



# Module 5

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## Forest fires - analysis of the main causes, evaluation of strategies for extinction and planning for the management of forest fires



UNIONE NAZIONALE LAUREATI  
ESPERTI IN PROTEZIONE CIVILE





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### Unit 5.1. Forest fires - Analysis of the main causes

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# **Objective of This Unit**

**The main aim of this unit is to introduce the main causes of the forest fires to the trainees.**

# Learning Outcomes

At the end of this unit you as a volunteer will be able to explain the main causes of forest fires.

# What is fire?

**Fire** is a chemical reaction in which energy in the form of heat is produced.

- The chemical reaction is known as **combustion**.
- Combustion occurs when fuel or other material reacts rapidly with oxygen, giving off light, heat, and flame.
- A flame is produced during the ignition point in the combustion reaction and is the visible, gaseous part of a fire.
- Flames consist primarily of carbon dioxide, water vapor, oxygen, and nitrogen.



# What does fire consists of ?

GAS	These are the gases created by the combustion process. They are invisible to the naked eye, but they exist and include such poisonous substances as Carbon monoxide.
FLAME	This is the light given off by the burning gas. As long as the three essential ingredients, fuel, oxygen, and heat are there, it can be seen.
HEAT	This is the part of the fire that one feels as warmth. A normal fire usually burns at around 1,100° C.
SMOKE	Smoke is a harmful vapor cloud mixed with a fine powder of solid particles and some gases. The solid particles in smoke create breathing and viewing problem during fire.



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# What is a Forest Fire?

**Forest fire** is the partial or complete burning of forests by fires caused by natural or human causes. There are natural causes such as lightning strikes, volcanic eruptions and high temperatures, and man-made forest fires caused by cigarettes and agricultural products.

Forest fires are one of the leading factors that endanger the continuity of forests in our country as well as all over the world. In Europe and in mainly partner countries which are located in the Mediterranean climate zone, more than 10000 forest fires every year cause the destruction of thousands of hectares of forest areas, with the effect of human-forest relationship. In order to minimize the damages caused by forest fires, it is necessary to take radical measures and establish an effective Fire Protection and Combat Organization (Bilgili, 2014).

# Forest Fires

Forest fires are the most important threat to forest and wooded area in Europe. According to the statistics forest fires in Greece, Italy, Portugal, Turkey and Georgia show that in these areas more than 550,000 ha burned on average each year (*Dimitriou et al, 2001*).

In these countries forest fires occur because of anthropological or natural causes. Lightning is the most common natural cause of fire. The majority of fires around the world are however caused by human activity.



# Wild Forest Fires

As a result, fire has been viewed by many as an environmental disaster over hundreds of years and has been linked, rightly in most cases, with reduced soil fertility, destruction of biodiversity, global warming and damage to forests, land resources and of course human assets (Bassi et. al, 2008).

**Forest fire** may be defined as an unclosed and freely spreading combustion that consumes the natural fuels. Combustion is another word for fire. When a fire burns out of control it is known as **Wild Fire**.



# The Reasons of Forest Fire

## “A Varios and Complex Reality”

In Europe, the causes of forest fires are not yet well understood. The first attempt done in 1933, a survey of fires produced by the Institut International d'Agriculture (I.I.A., 1933) showed that fire causes were mainly related to the negligent use of fire in agriculture, railroad sparks, coal kilning in forests, powerlines, and to a much lesser extent, voluntary actions.

A common Fire Cause classification created for all European countries in order to report national fire causes to the European Fire Database, was established in 2012 and pointed six generic topics:

- *Unknown reasons*
- *Natural reasons,*
- *Accident,*
- *Negligence,*
- *Deliberate,*
- *Rekindle*



# The Unknown and Natural Reasons of the Forest Fire

The “**unknown cause**” class is still the main category in many countries including Greece, Portugal, and Turkey ( Camia et al., 2013). This is explained by the difficulty in determining the ignition point and the cause or by the high number of fires without information or not investigated as happened in **Portugal and Turkey** (Tedim et al, 2015).

“**Natural causes**” (i.e., caused exclusively by natural processes) indicate only a small percentage of all fires and are mostly explained by lightning, which can be very important in some areas of several European countries for **Greece** for instance.



# The Human Induced Reasons of the Forest Fire

*Please Do Not Forget!*

*The majority of fires are human induced in Europe.  
With 95% the Mediterranean region accounts for the larger  
proportion of human-caused fires in the world.*

***According to Leone et al. (2013):***

***“Fires beginning from accidental or negligent reasons  
generally have some precise types of repetition,  
concentration, distribution pattern, and relationship with  
human seasonal activities.”***



# The **Human Induced Reasons** of the Forest Fire

## *“ACCIDENT”*

Forest fires started by **“accident”** (i.e., indirectly caused by humans without the use of fire) are mainly related to failure of electric lines, sparks emitted by train brakes or fall of catenaries, sparks emitted by engines and machinery, or firing and explosion during military exercises, etc.

In general, they are responsible for the outbreak of a small percentage of fires.



# The Human Induced Reasons of the Forest Fire

## *“NEGLIGENCE”*

Forest fires caused by **“negligence”** (i.e., unintentionally caused by people using fire or glowing objects) are more common and are the main cause of fire ignitions in most European countries.

These are mostly associated to burning of slash or of piles of vegetal waste, and vegetation renovation because it is a cheap and efficient tool. In addition to this, recreational activities like barbecues, picnicking and smoking may cause of fire outbreak.



# “Deliberate or Rekindle Fires”

There are different motivations behind the “deliberate fires” which are very poorly understood. Setting fire for profit is the most important motivation in some EU states, mainly related to opening or renovating pasture or for hunting.

Interests are also related to setting a fire for monetary (e.g., insurance fraud) or non-monetary profit (e.g., to set a fire to maintain seasonal employment).

The irresponsible use of fire called **“rekindle fires”** assumes a relevant expression in some countries and is explained by psychological troubles and mental illnesses and by entertainment or children’s games.



**Table 1. Classes, groups and categories of the harmonized fire causes classification scheme**

CATEGORY	GROUP	CLASS
100 UNKNOWN	100 Unknown	100 Unknown
200 NATURAL	200 Natural	201 Lightning
		202 Volcanism
		203 Gas emission
300 ACCIDENT	300 Accident	301 Electrical power
		302 Railroads (Railways)
		303 Vehicles
		304 Works
		305 Weapons (firearms, explosives, etc.)
		306 Self-ignition (auto-combustion)
		307 Other accident
400 NEGLIGENCE	410 Use of fire	411 Vegetation management
		412 Agricultural burnings
		413 Waste management
		414 Recreation
		415 Other negligent use of fire
	420 Use of glowing objects	421 Fireworks, firecrackers and distress flares
		422 Cigarettes
		423 Hot ashes
		424 Other use of glowing object
		500 DELIBERATE
512 Conflict (revenge)		
513 Vandalism		
514 Excitement (incendiary)		
515 Crime concealment		
516 Extremist		
520 Irresponsible	521 Mental illness	
522 Children		
600 REKINDLE	600 Rekindle	600 Rekindle

## Harmonized Classification Scheme of Fire Causes in the EU

The scheme is hierarchical and is made of 29 fire cause classes, 8 groups and 6 categories

## Negligence, carelessness, intention or natural causes...

Although the reasons are various, thousands of hectares of land are damaged in forest fires in Europe every year. Oxygen-source forests surrender to the flames with the living creatures in them.

These fires constitute a serious problem for Europe. Frequently, thought of almost exclusively as a problem for the Mediterranean countries. The burnt area in the Mediterranean region has shown a slightly decreasing trend since 1980 (Tedim et al, 2015).

According to Pyne (2007):

*“the heterogeneity of fire causes highlights the need to consider the social paradigm in forest fire risk management and in developing new forest fire management policies.  
Fire risk is socially constructed and needs to be resolved by social means.”*

**The next unit (M5.2) is about this subject.**

# Additional Training Material

Here you can find additional resources and references to the previous topics:

If you would like to have some additional information about the Fire Database of the European Forest Fire Information System (EFFIS) and the Harmonized Classification Scheme of Fire Causes in the EU [please visit this link !](#)

If you would like to have some additional information about the results of forest fires please read Strauss, D., Bednar, L., & Mees, R. (1989). Do one percent of the forest fires cause ninety-nine percent of the damage?. *Forest science*, 35(2), 319-328.

If you would like to have some additional information about the cause and facts of forest fires please read Silva JS, Rego FC, Fernandes P, Rigolot E (2010) 'Towards Integrated Fire Management – Outcomes of the European Project FIRE PARADOX'. European Forest Institute Research Report 23: 229p.

# SUMMARY of the UNIT

In this unit you learned the main causes of the forest fires. In this regard you have studied the meaning of fire, forest fire, wild forest fire.

Additionally in this unit you have been thought that the forest fire and its reasons is a various and complex reality.

# REFERENCES

- Bassi, S., Kettunen, M., Kampa, E., & Cavalieri, S. (2008). Forest fires: causes and contributing factors in Europe. *European Parliament, Brussels*.
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- Dimitriou, A., Mantakas, G., Kouvelis, S.,: An analysis of key issues that underlie forest fires and shape subsequent fire management strategies in 12 countries in the Mediterranean basin. Final report prepared by Alcyon for WWF Mediterranean Programme Office and IUCN. May 2001.
- Tedim, F., Xanthopoulos, G., & Leone, V. (2015). Forest fires in Europe: Facts and challenges. In *Wildfire hazards, risks and disasters* (pp. 77-99). Elsevier.



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