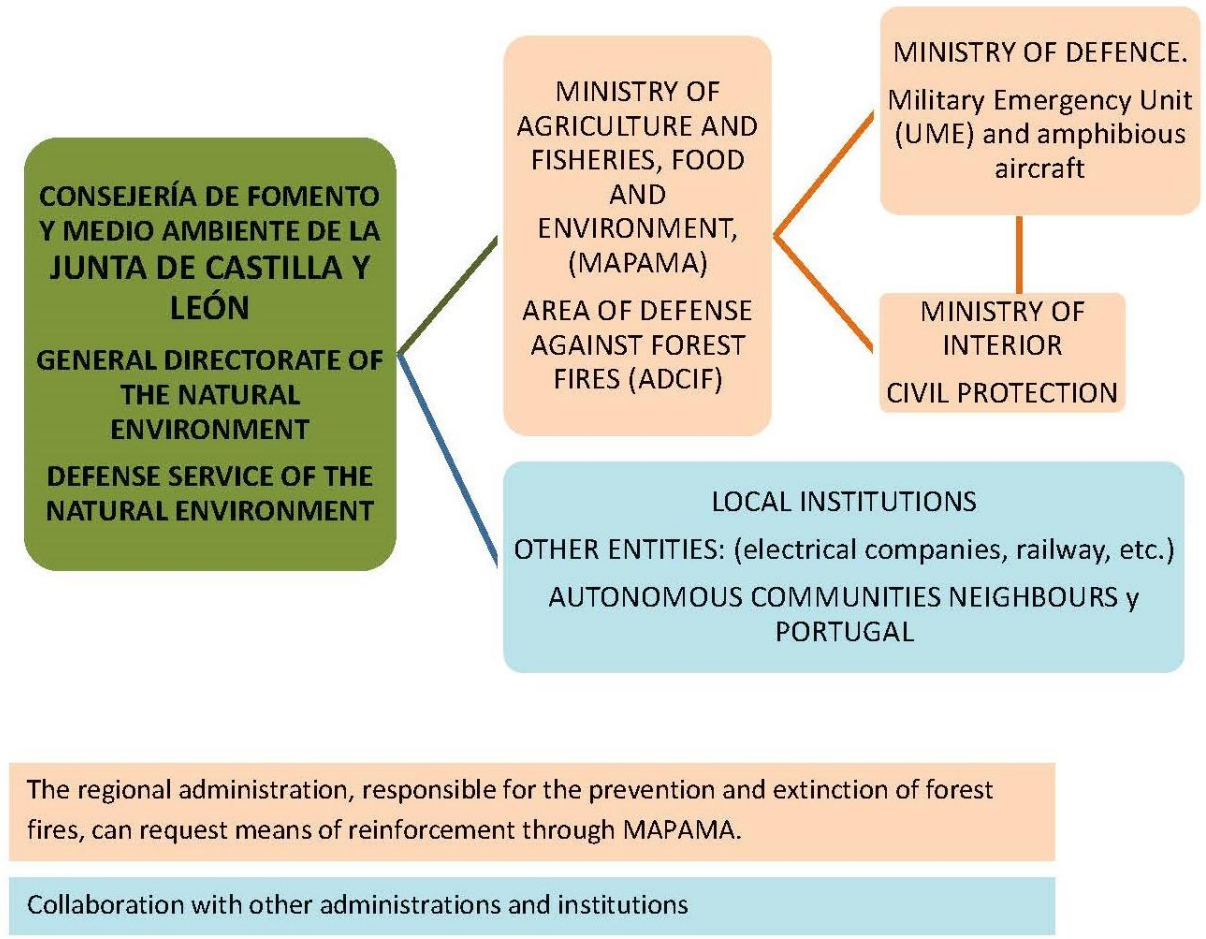

Figure 9 – Forest fire protection organization in Castilla y León

The structure and organization of the fire suppression operation is established in the CIVIL PROTECTION PLAN FOR EMERGENCIES FOR FOREST FIRES IN CASTILLA Y LEÓN (Decreto 274/1999, of October 28).

STRUCTURE CENTRAL SERVICES:

- Consejería de Fomento y Medio Ambiente (Junta de Castilla y León)

- General Directorate of the Natural Environment, (the General Director of the Natural Environment is the DIRECTOR OF THE PLAN).

- Defence Service of the Natural Environment.

- Functions: coordinate the nine provinces, interrelate with the rest administrations and organizations and direct the suppression of supra-provincial fires.

PROVINCIAL SERVICES STRUCTURE:

The Territorial Delegate of the Junta de Castilla y Léon is the Director of the Plan.

- Functions: direct the provincial operative, suppression of provincial fires, declaration of severity level 2, direction of the CECOPI, (Integrated Operational Coordination Centre).

COMARCAL STRUCTURE: only to set the number of Environmental Agents on duty at any time.

In this framework, three types of Command Operations Coordination Centres are established with their personnel:

- Centro Autonómico de Mando (CAM), (Regional Command Centre): it is the working organ of the Incident Commanders at community level, between which there will always be a "Autonomic Command Centre Daily Chief", and its main mission is the direction and coordination of the mechanical and human means of our community for the extinction of the fires, until the constitution of the autonomic CECOPI, and performs functions of receiving centre / emitter of information.

- Centro Provincial de Mando (CPM), (Provincial Command Centre): it is the working organ of the Incident Commanders of the province, among which there will always be a "Provincial Command Centre Daily Chief" (Jefe de Jornada), and its main mission is the direction and coordination of the mechanical and human resources of its province to The extinction of the fires until the constitution of the provincial CECOPI, and performs functions of receiving center / issuer of information.

- Puesto de Mando Avanzado (PMA), (Advanced Command Post): Technical management position for the control and suppression of a fire, located near the fire.

In the Autonomic and Provincial command Centres, in addition to the Daily Chief, there is a technician on duty and other support technicians, as well as the coordinator of aerial media, operators, etc. The technician on duty, when the Advanced Command Post is created by the existence of a fire, becomes the **Incident Commander (Director Técnico de Extinción, DTE)** in the PMA.

ACTION GROUPS:

For the execution of the actions that appear in the Plan, the following Action Groups may be constituted:

Fire suppression Group: constituted by the set of material and human means whose main action is the suppression operations. Groups are different for composition, means involved and origin.

- National: fire fighting brigades and aircrafts from the General State Administration;
- Regional: permanent and temporary staff and material resources;
- Local: fire stations, local means and human resources, groups of emergency.

Security group:

- From the General State Administration: “Guardia Civil”, (The provisions on State Security Corps and Forces shall be exclusively functional, without attaching specific human resources or materials. They always act under the command of their natural leaders).

- From the Autonomous Administration: Environmental agents.

- From Local Entities: Agents of the Authority of affected municipalities.

Health group:

- From the Autonomous Administration: Personal and sanitary means of "Consejería de Sanidad".

- From local Entities: Local sanitary means of affected municipalities provided for in its Municipal Plan.

- National: Cruz Roja Española means.

Logistic and support group: constituted by means that serve the supply, transportation and everything related to the logistics area of the groups and services that operate in the area of operations:

- Means of the Consejería de Fomento y Medio Ambiente (Junta de Castilla y León).

- Means and resources of affected municipalities provided for in its Municipal Plan.

- Means of support: other means of the Autonomous Community may be allocated when necessary, as well as requesting the intervention of the Armed Forces to the Ministry of Defence. Media may also be requested from other Autonomous Communities or other neighbouring countries following the INFOCAL Protocol and corresponding agreements.

CLASSIFICATION OF FOREST FIRES ACCORDING TO THEIR LEVEL OF GRAVITY

In the CIVIL PROTECTION PLAN FOR EMERGENCIES FOR FOREST FIRES IN CASTILLA Y LEÓN (INFOCAL), a classification of forest fires appears according to their level of severity. The operation of the Plan in emergency situations is based on the qualification of the potential seriousness of forest fires.

Gravity levels range from level 0 to level 3, from lowest to highest severity (Table 3).

At level 2, in which the fires need for their suppression the incorporation of means not assigned by the Autonomous Community or may involve emergency situations of national interest, the Steering Committee will be set up, and the Coordination Centre will be called the Centre of Coordination. Integrated Operative Coordination (CECOPI).

Table 3 - *Classification of forest fires according to their level of gravity*

GRAVITY LEVEL	GENERAL DEFINITION
0	In their most unfavourable evolution, they do not pose a danger to people not related to suppression work, or assets other than forest nature.
1	Due to its possible evolution, it is foreseen the need to implement measures for the protection of people and property that may be threatened by fire
2	They are fires for whose suppression it is foreseen the incorporation of means not assigned to the INFOCAL Plan, or they can entail emergency situations that derive towards national interest. For example, evacuations, cutting of national roads or railroads, etc.
3	Fires in which the national interest is at stake

3.3.2 Incident Command System (ICS)

ADAPTATION OF THE FOREST FIRE EMERGENCY MANAGEMENT SYSTEM (SMEIF) TO CASTILLA Y LEÓN

The system is the American forest emergency management system adapted to the characteristics of forest fires in Castilla y León (SMEIF = Incident Command System (ICS)).

"SMEIF" OR "ICS" POSITIONS (Figure 10)

- *DTE* (Director Técnico de Extinción): **Incident Commander**

He is responsible for directing the suppression of a forest fire. The DTE will be a professional who has received specific accredited training on the behaviour of the forest fire and adequate techniques for its extinction. (Article 46. LEY 43/2003, of November 21, of Montes).

He is a forestry engineer or forestry degree to the service of the Consejería de Fomento y Medio Ambiente (Junta de Castilla y León). Assume this function in extended attacks. In the first attack, the responsible is a forest agent.

- *Enlace* (Oficial de enlace e información): **Liaison and information officer**

Personal assistant to the DTE who receives, informs and services the media, authorities and officials of other organizations involved.

- *Logística* (Jefe de logística): **Logistics Unit Chief**

He makes a permanent forecast of necessities of provisioning and other provisions. He is responsible for its provision and distribution in collaboration with the CPM.

- *Planificación* (Jefe de Planificación): **Planning Unit Chief**

The Planning Unit Chief continuously updates information on the evolution of the fire, conducts medium- and long-term behavioural forecasts, controls and plans the arrival and departure of media, and proposes modifications to the existing Operational Plan.

- *Operaciones* (Jefe de Operaciones): **Operations Unit Chief**

Its function is to transmit the necessary instructions to execute the Operation Plan, to solve incidents, to coordinate and control its execution and to evaluate its effectiveness in each zone of the fire.

- Coordinador de Medios Aéreos: **Air Media Coordinator**

Personal assistant to the Operations Unit Chief. He transmits to the air means the necessary instructions to execute the Plan of Operations, resolves incidents, coordinates and controls its execution and evaluates its effectiveness.

- *Área de Espera* (Jefe del área de Espera): **Staging Area Chief**

He receives the incoming or outgoing media from one area to another. It transmits the necessary instructions: work zone, access, responsible, communications, points of refuelling, etc.

- *Sector* (Jefes de sector): **Sector Leaders**.

The sector leader transmits the necessary instructions to execute the Operations Plan in its area of action with the assigned means. It also solves incidents, coordinates and controls its execution and assesses the degree of effectiveness.

Each Sector Leader is assigned a sector or zone of action within the fire, in which he will have assigned a certain human resources and terrestrial materials.

ACTIVATION SMEIF UNITS (FOREST FIRE EMERGENCY MANAGEMENT SYSTEM)

When a fire starts, and from the CPM it is decided to send a service technician, the SMEIF unit is activated. The structure and organization of the unit will depend on the complexity of the emergency.

The Incident Commander (DTE) decides which units to activate.

Guidelines to be followed by the DTE:

- Contact the Fire Boss: fire detection and planning. Decide on the necessary SMEIF units. Together with the Fire Boss, the DTE assesses the capacity and availability of the Agents present for such units. It is recommended to activate immediately after arriving: Operations officer, Sector leaders, Coordinator. Inform the "Provincial Command Centre Daily Chief" of the state of the fire and organizational needs. Together, the necessary management personnel decide: agents, technicians, etc.

- Establish the Advanced Command Post and designate the Operations officer. Review the assigned tasks, set the Operations Plan and delegate to the Operations officer all the precise instructions for executing the extinguishing operations.

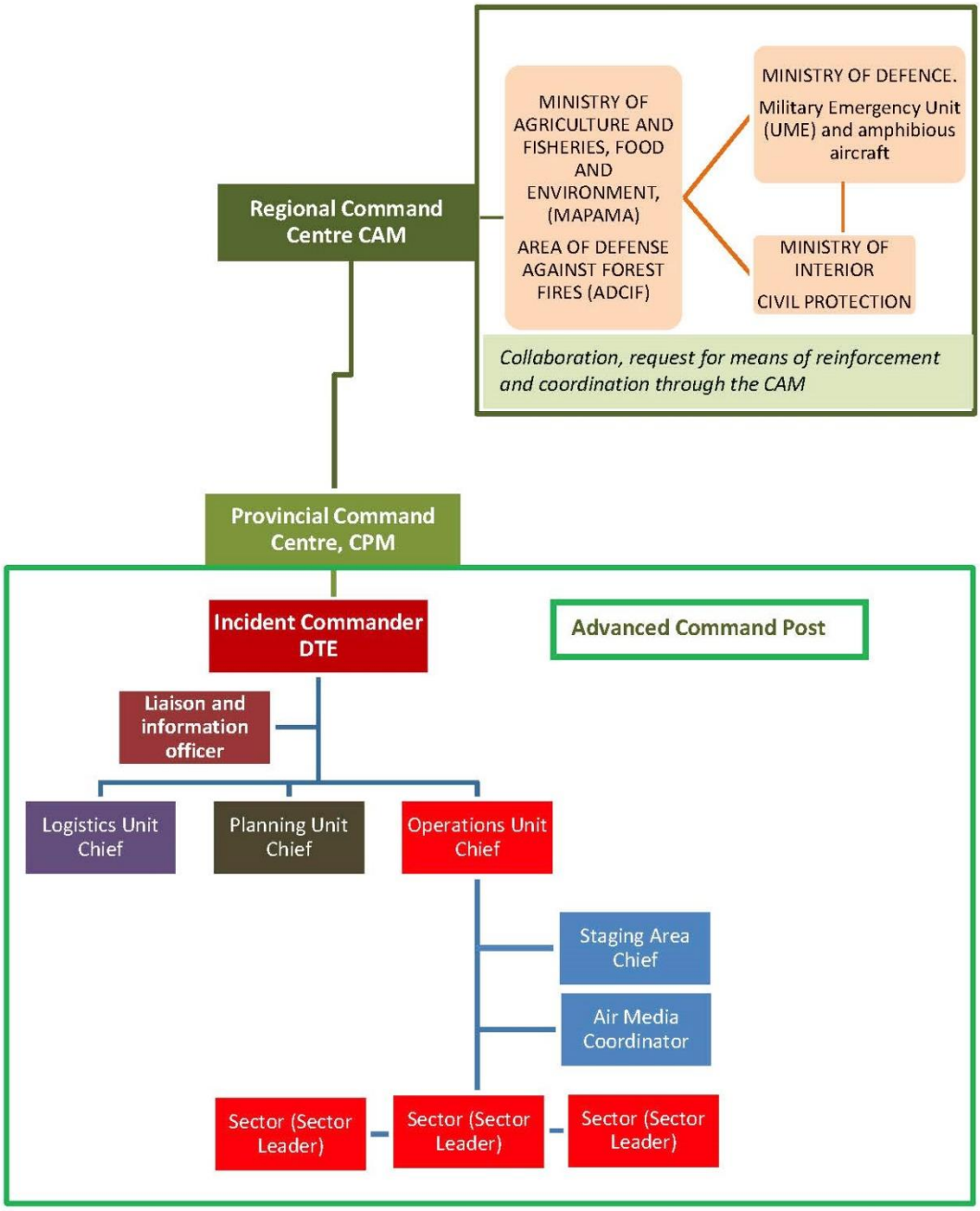

Figure 10 – Basic organizational scheme of the SMEIF or ICS in Castilla y León

- All operations related calls will be handled by the operations manager, who will be identified as "Command Post".

- Designate sectors: name, communication channels, person in charge of organizing the sector in working groups (Sector Leader). The sector leaders will depend on the Operations officer.

- Resume the planning function: predict behaviour, write down strategy and tactics and outline a sketch of the fire).

- If necessary, the DTE shall designate the heads of planning, logistics, staging area and / or liaison. It will review each assigned task and clarify the communications used.

Note: Fire Boss (Jefe de extinction): is the first agent to arrive at the fire until the CPM designates another person.

3.3.3 Fire fighting resources and their management

The Junta de Castilla y León (Public Entity) is responsible for forest fire suppression at regional level. Forest firefighters, who are professional, operate at both national and regional level using ground, aerial and heli-transported means. The majority of resources are managed at regional level, including fire fighting brigades, heavy machinery such as bulldozers, water tankers and a share of heliport brigades and aircrafts. At national level the other share of aircrafts and helicopters are managed together with the possibility to involve Military Emergency Unit, (Unidad Militar de Emergencias, UME).

There are several methods of suppression:

Direct attack with hand tools

This method consists of the action of the ground crews with hand tools on the same edge of the fire, attacking the flames and the fuel that is next to them to achieve a rapid extinction. The control line is established on the front line of the flame.

Direct attack with water (vehículo autobomba)

It consists of applying water directly on the flames when the flame height allows to get close enough to throw water at its base. The limit of 2.5 meters of flame is taken as reference. As a general rule, it is the most effective and safest way of working in the case of the fire engine (autobomba).

Air direct attack

With aerial means, the direct attack consists in discharging the water directly on the flames, thus facilitating the task to the ground crews when cooling the fuel and reducing the intensity of the fire.

Direct attack with heavy means (bulldozer)

The direct attack with bulldozer consists in using the shovel of the machine to raise from the ground a volume of earth near the fire that is pushed until burying the front of fire. In this way the fire is suppressed by the displacement effect of oxygen and the burning fuel is isolated. It is also possible to build a line of defence free of vegetable fuel with the same manoeuvre.

Indirect attack with hand tools

This method consists of the action of the ground crews with hand tools at a distance from the flame front. In these actions, the elimination of fuel, application of foams or cooling with water from the area before the fire comes.

Indirect attack with heavy means (bulldozer)

With heavy machinery such as the bulldozer, you can act by removing the vegetation at a distance from the front of flames when the intensity of the fire does not allow you to approach it. It is usually a very effective way to make lines of defence when natural barriers rivers, rocky outcrops, ...) or artificial (roads, roads, fire breaks ...) are not enough.

Backfire (contrafuego), (indirect attack)

It consists of creating a fire from a clear line of existing fuel or from a line of defence and directing it towards the fire, taking advantage of the suction currents generated by the fire itself. The intermediate fuel between our position and the fire burns and the fire is extinguished when the two fires are found.

Mop up: with hand tools and heavy means.

The act of extinguishing a fire after it has been brought under control. Mop up involves carrying out all necessary actions to prevent re-ignition.

The selection of the method of extinction is done according to the Plan of Operations that is done in the PMA, with a general strategy and tactical decisions to comply with the strategy.

In the fire zone they apply a methodology for the prediction of the behaviour of the fire. Changes in factors and critical points are identified. In the operational room is also used "SIPRO" (simulator of the evolution of a forest fire up to the nine hours following its beginning

The SIPRO Fire Simulator is a utility integrated into the MetoSIG weather forecast Web application. It allows to obtain an orientation on the possible behaviour of the fire in the next hours of evolution in the form of two-dimensional maps. It uses a high-resolution cartographic base (topography, fuel model, type and state of vegetation) for propagation calculations and operates by default with the weather forecasts of the system, although it also allows the introduction of observed meteorological conditions "in situ" "by the extinction team. The simulator uses as a basis of calculation the semi-empirical approach proposed by Rothermel and implemented in BEHAVE and other applications (FARSITE, CARDIN, FIREFAMILY, FIRESTATION, FMIS, E-FIS, FORFAIT) over the past 20 years.

Castilla y León has a specific procedure for complex incidents based on the adaptation of the American ICS (Incident Command System, or “Sistema de Manejo de Emergencias por Incendios Forestales”, SMEIF). This system is included in a technical guide.

This procedure implies a wide deployment of the command structure according to the complexity of the emergency. Other specific procedures are added such as for the mobilization of groups of interprovincial reinforcement convoys with autonomy to intervene for 3 days. There are also protocols for the incorporation of national reinforcement means: heavy media of the MAPAMA or the UME of the Ministry of Defence. There are also internal procedures to deal with logistics.

3.4 France

3.4.1 Forest fire protection organization

In France, the forest fire prevention and suppression strategy is managed at national level. It includes the attack strategies for all kinds of fire behaviours, the safety rules for fire fighters and for the means used, the management of national aerial fleet and reinforcement distribution where needed. Each year the French Civil Protection release a "National Forest Fire Operations Order".

Every year the Minister of the Interior on which civil security depends signs the order of national operation of fight against forest fires. this document updated each year specifies the conditions of mobilization and intervention of the national means of fight against forest fires. it defines the organization of the national system, the conditions of employment, the deployment of land and air assets on the national territory, the principles of command and coordination and the conditions of engagement. Each department subject to wildfire risk declines its own departmental order to fight against forest fires signed by the *préfet* of the department.

General Strategy

The new French forest fire strategy has been developed since 1986 and it is described within a national guide, called "Guide de stratégie générale". It is intended to inspire decisions of fire managers and officials when they have to plan and to implement actions. This guide is a national reference document, which involves all ministries, partners and actors in a global and convergent approach against fire. This intellectual approach reflects the characteristics and effects of the risk of control, based on orientations that have already proven to be effective. It aims to generate different behaviours, and to encourage the birth and development of new ideas, without which, no progress could be made.

This strategic design is expressed through two basic principles and four key objectives.

The two basic principle are:

- Global approach for fire prevention and fire suppression;
- Anticipation: location, time, resources, think before, organize priority, fire behaviour, ongoing operations.

The four main objectives in national forest fire strategy are:

- Preventing all fire start : patrol, watchtower, DFCI
- Controlling spread in early stages : DFCI, defend lines, access tracks
- avoiding catastrophic developments : Massive attack aerial & ground
- Rehabilitating areas destroyed by fire : less vulnerable in the future – loops to DFCI

Basic principles: the global approach

The result of responses from the past to try to solve the problem of forest fires shows the limits of partial actions in the search for a significant final solution.

Experience shows that all the data relative to the problem is interactive and therefore, the advanced solutions are as well. These solutions lose their meanings and effectiveness when they are taken out of the general context. It is no longer possible to satisfy the arbitrary and artificial separation between prevention and control, a result of outdated administrative disputes and corporate interests. Until now, this situation has been characterised by the dispersion of efforts and resources, a major obstacle to dealing with the problem of forest fires effectively. So it is good for all stakeholders, regardless of any fair skills and necessary steps, to base their interventions around a common and coherent framework from a global approach and design of the system, which should also cover issues of spatial planning, particularly town planning.

Basic Principles: anticipation

This is the golden rule when it comes to forest fires. In fact, the evolving aspect over time and space that characterises this risk, through its origins and manifestations, is in fact a particularly difficult phenomenon to comprehend and fight. Therefore, there is every reason to establish the principle of anticipation as an absolute rule. This rule leads to two basic options both in the design of orientations and in their operational application: to solve the problem of forest fires as far upstream as possible, to proceed with events at all times and under all circumstances. Therefore, anticipation is required for better control.

Four key objectives

The first two objectives, i.e. prevent fires and control outbreaks in their initial stages, are the keys to the success of any policy protecting forests from fires; therefore they call for the priority, interdependent and convergent mobilisation of all the partners and actors. The four objectives are:

The goal of the general strategy is to establish the communication required to solve problems intelligently. It is also a common and coherent framework involving a common policy linking preventive planning to the resilience of areas affected by fire. It should be noticed that this strategy leads to search into the causes and circumstances of fires in natural areas, a concept shared by firefighters, foresters and police officers.

There are numerous stakeholders involved in France, as emergency preparedness affects everyone starting with the citizens: state, local authorities, firefighters, foresters, military and police forces, associations with emergency preparedness as part of their role.

Since its publication, the general strategy guide has constituted the preamble of all national, regional and provincial orders relative to "forest fires" and all regulatory documents relative to protecting the forest from fire such as national reference training guides for firefighters for example.

Organisation

Firefighters are responsible for fire suppression. They are resources from Fire and Rescue Services. Other departmental organizations are involved in forest fire detection, first response, and forest fire monitoring. However, the active fight is the exclusive competence of firefighter. For fire prevention, detection/patrolling and initial attach of forest fires are organized and carried out by departmental foresters. Scouts of France are also involved in fire detection.

The national agency responsible of fire fighting has an operational centre where the priorities in emergency, the reinforcements, and the catastrophic events are managed considering also the final option to activate the European Civil Protection Mechanism in case of needs (Figure 11). The General Direction of Civil Protection and Crisis Management is the organism in charge of drafting procedures.

A cell composed of fire-fighter officers from the national level and local level try to identify the responsibility at each level.

Local level; operational centre of fire fighters (CODIS).

Regional level: Zonal Headquarter (COZ), it's the zonal operation centre that manage the operational reinforcement with aerial and ground means on big fire and potential big fire

National level: Operational centre of crisis management called COGIC.

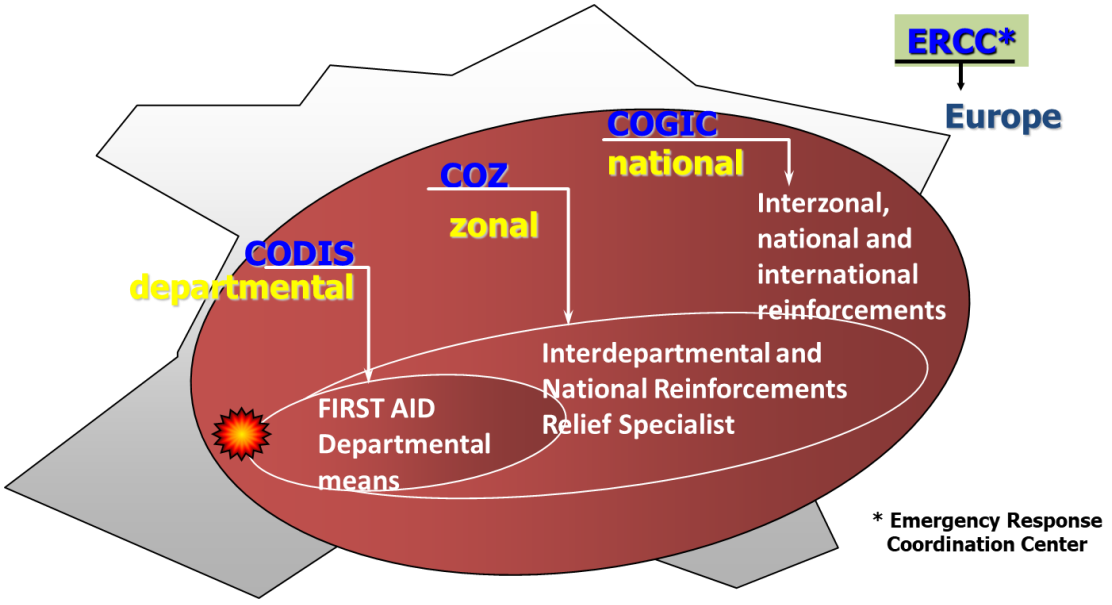

Figure 11 – Involvement of the different organizational level in relation with fire dynamics

Forest Fire danger indices

In France are used the following forest fire hazard indices:

- The Level of ignition probability and propagation (NEP - Niveau d'Eclosion et de Propagation), method developed jointly with the SDIS 40 and the INRA which allows to represent the danger in winter and spring situation.

- The Forest Weather Index (IFM - L'Indice Forêt Météo), a method imported from Canada that represents the danger in summer.

The former is developed by INRA, the latter is developed by a forecaster unit of Météo-France specialized forest fires that allows the production of a map of meteorological danger.

The Scale of Forest Fires Meteorological Danger (EDM - Échelle de Dangers Météorologiques feux de forêt) is divided in six levels (Table 4). Every day two maps of the meteorological fire danger are produced by a meteorological engineer at the zonal operation centre in Valabre: one in the morning for the same day and one in the evening for the next day (Figure 12).

According to these danger levels, the prevention and fighting means (air assets, reinforcing columns, etc.) are deployed on the ground in a preventive way in reinforcement of the local means. For example, on the basis of the EDM level the routes of the armed air patrols (G.A.AR. - guet aérien armé – i.e. water bombers monitoring high-risk areas, ready to drop extinguisher as soon as they detect a fire) are determined.

Table 4 - Scale of Forest Fires Meteorological Danger (EDM)

Level	Designation	Color	Definition
1 (F)	Low		The area is not very sensitive The meteorological danger is very low. The ignition of a fire is unlikely.
2 (F)	Light		The area is not very sensitive. In the unlikely event of forest fire, it would spread at low rate of speed.
3 (M)	Moderate		The sensitivity of the area increases. The drying state is weak or moderate. In case of fire, it would spread with a moderate speed.
4 (S)	Severe		The area is sensitive. Dryness is moderate or strong. Two main cases: - The start of a fire is unlikely. However, in case of departure, the fire could spread with high speed. This case is encountered in situations where the humidity of the air is high. - The meteorological danger is strong. In the presence of a cause of fire, the start of fire is likely. The speed of fire could be quite strong in situations where the humidity of the air is low.
5(TS)	Very severe		The area is very sensitive. The danger level is high. Any flame or source of heat may produce a fire propagating at a high speed.
6 (E)	Extreme		The area is extremely sensitive. The level of drought is extreme. The danger level is very high. Any cause of fire may produce a very intense fire, spreading at an extremely fast speed.

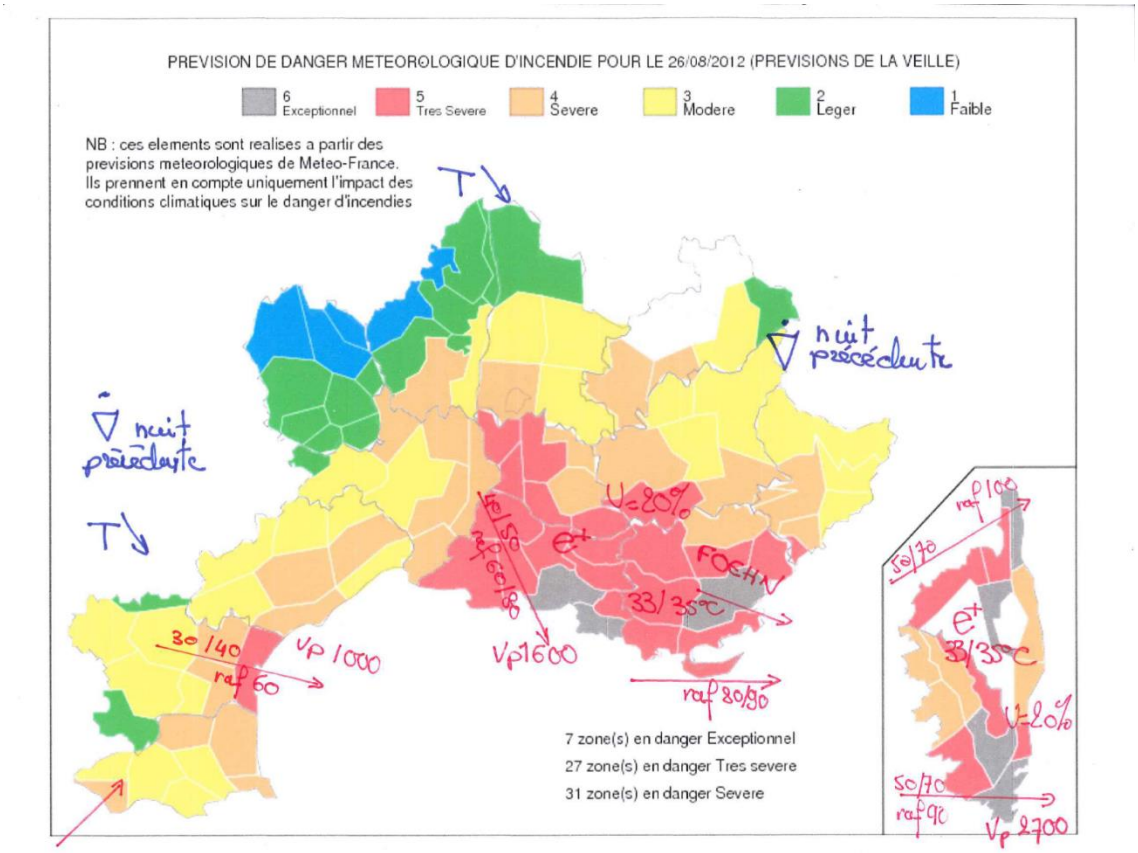

Figure 12 - Map of the 26 August 2012 produced by the predictive service of the Zonal operation centre of Valabre

3.4.2 Incident Command System (ICS)

The organization of Incident Command changes depending on fire severity and risks for population. The main position in the incident command system are:

Incident Commander (COS - Le commandant des opérations de secours)

When a forest fire is put out in its initial phase, the incident commander is in charge of developing the firefighting strategy and to coordinates all operational means. An incident director validates the actions of the incident commander. The incident director is either the mayor or the prefect depending on the fire scale. For each fire sector, it sets the priority objectives and decides the tactics to be applied. In order to improve the use of air assets, on request he/she may be assisted by an air officer (*officier AERO*) (Figure 13). The COS is usually on the operational theatre and during big fires only the firefighter with the highest training level can assume this position.

Aerial means officer (officier AERO)

It is a sector chief level firefighter designated by the COS to coordinate the aerial means according with the firefighting strategy developed by the COS. He/she designates the objectives and gives authorizations to drop.

Site Commander (Chef de Site)

It is the commander of sectored firefighting operation. He can lead a command post (Poste de Commandement). It is the C.O.S at the highest level.

Sector Manager (Chef de Secteur)

It leads resources starting from three intervention groups as a COS or as a SECTOR MANAGER under the authority of a Site Commander (Chef de Site). It can also control reinforcement detachment and to collaborate within a site command post.

Group leader (Chef de Groupe)

It controls a forest fire intervention group and can lead the operation as long as the committed means are less than 3 intervention groups.

Head of the Team (Chef d'Agres)

it commands an isolated means within a forest fire intervention group. He can lead the operations as long as the committed means are less than a group.

Command Post (PC - Poste de Commandement)

It is a structure composed of different unit intended to help the COS by taking charge of certain functions as soon as the operation grows. PC may have two levels:

- Sector command post - It is set up during firefighting operation for supporting the sector manager. Such a PC can be set up on one or more sectors during a very important operation. It is in permanent contact with the Site PC;
- Site command post – It is essential for supporting the Site commander on big fire. It is in charge of helping the Site commander in managing the event.

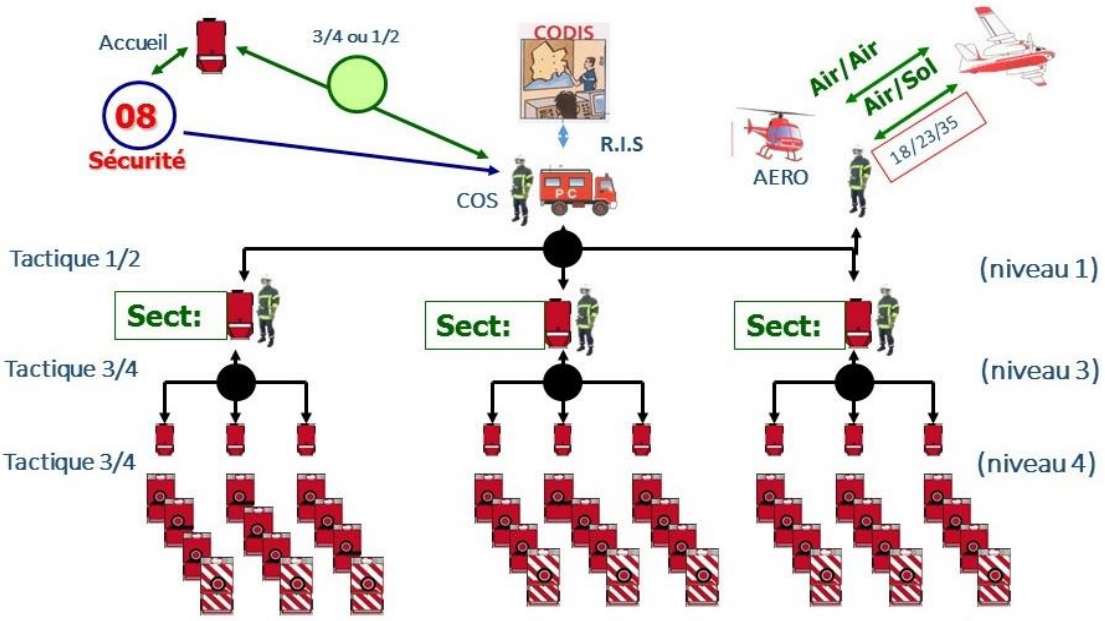

Figure 13 - Scheme of the incident command system

3.4.3 Fire fighting resources and their management

Also in France there are both professional and volunteers firefighters, which operates on ground, helicopter ad aerial means. In addition to the local or Departmental means, National firefighting means can support local actions using airplanes, helicopters or emergency preparedness instruction and intervention units (including intervention delaying detachments and support units with bulldozers, backhoes and dump trucks).

Ground means

Forest fires fighting is carried out on the ground using forest fire truck. Due to trained personnel, equipment, extinguishing agent capacity and “off-road” possibility, this mean is able to:

- fight forest fires, when stationary or moving at low speed;

- carry out water supply.

Forest Fire Intervention Units

In forest areas, the principle of fire fighting is to attack the fire line from specially adapted vehicles, called "penetrating".

Rapid intervention module (MIR, module intervention rapide)

The minimum forest fire intervention unit consists of one all-terrain light vehicle (Véhicule léger tout terrain) and two fire trucks (camion citerne feux de forêts) (Figure 14 and 15). This module is placed under the command of a forest fire team leader (Chef de groupe).

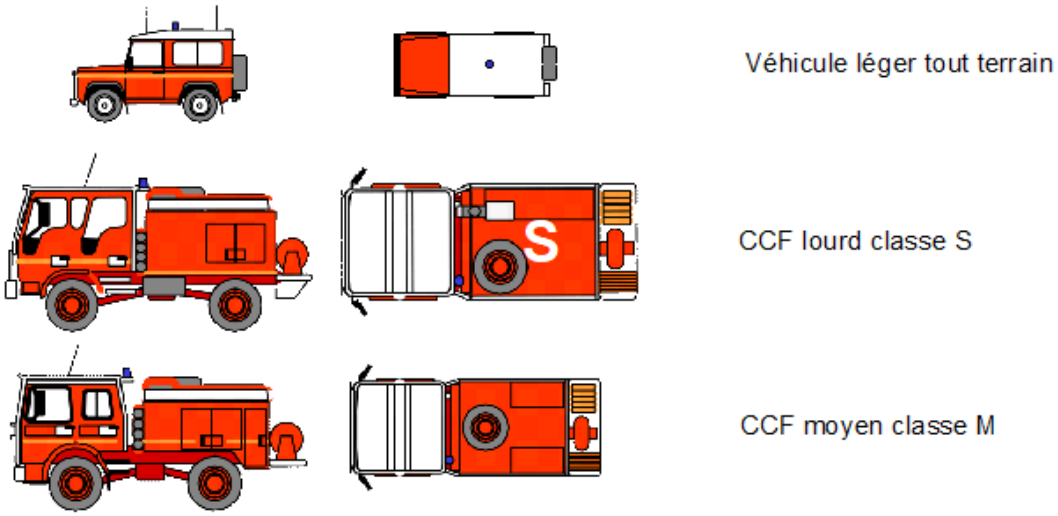

Figure 14 – Main type of Forest fire ground means

Figure 15 – Forest fire ground means units

Forest Fire Intervention Group (GIFF - Groupe d'intervention feux de forêts)

When the evolution of the disaster and the water needs exceed the extinguishing capacity, the implementation of a forest fire intervention group is necessary. This set of vehicles includes one VLTT and four fire trucks, under the command of a forest fire group leader.

Heavy Forest Fire Group (GIL - Groupe d'intervention lourde feux de forêts)

When the group is composed by a VLTT and two heavy truck, it takes the name of Heavy Forest Fire Unit (GIL).

Engagement of ground means

During the forest fire season the number of means engaged at the beginning in case of fire depends on the fire danger level (Table 4).

Aerial means

The national fire fighting fleet includes 12 Canadair 415, 2 DASH Q400 and 9 tracker S2F (Figure 16). At departmental level, air tractors and helicopters are available; their number depends on the department risk level and financial availability.

Figure 16 – Forest fire aerial means

Fire Suppression strategy

French strategy is to solve fire at the beginning, sending much as possible vehicles in order to minimize the risk of bigger fires. Regarding indirect attack, they use backfire only when weather conditions are positive.

Air and ground forces are used for patrolling the territory when severe weather conditions and fire risk level are recorded:

- High = aerial patrol and ground forces patrol
- Very high = aerial patrol over «very high risk» areas defined by «meteo France» + ground patrols
- Extreme = several races of aerial patrols + intensive ground patrols

The forest fire response management is based on three main point:

1. Fast initial attack
2. Massive attack
3. Priority to fire ignition

1. **Fast initial attack** starts from an early detection and is based on ground and aerial patrols (Prepositioned resources, watch towers, remote sensors - Resources assigned based on risk analysis), and short time response (Reducing response time by increasing units on the ground and patrolling). In this sense, aerial fire fighting is adapted and proportioned to the required response: resources activated and deployed accordingly to the fire danger (D-1); aerial retardant bases (call to open); Aerial resources pre-deployment (national, regional and local level (Counties resources 20 helitacks Type).
2. **Fast detection** has as response an initial massive attack that results in a response based on several ground and aerial means deployed to the fire in the first 5 minutes. Aerial patrol is usually based on 2 Trackers (S2F) with retardants available - “G.A.AR. = Guet Aerien ARmé”, while aerial initial attack is based on 4 to 6 Canadairs (“train of aerial resources”) + 1 DASH (Figure 17). Sometime the wave approach is applied, i.e. all resources available are sent to the fire.
3. **Priority to fire ignition**. During fire events, new fire ignitions (spotting, or new ignition) has the priority in extinction in order to avoid the development of more than one big fire at the same time in the same operational scenario.

Figure 17– Forest fire aerial massive attack

3.5 Croatia

In Croatia, national public institutions directly manage fire operations in terms of protection and prevention. National Protection and rescue Directorate, Croatian Forestry service, Volunteer Fire Association and the Ministry of Interior are responsible for activities related with forest fires. The Government of the Republic of Croatia adopts each year the Program of activities in the implementation of special fire protection measures of interest for the Republic of Croatia. The Program of activity describes tasks for preparing all the institutions involved in the preparation of a fire fighting season. The National Protection and rescue Directorate has a Fire Fighting sector inside. On the national level this Sector monitors the situation and events in the field of fire protection, drafts strategies and tasks, trains and equips fire brigades as well as other participants in fire fighting activities. This Sector directly manages the national Intervention Units and coordinates the activities of all participants in fire fighting operations. In the operating room there are fire fighting officers, military officer for air operations, because the aerial means belong to the Ministry of Defence and police officer for coordinating with Police Force. Depending on the size of fires, the coordination and responsibility are in charge of a local, regional or national agency. The available resources for operating against forest fires are various and dedicated to direct attack, from the ground means (local management) to helicopters and aerial means (National management). In Croatia no prediction systems are used to fire operations, and the strategy to be applied against each fire event is chosen on the basis of the experience of operators. At national level, a Plan for interventions against big forest fires exists, and it is organised in 5 levels.

3.6 Similarities and differences in organizations

The description of the fire fighting systems applied in the countries of the project partners clearly highlighted the differences and similarities about organization, approach and means applied in fire fighting. All the countries and regions examined have shown a structured organisation aimed to fire prevention and management. The main differences are related with the identification of the hierarchy in terms of responsibilities.

In relation with the organization structure (Table 5), fire prevention and management are developed at regional level in Italy and Spain and at national level in France and Portugal. However, in all countries national, regional and local level exist in firefighting organization. The differences are related with the tasks covered at each level. In Italy and Spain, the autonomy in fire prevention and management organization have to consider the general national framework given by a legislation on this topic. In France and Portugal, forest firefighting is managed at national level but the central administration delegates at regional and local level some aspects of fire management in order to increase the preparedness level in case of emergency, thanks to a dislocation of means and resources. All the countries/regions are using fire risk and/or danger indices for developing and organize fire prevention and preparedness in relation with the fire risk level.

In relation to the incident command system (Table 6), most of the positions of responsibilities exist in all the countries, in particular for Spain and Portugal. France and Portuguese organizations include the possibility to have an aerial means officer on the operational theatre, for supporting the incident commander in managing the aircraft activity.

In all countries, aerial resources (table 7), are managed at both national and regional/departmental level. However, in Italy the regional fleet is independent and it is used only within the regional boundaries. In France and Portugal the ground means are organized in groups. In all the countries/region the use of fire in firefighting in allowed and applies when necessary. In all the countries, with the exception of Spain, firefighting is carried out by both professional and volunteer firefighters. However, in Tuscany the volunteers are organized in independent structures, while in France and Portugal they are included in the fire and rescue service.

The general organization of the different chains of command is very similar. The availability of means in almost all situations is i) Aerial means under national control, ii) helicopters are often under regional control, iii) ground crews are directly managed at local level, starting from local basis and always under control by regional or national coordination in order to guarantee support in case of big events. In Tuscany region, the national fire and rescue service is involved in forest fire only for protecting infrastructures and people.

Table 5 – Summary table about fire fighting organization

Country	Region	National organization	Regional Organization	Availability of risk/danger indices
France		Yes	No	Yes
Italy	**Tuscany**	No	Yes	Yes
Portugal		Yes	No	Yes
Spain	**Castilla y León**	No	Yes	Yes

Table 6 – Summary table about incident command system (ICS)

Country	Region	Main position in ICS						
		Operational room/centre Regional/ Departmental	Incident commander	Incident commander assistant/sector leader	Logistic specialist/unit	Operation specialist/unit	Planning specialist/unit	Aerial means officer
France		Yes	Yes	Yes	No	No	No	Yes
Italy	**Tuscany**	Yes	Yes	Yes	Yes	No	No	No*
Portugal		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Spain	**Castilla y León**	Yes	Yes	Yes	Yes	Yes	Yes	No

* This function is in charge to the incident commander

Table 7 – Summary table about firefighting resources

Country	Region	Aerial resources		Terrestrial resources	Use of fire in firefighting	Firefighters		
		National fleet	Regional/departmental fleet	Organized in groups of means		Professionals - National fire and rescue service (NFRS)	Professionals - Regional organization*	Volunteer
France	-	Yes	Yes	Yes	-	Yes	No	Yes; Included in the fire and rescue service
Italy	**Tuscany**	Yes; Managed at national level	Yes; Managed by and operating only within the Region	Yes	Yes	Involved only for protecting infrastructure and population	Yes*	Yes indipendent organizations under regional coordination
Portugal	-	Yes	Yes	Yes	Yes	Yes	No	Yes; Included in the fire and rescue service
Spain	**Castilla y León**	Yes	Yes	Sometimes	-	Yes	Yes	No

* Completely independent from the National fire and rescue service.

4. The organization of Forest fire Training

Following the main aim of MEFISTO project, it is fundamental to well understand the structure and the organization of training activities of forest fire fighters. This is the basis to start working in developing a common structure at European level to identify common roles and levels of fire fighters skills.

4.1 Training organization in Tuscany Region

The Tuscany Region, with the goal of complying at best with the above mentioned requirements, established the Regional Training Centre 'La Pineta di Tocchi' – located in Municipality of Monticiano – Siena. The Centre was inaugurated on April 2007 and is used to inform and train the personnel who take part, at different levels, in the activities of forest fire prevention and fighting. Courses were organized for firefighters (basic firefighting course and self-protection course), fire fighting vehicle drivers, group leaders, incident commanders and control room operators.

As reported in the introduction, in Italy fire management is under regional administrations. Nevertheless, there is a national law as reference for Regions in developing their own laws on fire management, to be calibrated on their own needs. The Italian law is the n. 353/2000, and the Tuscan law is the n. 39/2000. Moreover, together with the law, Tuscany Region have developed a planning document, called 'Regional Operational Plan, (last edition 2014)'. In Tuscany working in forest fire fighting operations is considered a dangerous and difficult work. For this reason, it is mandatory to have a special qualification for being an active forest firefighter operating on the regional territory. Obviously, depending on the role covered by a fire fighters, different qualifications and different trainings are required. In Tuscany, the different responsibility level that requires a training and a qualification in fire prevention and fighting activities are:

- **Fire fighters (ground operator);**
- **Group leader (responsible for ground crews);**
- **Incident commander assistant incident commander;**
- **Logistic specialist;**
- **Engine driver (light, medium or heavy trucks);**
- **Prescribed fire manager;**
- **Drip torch user;**
- **Chainsaw user (for volunteer firefighters);**
- **Operational room Coordinator and operator.**

The first four position includes basic course and periodical updating. Training is mandatory and can be certified after training courses and final evaluation (exam) and/or by certified experience on the topic. In any case, it is mandatory to participate at the update trainings at the Regional Fire Service School and in the simulations carried out in the territory. Moreover, to be qualified to operate, it is necessary to pass a medical examination that certify operator's good health. The school provide certifications recognized at national level. The skills are

recognized and certified by the Regional Forestry Office. Each qualification does not depend on the others, and training activities are calibrated for each role. In practice, to become an incident commander it is necessary to attend just the specific training course. In fact, the Regional operational structure defines the mandatory competences to be acquired for each position in terms of knowledge, competence and ability.

4.2 Training organization in Portugal

In Portugal it is not necessary to have a professional qualification for operating in forest fire fighting, even if a qualification exists, but it is optional. To obtain the optional qualification it is necessary to attend training courses by the National Fire Service School (ENB) and/or have work experience in the field. The necessary requirement to access to qualification for forest fire fighters is to be a firefighter.

The training activities for fire fighters are regulated by Dispatches (9920/2015 and 11787/2015) from the President of the National Civil Protection Authority (ANPC). The National Fire Service School (ENB), which is a private entity, is responsible for Portuguese firefighter training activities, and it delivers training courses at national, regional and local level. ENB defines the training programs, the skills of the trainers and certifies the carried out trainings.

There are different training courses and to have access to the higher levels it is fundamental to have passed the previous level/s. The existing training courses specifically for forest fire fighting are:

- **Forest Fires – Level 1;**
- **Forest Fires – Level 2;**
- **Forest Fires – Level 3;**
- **Forest Fires – Level 4;**
- **Forest Fires – Level 5;**
- **Aerial Operations – Level 1;**
- **Aerial Operations – Level 2;**
- **Forest Fires – Personal Safety and Fire Behaviour;**
- **Forest Fires – Recognition and Situation Evaluation Teams;**
- **Forest Fires – Forest fire prevention;**
- **Forest Fires – Prescribed burn.**

For each level of performance, the specific competences to be acquired are defined by ENB.

4.3 Training organization in Castilla y Leòn

In Spain there is a National law on forest fire management, the national law on forests 43/2003. It tells that the Ministry with competences on environment establishes (*Ministerio de Agricultura y Pesca, Alimentación y Medio Ambiente, MAPAMA*), in collaboration with the Autonomous Communities, common guidelines for the implementation of the emergency management system, the trainings, preparation and equipment of personnel

and for the standardization of material means. In Article 46.2, the Technical Director of Extinction (DTE) is mentioned: "*The technical director of the extinction have to be a professional who has received specific and certified training on forest fire behaviour and suitable techniques for extinction*". Under this general law, Autonomous Communities have to develop own laws and rules in order to effectively manage forest fires in their area. In Castilla y Leòn the 'Civil Protection Plan for emergency in forest fires (INFOCAL)" exists since 1999, and it states about trainings in the topic of forest fire fighting. Moreover, other laws and regulations tell that the Centre for defence against fire (CDF – *Centro para la defensa contra el fuego*) is responsible for training the personnel involved in prevention and extinction operations, including safety rules and emergency procedures. In practical, the training organization is defined at regional level and the public administration (Junta the Castilla y Leòn) is responsible, while the CDF is the agency that implement the training courses. The official figures involved in forest fire fighting are:

- **Incident Commander, DTE;**
- **Incident Commander Assistant (DTE "junior" or "Técnico de operaciones");**
- **Forest Ranger, Forest Warden or Environmental agent, AM;**
- **Fire Lookout, VI;**
- **Fire engine driver CA;**
- **Fire engine assistant PA;**
- **Heavy machinery driver CM;**
- **Helitack officer RH;**
- **Helitack operator PH;**
- **Brigade foreman CT;**
- **Brigade Worker PT;**
- **Helicopter pilot PHT;**

The only figure developed at national level is the DTE – Director of extinction. Only in that case, the standards have been developed by the national Forest Fire fighting Committee (CLIF). For DTE three levels of training have been differentiated according to the complexity of the fire and the work of extinction (basic, intermediate and upper level). In general, for all the figures involved, basic courses are the priority.

The training courses for the different profiles are listed in Table 8 and described in Table 9.

Table 8 – Training course carried out in Castilla y Leòn

COURSE CODE	TRAINING COURSES	
TEC.1	Curso básico para técnicos en incendios forestales	Basic course for forest fire technicians
TEC.2	Curso avanzado para técnicos en incendios forestales	Advanced course for forest fire technicians
AGM.1	Curso básico para agentes en incendios forestales	Basic Course for Forest Fire Rangers
AGM.2	Curso avanzado para agentes en incendios forestales	Advanced Course for Forest Fire Rangers
AGM.3	Curso de actualización para agentes en incendios forestales	Updating course for forest fire Fire Rangers
VIG.0	Curso de capacitación para vigilantes en incendios forestales	Training course for Fire lookout
AUT.0	Curso de capacitación para conductores y peones-operadores de vehículos autobomba contra incendios forestales	Training course for drivers and operators of fire engine
MAQ.0	Curso de capacitación para conductores de maquinaria pesada en incendios forestales	Training course for drivers of heavy machinery in forest fires
REL.1	Curso de coordinación para técnicos y capataces helitransportados	Coordination course for helicopter technicians and foremen
CAP.0	Curso para capataces de cuadrilla de tierra en incendios forestales	Course for foreman of land brigades in forest fires
CUA.0	Curso de capacitación para peones de cuadrillas de tierra y helitransportadas en incendios forestales	Training course for ground crews and heli-transport in forest fires
FOR.1	Curso de formador en extinción de incendios forestales	Forest fire suppression trainer course
PHT.0	Jornada formativa para pilotos de aeronaves sobre actuaciones en incendios forestales	Training session for aircraft pilots on actions in forest fires

In the coming years the following advanced training courses will be included: MAQ.1 and CAP.1

Table 9 – Main characteristics of the training course carried out in Castilla y León

ROLE	BASIC COURSE	HOURS	TRAINING AND UPDATE	HOURS	PERIODICITY	OBSERVATIONS
ENGINEERS/TECHNICIANS						
DTE AUXILIAR	TEC.1	60				Courses given by the CDF
DTE	TEC.1	60	TEC.2 (voluntary)	50		Previous experience: 1 year of DTE AUXILIAR
FOREST RANGER						
AM	AGM.1	45	AGM.2 and AGM.3	35 / 24		
STAFF AND COMPANIES (PERSONAL LABORAL Y DE EMPRESAS)						
VI	VIG.0	6				
CA	AUT.0	14	AUT.1 (7 H)			
PA	AUT.0	14	AUT.1 (7 H)			
CM	MAQ.0	14	Maximum 5 years (In the coming years it will include an advanced training course: MAQ.1)			
RH	REL.1	14	Prior regulated training	-		
			Continuous and practical training	-		
CT	CAP.0	14	In the coming years it will include an advanced training course: CAP.1	-		
			Before, course CUA.0	-		
PH	CUA.0	14	CUA.0	14	Maximum 5 years	The CUA.0 trainers must be enabled by the CDF through the FOR.1 course and the accreditation of their experience.
			Continuous and practical training	-	Continuous practices	
PT	CUA.0	14	CUA.0	14	Maximum 5 years	
			Práctical training	-	Continuous practices	
PHT	PHT.0	7				

4.4 Training organization in France

In France the organization regarding trainings for forest fire fighters is under national control. They have a network of fire fighter stations that implement basic courses following the programs stated by a national committee. The trainings for advanced level are all made in the national school in Valabre, called ECASC (National School for Forest Fire Training). To operate in forest fire fighting it is mandatory to attend trainings and to have certified the related competences. ECASC is responsible for forest fire trainings, it defines the skills and it certifies competences. A national commission of forest fire experts defines the programs for the trainings that ECASC delivers to fire fighters. In France, five levels have been identified for forest fire fighters:

- **Level 1**: basic fire fighters
- **Level 2**: group chief who commands a truck
- **Level 3**: platoon leader who commands 4 trucks and can command a small fire
- **Level 4**: command a fire which use a mobile HQ Chief of columns (Equivalent of 3 groups)
- **Level 5**: command big fire

To obtain the first two levels qualification, the training courses are organised at local level, while for the III, IV, and V level the courses are all made at ECASC, where a simulator is located.

4.5 Training organization for forest fire fighters in Croatia

In Croatia both professional and volunteer fire fighters can operate against forest fires. Professional fire fighters have a specific module regarding forest fires in their professional trainings. Volunteers can attend a 25 hours course if they are interested in, but it is not mandatory for operating in emergency conditions in forest fires. All fire fighters must pass a medical test every 2 years in order to be declared able to operate in emergency conditions. The Croatian Protection and rescue Directorate (NPRD) is responsible for forest fire trainings, and it delivers these courses through the Fire fighting School. All agencies involved in this structure are public. No detailed information have been obtained from the questionnaire.

4.6 Evaluations on the different organizations related with professional trainings about forest fire fighting

In this chapter a general description of each organization in terms of trainings about forest fire fighting has been made. This is only a general description because more detailed information about training will be developed in other task of the project (Task E). The differences highlighted in the previous chapters have been confirmed, even if under a general perspective, organization in all countries are very similar. Each of them have a structured organization, due to the relevance of forest fires in Mediterranean area. Most of these organizations refers to public Entities, even if in some cases (Portugal, Spain and partially Italy) there is also a participation of private agencies.

In each Country there is a national law aimed to define the structure to manage forest fires, and consequently to identify the needs and the organization of trainings for fire fighters. In some cases, such as Spain and Italy, although a general national organization, the main responsibilities and organizational challenges are under regional control. In the cases of France and Portugal the topic remains at national level and training activities are directly managed by national institutions. Despite this difference, the organization is very similar in all Countries. All Countries have identified specific roles for their fire fighting crews against forest fires. Also in this cases figures are similar, even if Italy and Spain have identified specific figures with specific roles while France and Portugal have identified increasing levels of competences with higher responsibilities at the increase of level. Another important difference is that in France, Portugal and Spain, only fire fighters (professional or volunteer) can operate against forest fires, while in Italy people who are not fire fighter can operate, as volunteers, in forest fire fighting. This is possible only when the volunteer has its own personal protection equipment and after both a medical assessment and a specific training. Finally, the analysis on general organization showed a good starting point for future implementation of common rules, figures and roles in forest fire fighting.

5. Analysis and assessment of training methods

In this chapter the analysis move inside the core of the topic under study, the training programs and methods behind the certification of competences in fire fighting. Training methods, approaches and durations have been reported, commented and organised in order to show the best points and the weaknesses in all Countries examined.

5.1 Tuscany Region trainings in forest fire fighting

The Training Centre 'La Pineta' is the only one establish in Italy until now. Since the beginning of the training activity in 2001, in Tuscany Region more than 45,000 forest fire operators have been trained in the different types of course:

For each training course a specific educational project has been developed. Each educational project includes:

- ✓ analysis of training needs and definition of learning objectives**;**
- ✓ educational tools;
- ✓ learning assessment methods (knowledge, competence and skills acquired evaluation; satisfaction form)
- ✓ course content and time schedule.

Educational tools includes lectures (with the support of multimedia presentations), classroom discussion, and field practice. The collaborating teaching methods is applied during the lectures in order to allow trainees to actively participate in the learning process by talking with each other and listening to others opinions. This method is useful to stimulate the attention and the active participation of the learners.

Field practice is part of training and include use of machine and tools, field condition assessment, fuel analysis and real fire fighting practice during the training activities about prescribed burns.

The School has:

- a classroom with an electronic whiteboard mainly used for debriefing and case study analyses;
- a classroom with computers for training the operators/coordinators of operational rooms;
- a classroom for cartography exercise;
- a classroom called "send bench" that allows. through the projection of orthophotos on white sand substrate, the simulation of fires with their progression and the possibility of hypothesizing fighting tactics and strategies, and for simulating the development of attack plans.

The school also has a warehouse with fire fighting tools and equipment that trainees can use during field exercises.

The main information about the courses each course are here summarized:

- **Firefighter basic level** (ground crew operator) - 3 days course (26 hours) + simulations. This course provides technical and operational skills to join firefighting teams. An updating course every 3 years of 6 hours is required. 20 trainees per edition are admitted;

- **Group leader** – For attending this course a prerequisite of 5 years experience as firefighter is required – 3 days course (26 hours) + simulations. This course provides technical and operational skills to coordinate 2 to 4 AIB teams. Update every 2 years (16 hours). 15 trainees per edition are admitted;
- **Incident commander** - 7 days course (56 hours) + simulations. This course provides technical and operational skills to prepare strategy, attack plan and coordinate all available resources. Update every year (16 hours). 12 trainees per edition are admitted;
- **Logistic specialist** - prerequisites 5 years as firefighter –3 days course (26 hours) + simulations. This course provides technical and operational skills to manage the water resource, to organize teams arrival and departure and to help incident commander in radio communications. Update every 2 years (16 hours). 15 trainees per edition are admitted;
- **Engine driver** - 3 days course (26 hours) + simulations. This course provides technical and operational skills to drive light or heavy trucks . 12 trainees per edition are admitted;
- **Prescribed fire manager** – accessible only to incident commanders; 3 days course (26 hours) + collaboration in 5 prescribed fire execution. This course provides technical and operational skills to manage and coordinate prescribed fires. 12 trainees per edition are admitted;
- **Drip torch user** - 3 days course (26 hours) + practice on 3 prescribed fires . This course provides technical and operational skills to be applied in prescribed fire. 12 trainees per edition are admitted.
- **Chainsaw user** (volunteers); 2 days course (16 hours)+ simulations. 12 trainees per edition are admitted;
- **Coordinator and operator of the operational room** - 2 days course (16 hours) + simulations . This course provides technical and operational skills to handle all available resources. 15 trainees per edition are admitted .Update every year (8 hours).

5.2 Portuguese training activities: ENB's training programs and strategy as national school for fire fighters

ENB has a developed structure where a complete set of training programs is applied during training sessions. The complete set of training programs related to forest fire fighting is attached in the ANNEX I. Here, a resume of the most important programs, methods and educational resources used in training activities is reported for all the figures.

- **Forest Fires – Level 1**

  Basic level, this course provides trainees with technical and operational skills to integrate first intervention teams in forest fire extinguishing operations. The course is 50 hours (10 theoretical and 40 practical) and 16 trainees per edition are admitted.

- **Forest Fires – Level 2**

  This course provides trainees with technical and operational skills to lead teams in forest fire extinguishing operations. The course is 25 hours (10 theoretical and 15 practical) and 16 trainees per edition are admitted.

- **Forest Fires – Level 3**

  This level provides trainees with technical and operational skills to command forest fire extinguishing operations involving a maximum of six teams. The course is 35 hours (9 theoretical hours and 26 practice hours) and 16 trainees per edition are admitted.

- **Forest Fires – Level 4**

  This course provides trainees with technical and operational skills to lead a combat or reinforcement groups in forest fire extinguishing operations. The course is 50 hours (6 theoretical hours and 44 practice hours) and 16 trainees per edition are admitted.

- **Forest Fires – Level 5**

  This course provides trainees with technical and operational skills to lead a combat group in forest fire extinguishing operations. The course is 50 hours (8 theoretical hours and 42 practice hours) and it is activated for minimum 18 and maximum 20 trainees.

- **Aerial Operations – Level 1**

  The course provides trainees with technical and operational skills to perform the role of air operations officer in forest fire extinguishing operations. The course is 25 hours (13 theoretical and 12 practical) and 16 trainees per edition are admitted.

- **Aerial Operations – Level 2**

  The training provides trainees with technical and operational skills to perform the function of coordinator of aerial operations (COPAR) in forest fire extinguishing operations. The course is 25 hours (6 theoretical and 19 practical) and 12 trainees per edition are admitted.

- **Forest Fires – Personal Safety and Fire Behaviour**

  This training provides trainees with skills to assess fire behaviour and support them in strategies definitions, tactics and manoeuvres, assuring every moment the safety conditions of the personal, and minimizing the occurrence of accidents during the operations of forest fire suppression. The course is 25 hours (12 theoretical and 13 practical) and 16 trainees per edition are admitted.

- **Forest Fires – Recognition and Situation Evaluation Teams**

  This course provides trainees with technical and operational skills to integrate the recognition and situation evaluation teams (ERAS) in the context of forest fires. The course is 35 hours (10 theoretical hours and 25 practice hours) and 16 trainees per edition are admitted.

- **Forest Fires – Forest fire prevention**

  This course provides trainees with skills to perform fire prevention tasks in forest areas. The duration of the course is 50 hours (24 theoretical hours and 26 practice hours) for a maximum of 16 trainees.

- **Forest Fires – Prescribed burn**

  Provide trainees with technical and operational skills to prepare and perform prescribed burns. The duration of this course is 50 hours (12 theoretical hours and 38 practice hours) and 16 trainees are the maximum per edition.

All the described courses are structured in order to allow trainees to learn as maximum as possible on the topic. Most of the hours are dedicated to practical activities, simulations and practical training.

Training methods

In the theoretical sessions, the expository method is used to transmit theoretical concepts and knowledge with the support of multimedia presentations.

The interrogative method is used to ask questions and stimulate the discussion with the trainees. Case studies are also used to stimulate group analysis and discussion.

The practical sessions consist of the application of the demonstrative method, to show the operation of different equipment and the execution of practical manoeuvres, individually or in team. In practical sessions, the trainees are placed in a practical area that allows them to repeatedly train the various techniques.

Practical exercises are also performed that combine the different manoeuvres and techniques in the context of a simulated scenario, using real vehicles and equipment. Real fire may be used in the exercises if the weather conditions allow it to be carried out safely.

Simulated exercises using virtual reality are performed to practice the operations management system and the organisation of a command post.

Educational resources

Through an e-learning platform are made available manuals and handouts to support learning.

PowerPoint presentations and other multimedia elements, especially video, are used to support the presentation of the different subjects throughout the theoretical sessions.

5.3 Training Courses for forest fire fighters in Castilla y Leòn

METHODOLOGY OF TRAINING IN CASTILLA Y LEÓN

Design of training based on objectives and acquisition of competences. The design of the training activities is based on work on knowledge, skills and attitudes. For each module, a selection of the most appropriate methodology is made: master class, individual work and group dynamics. An important part of the training is the role-playing exercises followed by debate dynamics and obtaining conclusions. In recent years, a part of online training has been included, but only the initial theoretical topics or an individual final exercise of the student are addressed as a formula for a complete revision of the contents of the course.

Difficulties and constraints:

- The annual staff renewal rate

- The reduction of budgets since 2011. It has associated pressure to redirect more training modules to online mode to reduce costs.

- Certain lack of motivation of a part of veteran personnel towards the recycling training.

In Castilla y Leon, for each figure involved in fire fighting activities a specific training course is available. Here a resume containing the most important aspects:

- **Incident Commander, DTE**
  For DTE, it is necessary to attend **TEC.1** course. Moreover, it is possible to attend also a voluntary adding course, the **TEC.2:** advanced course for forest fire technician. 50 hours. The aim of higher education is to equip the DTE with professional skills to deal with fires which, due to their special gravity, require the intervention of extraordinary means, greater sectorization and the establishment of support sections: operations, planning and / or Logistics.

- **Incident Commander Assistant (DTE "auxiliar")**
  For "DTE auxiliar", a course of 60 hours is necessary. The code of the course is TEC.1: basic course for forest fire technicians. The general objective is to train the Technicians in the procedures of planning of the extinction of forest fires and in the execution of the extinguishing works based on criteria of personal security and effectiveness.

- **Forest Ranger (Forest warden, Environmental agent) AM;**
  Three different courses have to be attended to become AM. Basic (**AGM.1**, 45 hours), Advanced (**AGM.2**, 35 hours) and Updating (**AGM.3**, 24 hours) courses for forest fire ranger.
  AGM.1: the general objective of the course is to train the Agents in the performance of the functions of the chief of extinction in forest fires, with special attention to the safety of the personnel of the operation under his charge.
  AGM.2: the general objective of the course is to review the Environmental Agent's own functions in relation to forest fires, applying them to the extinction of fires that can not be controlled in a first attack and to the permanent supervision of the Operation.
  AGM.3: General objective: to review the working procedures of a Forest or Environmental Agent in the extinction of forest fires of complex organization.

- **Fire Lookout VI;**
  The required course is **VIG.0**: Training course for forest fire watchman. Duration: 6 hours. Objectives: monitor the assigned territory; identify false alarms; transmit alarms in a precise and concise manner; evaluate the alarms: dangerousness, probable evolution, etc.; serve as a communications link; take meteorological data for the calculation of hazard indexes.

- **Helitack operator PH;**
  The course provided is **CUA.0**: training course for ground crew and heli-transport in forest fires. 14 hours. The aim of the course is to furnish all the knowledge to the fire operator in order to operate in direct attack to forest fire, including organization, safety and efficiency criteria.

- **Brigade foreman CT;**
  To become CT it is necessary to attend the course **CAP.0**: Course for foreman of land brigades in forest fires, 14 hours. General objective: to train in the performance of the functions of the crew foreman in forest fires extinction, seeking to optimize organization, safety and efficiency in the works

- **Brigade Worker PT;**
  For PT, the same course of PH is provided.

- **Helicopter pilot PHT;**
  To become PHT, it is necessary to attend **PHT.0** course: training session for aircraft pilots on action in forest fires. General objective: to update and homogenize the work procedures of air means in the operations of fire suppression forest in Castilla y León.

- **Fire engine driver CA;**
  For the role CA two courses are provided, **AUT.0** (14 hours) and **AUT.1** (7 hours): Basic and advanced training course for drivers and operators of fire engine.
  AUT.0: General objective: to improve the performance of the workers' own tasks, with special emphasis on organization, safety and efficacy of suppression work.
  AUT.1**:** The general objective of the course is to review the safety and the working procedures using engines to extinguish the fire.

- **Fire engine assistant PA;**
  For PA, the same training courses of CA are provided.

- **Heavy machinery driver CM;**
  To become CM, it is necessary to attend **MAQ.0** (14 hours) and **MAQ.1** (7 hours) training courses: basic and advanced training course for drivers of heavy machinery in forest fires.
  MAQ.0: to train the worker for the forest fire extinguishing operations with bulldozer, seeking to optimize organization, safety and efficiency in the works.
  MAQ.1: The general objective of the course is to review the safety and the working procedures using bulldozers to extinguish the fire

- **Helitack officer RH;**
  The role of RH implies to attend the course **REL.1** (14 hours): coordination course for helicopter technicians and foreman. The general objective of the course is to establish the general working guidelines of the heli-transported units as first-attack means specialized in extinction.

5.4 French organization of training activities

Level 1 (FDF 1) is the basic forest fire fighter training to became member of a crew on a truck. Basic skill on safety procedure, knowledge on forest fire, knowledge of basic forest fire procedures are given. The training lasts 32 hours.

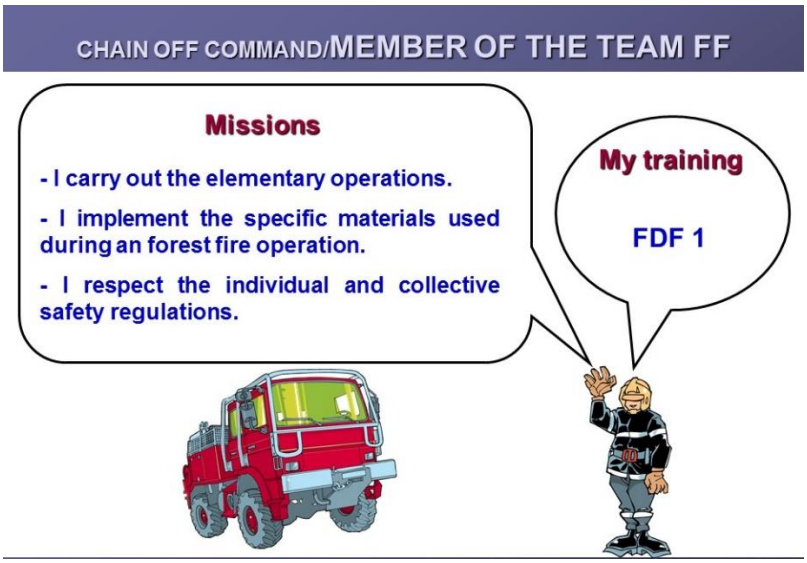

Figure 18 – Main competences of firefighters with FDF1

Level two (FDF 2) it is the training required to become chief of a truck and command a team of 4 fire fighters. Safety procedures, attack methods to be applied on an initial forest fire are the main ability required. The training lasts 34 hours.

These two first levels of training are taught in the departments and not at the ECASC

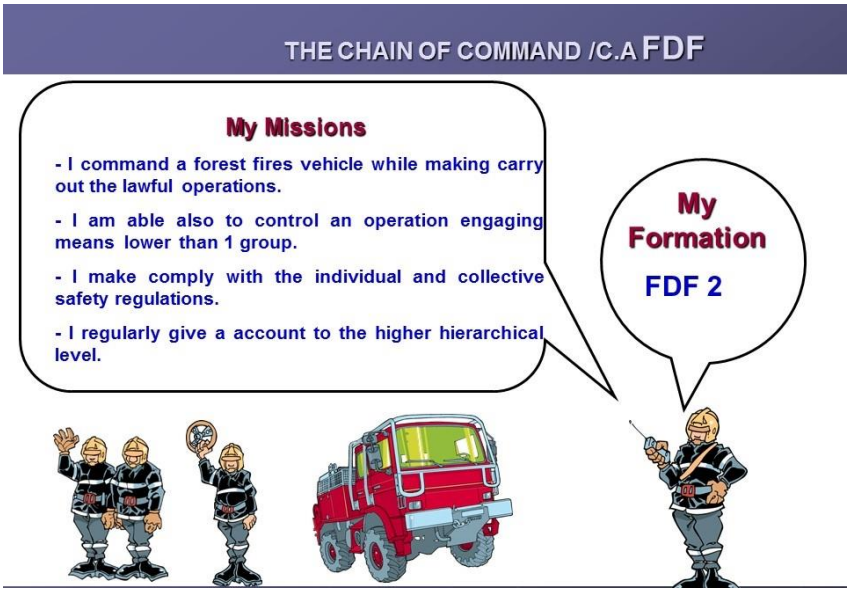

Figure 19 – Main competences of firefighters with FDF2

Level 3 (FDF 3): Chief of a group - Objectives: managing the operational commitment of two intervention groups and the initial attack of water bomber aircraft. Contents: situation awareness, method of command, safety, development of order. Course duration: 80 hours, one week on the simulator and one week on the field. Final evaluation of trainee required.

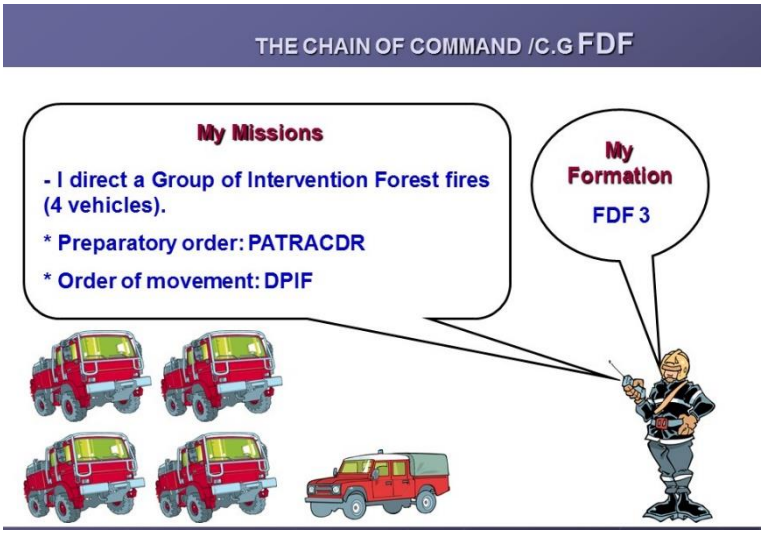

Figure 20 – Main competences of firefighters with FDF3

Level 4: Chief of column (3 groups) - Objectives: managing the operational commitment of 3 intervention groups and the attack of water bomber aircraft. Command of a sector, work in field command post. Contents: situation awareness, method of command, safety, development of order, skills in command post. Course duration: 80 hours, two week on the simulator. Final evaluation of trainee required.

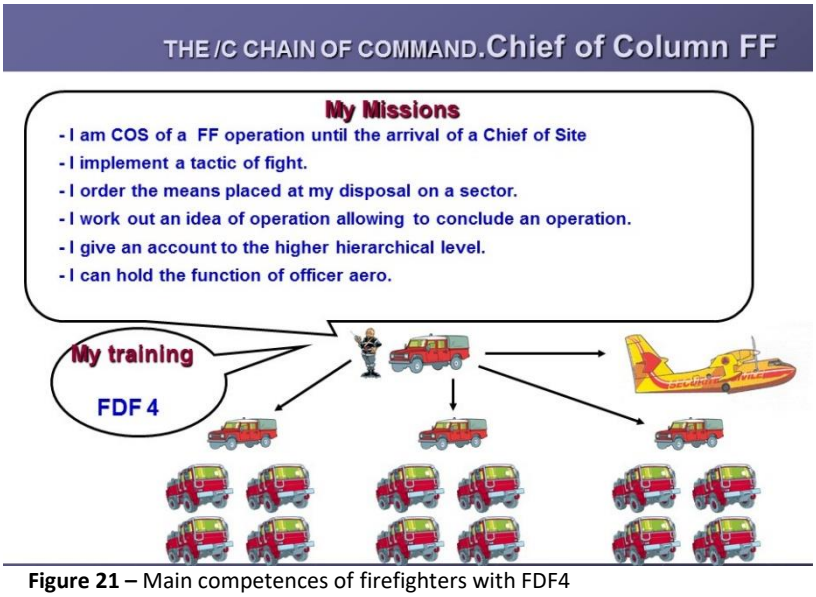

Figure 21 – Main competences of firefighters with FDF4

Level 5: Incident Commander

Objectives: managing the operational commitment of a lot of intervention groups, a field command post, the attack of water bomber aircraft and command as incident commander. Contents: management of large fire, relationship with LEMA and other services committed on the fire. Course Length: 80 hours, two week on the simulator. Final evaluation of trainee required.

For all reported training activities the lessons are of 3 types: i) front lesson; ii) e-learning; iii) simulation. Moreover, multimedia materials, simulators and manuals and handouts are provided to trainees in order to optimize the learning process.

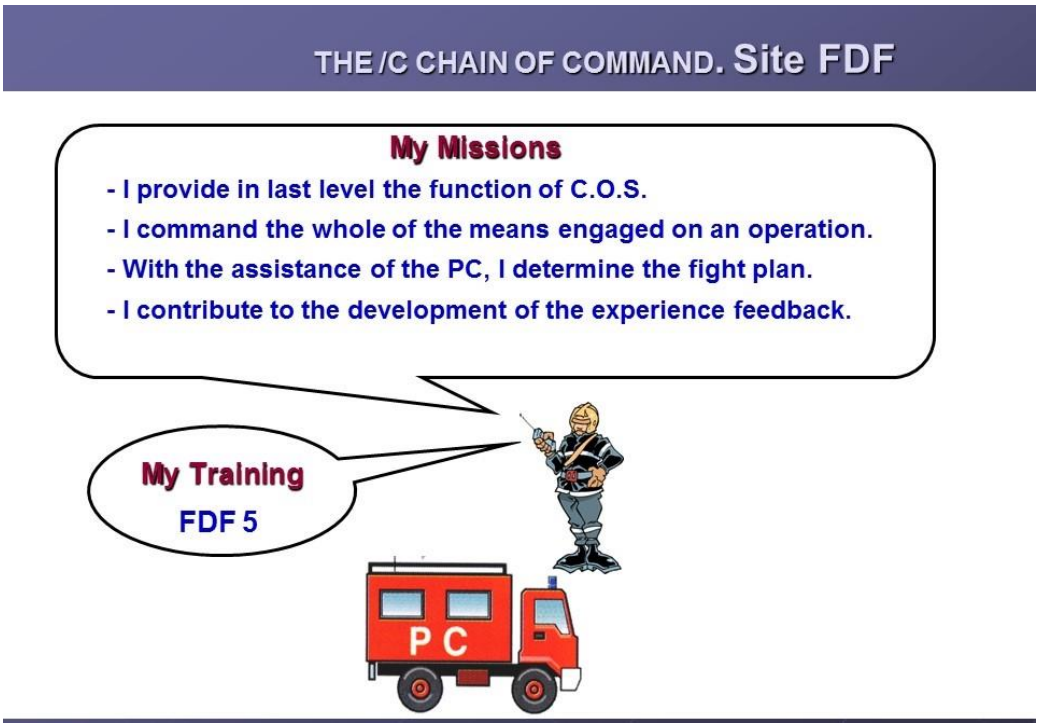

Figure 22 – Main competences of firefighters with FDF5

5.5 Croatian organization of training activities

Very few information have been provided from Croatia. The only information regarded the use of the same training methods and materials described for French trainings (front lessons, e-learning and simulation).

6. Accident and safety measures

6.1 Injuries related to forest fire fighting – available information

Forest fire firefighting is arduous work, performed for long shifts in extremely difficult environmental conditions. Firefighters are exposed to several risk of injuries and to physical, chemical and biological agents that due to repeated or continuous exposure can lead over time to occupational disease. The work can be dangerous, due to the fire and the working conditions. The most important risks for the workers are related with the exposure to heat, smoke, and environment (steep terrain, rolling rocks, falling snags etc.). Other factors potentially affecting the workers' health are heavy loads use of sharp tools, noise and other related with aerial operations. Heavy workload and fatigue can impair performance and decision-making, thus increasing the risk of injuries. Moreover, prolonged exposure to fatigue, stress, smoke, and poor nutrition and hydration has the potential to increase the incidence of upper respiratory illness and other illnesses.

Considering the high risks related to this job, an analysis regarding injuries occurred during forest, firefighting may be important to improve the debate and to develop new solutions for accident reduction in this field. For this reason, we decided to develop a survey in the countries/regions of the work accidents occurred in firefighting. Due to the high incidence of injuries caused by forest fire also to citizens living in the rural area or carrying out recreational activity in the forest, we decided to include in the survey also the accident to people not directly involved in firefighting.

The main result of the survey is the lack of official data about firefighter injuries in France, Italy and Portugal, while for Spain some data are available, even though they are made available with a few years of delay.

6.1.1 Statistics from Spain

The Security Working Group of the CLIF (Committee for the Fight against Forest Fires), under the Ministry of Agriculture and Fisheries, Food and Environment, has been working since its early years in the creation of a national statistics of accident occurred in the suppression of fires. The data published to date are data on the fatal accidents in forest fires in Spain, as well as other reports on case history of events in the suppression of forest fires (BRIF, Forest Fire Reinforcement Brigades of the Ministry, and aerial means).

The data currently available for fatal accidents refer to the period 1991-2012 (Table 10; Figure 23). In this period, 141 accidents were recorded for firefighters and 46 affected people not involved in firefighting. The most common cause of accident for both the categories were entrapment and aerial accident.

Table 10 – Fatalities occurred during forest fires in Spain (from 1991 to 2012)

Cause	Fire suppression personnel	Personnel that does not intervene in the suppression
Aerial Accident	48	3
Vehicle Accident	6	2
Accident with machinery	6	0
Falls	1	2
Entrapment	56	28
Medical events	8	3
Landslides / Rocks	3	0
Electrocutions	1	0
No data	12	8
TOTAL	**141**	**46**

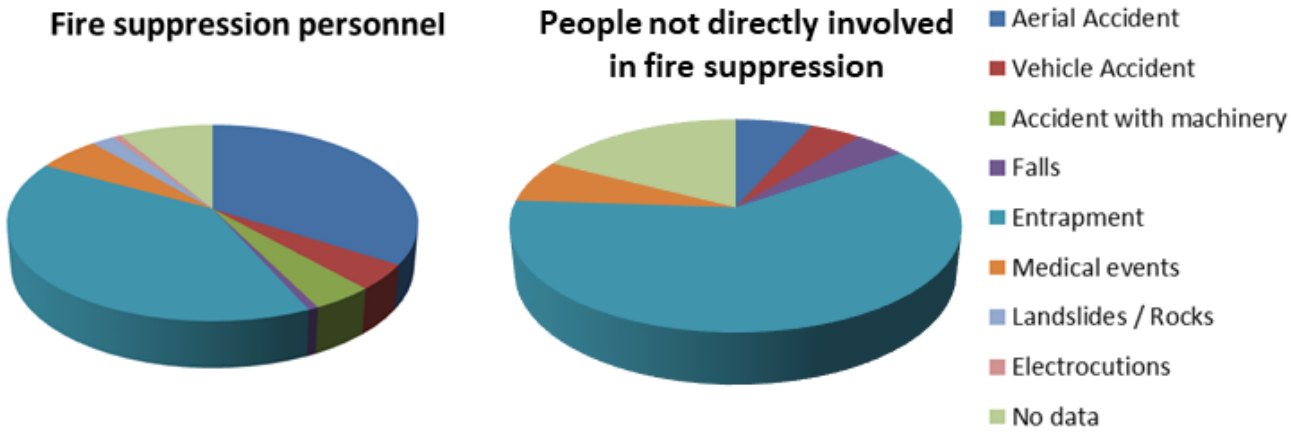

Figure 23 – Causes of fatalities occurred to firefighters to people not directly involved in firefighting, Spain 1991-2012

6.2 Individual and collective safety measures

Safety measures play a key role in preventing accident to firefighter. The Table 11, 12 and 13 summarize the individual and collective safety measures applied in each participant country.

Table 11 – Individual safety measures applied in each participant country

Individual safety measure		***Tuscany Region***	***Portugal***	***Castilla y Leòn***	***France***	***Croatia***
Common uniform	*Do you have it?*	Yes	Yes	Yes	Yes	Yes
	In allocation or paid by FF?	Allocation - For volunteers paid by each organization	Allocation	Allocation	Allocation	Allocation
	Is it mandatory?	Yes	Yes	Yes	Yes	Yes
Head protection		Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
Hands protection		Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
Protective clothes		Flame resistant coverall	Trousers and fireproof coat	Fireproof clothing and neck protectors	Parka, jacket and pants fireproofed	Overalls in nomex material
Protective shoes		Boots fire resistant	Boots fire resistant	Boots fire resistant	Boots fire resistant	Boots fire resistant
Other PPE		/	/	Mask, safety glasses, Auditory protector	Protective cover	/
Sustainability equipment		Evacuation mask, safety glasses and flashlight	Fire shelter and hydration system, evacuation mask and flashlight	Particle mask	Individual mask Hydration system	/
Medical examination		Yes Every 1-2 years	Yes Every 2 years	Yes Every year	Yes Every year	/
Rules of incapacity		Minimum 18 years old, Lack of medical standards	Yes. Age limit fixed at 65 years old	Yes. Defined in a special document	Yes. Lack of medical and physical standards	Yes, weight, age, illnesses
Information to operators about	*Personal hygiene*	No	No	Yes	Yes	No
	Special fitness required	No	No	n.a.	Yes	No
	Drugs and alcohol	No	No	Yes	n.a.	No
Special food	*Do you have it?*	No	No	No	No	No
Fire fighters Rescuers	*Are they also rescuers?*	No	Yes	No	Yes	Yes
	Do they have rescue equipment?	/	Life support and trauma bag in the vehicle	Yes. Full first-aid kit	n.a.	Not mandatory

Table 12 - Collective safety measures applied in each participant country

Collective safety measures		***Tuscany Region***	***Portugal***	***Castilla y Leòn***	***France***	***Croatia***
Sanitary rescue	*What?*	Ambulances	Ambulances	Constitution of Health Group	Ambulance with doctor 24/24	First Aid vehicles with doctor
	Where?	Inside the operational theatre	Specific areas in operational zone	Close to operation zone	Near the command post	Near the command post
	How much time to arrive?	n.a.	10-15 minutes (avg. max)	Few minutes	Few minutes	Few minutes
Collective Safety measures	*Do you have it?*	Yes	Yes	Yes	Yes	No
	Which one?	LACES protocol	LACES protocol	LACES protocol	Self protection with all vehicles	/
Safety equipment in the vehicle	*Do you have it?*	Yes	Yes	Yes	Yes	No
	Which one?	Sprinklers	Sprinklers	First-aid kit 500 l of water reserve	Water protection	/
Radio link	*Do you have it?*	Yes	Yes	Yes	Yes	Yes
	With who?	Operational room, command post, aerial means, chiefs, Commanders and fire fighters	Operational room, command post, aerial means, chiefs, Commanders and fire fighters	Operational room, command post, aerial means, chiefs, Commanders and fire fighters	Officer commander	Aerial means and command post
Shifts		6 hours	8, 12, 24 hours	Yes, 12 hours	Yes, generally 8 hours	Yes, 12 hours
Food and water distribution	*food*	Generally every 6 hours	Every 8 hours hot meals. Frequent light meals	It depends on the event	Yes	Depends on local community
	Water	Generally every six hours	1,5 litres per hour	It depends on the event	Yes	Depends on local community.
Maps	*Do you use it?*	Yes	Yes	Yes	Yes	Yes
	What scale?	1:25000	1:25000	1:25000	1:25000	n.a.
Road creation		Yes, with bulldozer	Yes, with bulldozer	Yes	Yes	Yes

Safety zones in forest	No	No	No	Yes	No

Table 13 - Collective safety measures applied in each participant country

Collective safety measures		***Tuscany Region***	***Portugal***	***Castilla y Leòn***	***France***	***Croatia***
Mandatory rest periods	*Do you have it?*	No	No	Yes	Yes	Yes
	Description	/	/	10 hours of rest after exceed of scheduled time	2-3 days rest after 1 day of work	n.a.
Maximum time of work per operator		6 hours. In special conditions more.	24 hours	12 hours	24 hours	24 hours
Responsible to control work time	*Who is?*	DO AIB	Logistic cell of command post	PMA	Officer commander and team leader	On site commander
Water points in the forest	*Do you have it?*	Yes	Yes	Yes	Yes	No
	Which one?	Tanks, water basin, etc.	Tanks, water basin, etc.	Fixed in the territory	Tanks, water basin, etc.	/
Exercises	*Do you organize it?*	Yes	Yes	Yes	Yes	Yes
	How often?	Annually	Annually	n.a.	Annually	Annually
	What kind of exercises??	All chain of command	Level IV operations system	Aerial and ground means	Whole chain of command	n.a.
	What kind of evaluation?	Team of auditors	Team of Auditors	No evaluation, only monitoring	Internal	Internal

Regarding the use and the availability of individual and collective measure, the realities examined are very similar. Few differences are present and these do not highlight heavy weakness on safety level. In all countries, it is necessary a medical surveillance for working in forest fire fighting. In Portugal, it is required for all those who wish to enter the firefighter's career, the presentation of a medical certificate attesting that the candidate is physically and mentally fit to perform the functions of fire fighter. Volunteer firefighters are not legally required to conduct annual medical examinations, however, there is a medical surveillance program especially directed at volunteer firefighters since 2013. Professional firefighters conduct occupational health medical examinations, which occur every two years.

The most important existing difference is that in Tuscany and Castilla y Leòn fire fighters are not rescuers, while in Portugal and France they are.

7. Conclusions. Challenges for an efficient standardisation of training activities at European level

In this deliverable the firefighting systems, training structures and safety measures applied in the countries of the project partners have been described. The analysis of the information collected highlighted differences and similarities about organization, approach and means applied in firefighting. On the basis of the results of this analysis, it is possible to highlight the main aspects that would require further development for improving the collaboration capacity in forest fire fighting. In particular, it will be necessary:

- to recognize the different approaches applied in the partners countries. Organization at national level in France and Portugal, at regional level in Italy and Spain. Despite the different level of organisations, a general common structure emerged in all the analysed countries/regions, including the same solutions for the main aspects. In fact, a regional or national responsibility of forest fire organisation does not differ heavily in the practical organization and in the main figures of the chain of command. The management of the emergencies, including the management of means and operators, have similar organizational and operative procedures. Differences can be easily solved in order to collaborate against border emergencies and big fires, if a reciprocal knowledge of the existing differences is provided to the main figures of the chain of command. It means that it is possible to make these organisations able to collaborate without big changes in their own approaches to forest fire fighting organization. This is a key aspect to be considered for developing collaborations and agreements;
- to share information about the organizational structure applied in each country in order to allow efficient collaboration. In this sense, It would be advisable to establish a list of equivalences between the profiles involved in the fire extinguishing operation of each country. In particular, it would be important to make this equivalence finding common figures independently of regional or national organization. In fact, figures and roles involved in fire fighting structure are mostly the same. Differences are mainly related with the position in the national/regional organisation, but it does not negatively influence collaborations, if both parties well know the reciprocity of roles with partners;
- to compare and find the right matches among training level for each profile;
- to homogenize, as far as possible, the basic content of the training courses of each profile. Apart from the common part, each country will have a specific part depending on its peculiarities. This is also a chance of improvement for all countries/regions in order to optimize their own training activities taking into account the strengths of the others;
- to establish a common and basic nomenclature and symbology related with forest fire for all countries. In fact, communication is the main challenge for an efficient collaboration between two or more organizations, especially when there are differences in languages;
- to collect data about accident and fatalities in all the countries, taking into consideration both firefighters and people not directly involved in firefighting. The development of a common procedure for the data collection is strongly suggested. Data collected with similar standards are comparable and may be useful for improving safety in all the countries. It is a very important and difficult challenge. Normally, it is hard to obtain information on injuries and fatalities in all activities/works being this a

thorny topic. However, a complete overview of injuries and fatalities would be a fundamental information for improving health and safety levels for forest fire fighters.

- to increase the collaboration between training centres for exchanging experiences and share the lessons learned at the end of each fire season.

Finally, a change of vision would have the best effects in collaborations in forest fire fighting. In fact, a collaborative and sharing approach in relations between countries/regions would be the best way to improve and to enhance collaborations. Often, each organization invest resources (time and money) for the improvement of aspects already optimized in other realities, but they don't know that because of lack of communications. This is the worst way to spend resources. An active network with strong links between fire fighting organizations is the key for an effective and sound improvement of the sector through the optimization of investments.

ANNEX I – Questionnaire used to obtain information from Partners

MEFISTO
MEDITERRANEAN FOREST FIRE FIGHTING TRAINING STANDARDISATION

QUESTIONNAIRE

Project Acronym	MEFISTO	Task ID	B	Task Titles	Mediterranean forest fire fighting: state of the art

Partner Responsible for implementation:	ENB	Partner Contribution	All

PART I – Analysis, understanding and comparison of procedures, methods and techniques

I.1 - Please describe in detail your forest fire prevention and suppression strategy at National and, if present, Regional and Local level.

dd

I.2 - Which agency/ies is/are responsible for the forest fire prevention/suppression? At what level?

Clique aqui para introduzir texto.

National ☐ → Regional ☐ → Local ☐

I.3 - The agency is:

Public ☐ → Private ☐

I.4 - Which agency has in charge the drafting of procedures?

Clique aqui para introduzir texto.

I.5 - Is there a management system for forest fire operations? At What level?

Yes ☐ → No ☐

National ☐ → Regional ☐ → Local ☐

Please describe:

Clique aqui para introduzir texto.

I.6 - Does the management system address multi agency operations?

Yes ☐ → No ☐

Please describe:

I.7 Describe in detail the incident command structure for forest fire operations. It is important to identify each position of responsibility describing the duties for each role.

I.8 Describe in detail the operational room's structure for forest fire coordination.

Clique aqui para introduzir texto.

I.9 Which agency is responsible for forest fire suppression at operational level? At what level?

Clique aqui para introduzir texto.

National ☐ → Regional ☐ → Local ☐

I.10 The agency is:

Public ☐ → Private ☐

I.11 The forest firefighters operate at what level?

National ☐ → Regional ☐ → Local ☐

I.12 The forest firefighters are:

Professional ☐ → Volunteer ☐ → Both ☐

I.13 What are the available resources for forest fire operations?

Ground means ☐ → Aerial means ☐ → Helitransported teams ☐ Others ☐

I.14 Please describe in detail at what level each resource is managed.

Clique aqui para introduzir texto.

I.15 What methods of suppression/suppression tactics (direct and indirect attack, mop up) are used?

Clique aqui para introduzir texto.

I.16 How do you select an appropriate suppression method/tactic?

Clique aqui para introduzir texto. →

I.17 Do you use a wildfire prediction system (Campbell Prediction System or similar)?

Yes ☐ → No ☐

Please describe:

Clique aqui para introduzir texto. → ¶

I.18 – Is there a specific organization/procedures for big forest fire operations?

Yes ☐ No ☐

Please describe:

Clique aqui para introduzir texto. ¶

I.19 – Additional information (which you consider important)

Clique aqui para introduzir texto. → ¶

PART II – Analysis, understanding and comparison of the National/Regional Forest Fire Training organization

II.a. – Qualification

II.a.1 – Is it necessary to have a professional qualification for forest firefighting?

Yes ☐ → No ☐ ¶

II.a.2 – Please describe the qualification in detail for all the roles involved in forest firefighting.

Clique aqui para introduzir texto. ¶

II.a.3 – The qualification is:

Mandatory ☐ → Optional ☐ ¶

II.a.4 – How can this qualification be obtained?

Training ☐ → Experience ☐ → Both ☐

Clique aqui para introduzir texto. ¶

II.a.5 – What are the qualification access requirements (literacy, physical condition, psychological condition, others)? Please describe the requirements for each role involved in forest firefighting.

Clique aqui para introduzir texto. ¶

II.a.6 – Is there a competence framework associated with this qualification? Please describe the competence framework for each role involved in forest firefighting.

Clique aqui para introduzir texto. → ¶

II.b. – Training organization

II.b.1 – Is there any legal framework for forest firefighting training?

Yes ☐ → No ☐ ¶

II.b.2 – Please describe in detail the legal framework/s, highlighting minimum requirements, specific rules and constraints.

Clique aqui para introduzir texto.

II.b.3 – What is the agency responsible for forest firefighting training? At what level?

Clique aqui para introduzir texto.

National ☐ → Regional ☐ → Local ☐

II.b.4 – The agency is:

Public ☐ → Private ☐

II.b.5 – At what level is organized the training?

National ☐ → Regional ☐ → Local ☐

II.b.6 – Which agency certifies the training? At what level?

Clique aqui para introduzir texto.

National ☐ → Regional ☐ → Local ☐

II.b.7 – The agency is: II.b.7 – The agency is:

Public ☐ → Private ☐

II.b.8 – Which agency/ies delivers the training? At what level?

Clique aqui para introduzir texto.

National ☐ → Regional ☐ → Local ☐

II.b.9 – The agency is:

Public ☐ → Private ☐

II.b.10 – Which agency define/certificate the skills of the trainers? At what level?

Clique aqui para introduzir texto.

National ☐ → Regional ☐ → Local ☐

II.b.11 – The agency is:

Public ☐ → Private ☐

II.b.12 – Which agency defines the training programs? At what level?

Clique aqui para introduzir texto.

National ☐ → Regional ☐ → Local ☐

II.b.13 – The agency is:

Public ☐ → Private ☐

II.b.14 – What training levels exist for forest firefighting? (e.g. Level 1, Level 2, (…) or Basic, Intermediate, Advanced, (…)). Please list and describe in detail the training levels.

Clique aqui para introduzir texto.

II.b.15 – Is there any precedence between the training levels?

Yes ☐ → No ☐

Please describe:

Clique aqui para introduzir texto.

II.b.16 – Are there training references or standards?

Yes ☐ → No ☐

Please describe:

Clique aqui para introduzir texto.

II.c – Forest Fires training courses

Please identify for each training course:

a) → Objectives
b) → Contents
c) → Course Length
d) → Evaluation

PART III – Analysis and assessment of training methods, and related inter-operational problems

III.a – Training methods

Please identify for each training course:

a) → Presential
b) → E-learning
c) → B-learning

III.b – Educational resources

Please identify for each training course the educational resources:

a) → Multimedia materials
b) → Simulators
c) → Handouts and manuals

III.c.- Difficulties and constraints of the training entities at the technical and organizational level

Please describe:

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III.d.- Additional information (which you consider important)

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PART IV - Individual and collective safety measures

IV.a.- Individual safety measures

IV.a.1 - In your organization, do have you a common uniform?

Yes ☐ → No ☐

IV.a.2 - Is it an allocation or does it pay by each fire fighters?

Please describe:

Clique aqui para introduzir texto.

IV.a.3 - Is it mandatory on fire?

Yes ☐ → No ☐

IV.a.4 - Do all fire fighters have it?

Yes ☐ → No ☐

IV.a.5 - Do you have head protection?

Yes ☐ → No ☐

Which one?

Clique aqui para introduzir texto.

IV.a.6 - Do you have hands protection?

Yes ☐ → No ☐

Which one?

Clique aqui para introduzir texto.

IV.a.7 - Do you have protective clothes?

Yes ☐ → No ☐

Which one?

Clique aqui para introduzir texto.

IV.a.8 - Do you have protective shoes?

Yes☐ → No☐¶

Which one?:

Clique aqui para introduzir texto.¶

IV.a.9 Do you have other protective equipment?¤

Yes☐ → No☐¶

Which one?:

Clique aqui para introduzir texto.¶

IV.a.10 Have you sustainability equipment (fire shelter, particle mask, hydration system, evacuation mask)?¤

Yes☐ → No☐¶

Which one?:

Clique aqui para introduzir texto.¶

IV.a.11 Is there specific personal equipment for women or is it the same model for both genders?¤

Please describe:

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IV.a.12 If you don't have complete personal equipment, it's allowed remaining in a fire scenario without it?¤

Yes☐ → No☐¶

IV.a.13 Do you realise a special medical examination ? Which is the frequency? ¤

Yes☐ → No☐¶

Please describe:

Clique aqui para introduzir texto.¶

IV.a.14 Have you a medical examination at the time of admission?¤

Yes☐ → No☐¶

Please describe:

Clique aqui para introduzir texto.¶

IV.a.15 Have you done any physical assessment at the time of admission?¤

Yes☐ → No☐¶

Please describe:

Clique aqui para introduzir texto.

IV.a.16 – After admission, do you perform physical tests annually?

Yes ☐ → No ☐

Please describe:

Clique aqui para introduzir texto.

IV.a.17 – Do you have some rules of incapacity (weight, size, age, gender, illnesses e.g. diabetes)?

Yes ☐ → No ☐

Please describe:

Clique aqui para introduzir texto.

IV.a.18 – Do you give some informations about the personal hygiene? Which ones? Do you control them?

Yes ☐ → No ☐

Please describe:

Clique aqui para introduzir texto.

IV.a.19 – Do you ask a special fitness? Do you put at disposal of fire fighter some specific equipment?

Yes ☐ → No ☐

Please describe:

Clique aqui para introduzir texto.

IV.a.20 – Do you give special food, before, during or after the fire? Which one?

Yes ☐ → No ☐

Please describe:

Clique aqui para introduzir texto.

IV.a.21 – Are the firefighters also rescuers? They have training about the gestures which save?

Yes ☐ → No ☐

Please describe:

Clique aqui para introduzir texto.

IV.a.22 – Do the firefighters have rescue equipment (e. g. first aid kit)? Where?

Yes ☐ → No ☐

Please describe:

Clique aqui para introduzir texto.

IV.a.23 – Do you speak about the drugs, alcohol? Do you have specific measures in case of drug or alcohol?

Yes ☐ → No ☐

Please describe:

Clique aqui para introduzir texto.

IV.b. – Collective safety measures

IV.b.1 – What do you use to sanitary rescue? Where is it? How much time are it from attack line?

Please describe:

Clique aqui para introduzir texto.

IV.b.2 – Do you define special rules during transportation, before, during and after the attack?

Yes ☐ → No ☐

Please describe:

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IV.b.3 – Have you collective safety measures in case of danger during the attack? Which ones?

Yes ☐ → No ☐

Please describe:

Clique aqui para introduzir texto.

IV.b.4 – Have you specific equipment in the vehicle (self-protection or others)?

Yes ☐ → No ☐

Please describe:

Clique aqui para introduzir texto.

IV.b.5 – How do you rescue a vehicle in danger?

Please describe:

Clique aqui para introduzir texto.

IV.b.6 – Have you radio link? With who?

Yes ☐ → No ☐

Please describe:

Clique aqui para introduzir texto.

IV.b.7 – Have you a safety radio link? Which one?

Yes ☐ → No ☐

Please describe:

Clique aqui para introduzir texto. →

IV.b.8 – Do you organize some shifts?

Yes ☐ → No ☐

Please describe:

Clique aqui para introduzir texto.

IV.b.9 – Do you distribute water and food? Which one? When? Who?

Yes ☐ → No ☐

Please describe:

Clique aqui para introduzir texto.

IV.b.10 – Do you work with maps? Which one? Which scale? Who?

Yes ☐ → No ☐

Please describe:

Clique aqui para introduzir texto.

IV.b.11 – Do you identifie the dangerous areas, obstacles? How? Who? For who? Who and how do you inform the firefighters?

Please describe:

Clique aqui para introduzir texto.

IV.b.12 – Do you create special roads in the forest (e.g. with U-turn zones)?

Yes ☐ → No ☐

Please describe:

Clique aqui para introduzir texto.

IV.b.13 – Have you security zones in the forest? Do you know their localization?

Yes ☐ → No ☐

Please describe:

Clique aqui para introduzir texto.

IV.b.14 – Have you in the forest indication signals for safety zones, roads without exit or water points?

Yes ☐ → No ☐

Please describe:

Clique aqui para introduzir texto.

IV.b.15 – Have you mandatory rest periods?

Yes ☐ → No ☐

Please describe:

Clique aqui para introduzir texto.

IV.b.16 – What is the maximum range of time that is allowed to work in a fire scenario?

Please describe:

Clique aqui para introduzir texto.

IV.b.17 – Who is responsible to control the work time in a fire scenario?

Please describe:

Clique aqui para introduzir texto.

IV.b.18 – Do you put in place some tankers of water reserves in the forests?

Yes ☐ → No ☐

Please describe:

Clique aqui para introduzir texto.

IV.b.19 – How do you identify the reserves of water (on the field, on the map...)?

Please describe:

Clique aqui para introduzir texto. → →

IV.b.20 – Do you perform exercises regularly? How often do you organize exercices? What kind of exercises (e.g. table top, simulation, in situ)? What level of the chain of command is involved?

Yes ☐ → No ☐

Please describe:

Clique aqui para introduzir texto.

IV.b.21 – What kind of resources do you use in the exercises (e.g. aerial means)?

Please describe:

Clique aqui para introduzir texto.

IV.b.22 - What kind of evaluation do you use in the exercises?

Please describe:

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Thank you for the collaboration