



## **Defense of Villages, Farms and Other Rural Assets against Wildfires:**

### **Guidelines for Local Community and Municipality Authorities in the Balkan Region**

#### **Part 1: Guidelines for Local Authorities**

##### **SECTION 1 – Background and Rationale**

All over the Balkan Peninsula and the surrounding islands of the Aegean, Ionian and Adriatic Seas, rural settlements (villages, towns, agricultural and livestock farms) and other rural assets (agricultural fields and crops, infrastructures and other values at risk) are increasingly endangered by wildfires. This increasing wildfire threat is a consequence of:

- Internal immigration of rural population to urban centers, which resulted in the decrease of the rural work force and, consequently, self-protection ability against wildfires
- Land use changes from the abandonment of agricultural and grazing lands which resulted to the encroachment of natural vegetation (shrubs, trees, etc.) and high natural fuel accumulation
- Less intensive forest management practices (logging, resin collection, road construction, etc.) and decreased firewood collection from forested lands, as a result of rural population reduction and economic decisions
- Regional climate change characterized by higher summer temperatures, prolonged drought episodes and rainfall reduction throughout the year.

The urbanization of large parts of the rural populations and the industry concentration around urban centers created a keen demand for housing and industrial development sites and, consequently, increased pressure for land use change of areas covered with natural vegetation at the rural-urban interface. This trend was reflected by an increased frequency of arson fires in these areas.

The intermix of human settlements with natural ecosystems and the fires burning at the interface between wildlands and rural settlements and, in some cases, also in the peri-urban zone of larger cities in many places create severe problems, which have become a major issue of political debate and confrontation.

Recent major wildfire disasters in the Balkan Region reveal that government authorities and civil society, notably rural communities, are not sufficiently prepared to prevent and reduce the risk of wildfires, to defend rural communities and rural assets at risk, and to protect human health and altogether human security against the adverse direct and indirect impacts and consequences of wildfires.

These Guidelines provide information to local community leaders, local fire service units, volunteer firefighters and village defense committees about the necessity of collaboration with local inhabitants to develop efficient measures in

- Wildfire prevention
- Preparedness for a wildfire emergency situation, including a large wildfire incidents
- Protection of settlements and rural assets threatened by wildfires.

Heads of Local Communities (Mayors or Heads of Local Administrations) and the Heads of Public Services at Municipality or County levels need to promptly inform the inhabitants of local communities, living in villages and dispersed agricultural farms, about the threats of wildfires and how to protect themselves and their property.

These guidelines aim to inform and enable local community members to put in effect basic fire safety regulations for protecting their properties and, most importantly, their families against direct and indirect effects (e.g., consequences of fire smoke pollution on the health and security of people and firefighters) of wildfires.

The problem of wildfires burning on natural lands that are used as waste disposal sites or they are contaminated by industrial waste needs to be addressed due to the highly toxic emissions that are produced by the simultaneous burning of natural vegetation and chemical by-products.

In addition, the threats arising from fires burning on territories contaminated by unexploded ordnance (UXO) need to be addressed since some forest and non-forest lands in the Balkan Region are still contaminated by land mines and UXO stemming from historic and recent armed conflicts.

Along with these Guidelines a second set of illustrated materials is provided to be distributed to the individual owners of houses or farms and to rural businesses. With these illustrated materials local inhabitants will be made aware of the threats of wildfires to the security and health of their families, threats to private property and to public infrastructures, and will learn how to reduce or mitigate these potential threats.



## **SECTION 2 – Some Facts about Wildfire Threats**

### **2.1 *Wildfire Threats to Society***

Many homes, structures and other rural assets, such as machinery and crops, are interspersed within forests, natural rangelands, agricultural lands and pastures. Thus, there are many different zones of interaction between potentially flammable landscapes and the assets of rural society. This zone of contact between natural landscapes and human structures and assets increases the risks of catastrophic wildfires threatening life, property and infrastructure in thousands of communities across the Balkans. Fighting wildfires within this zone can be complicated, costly and dangerous due to the perplexity of the situations that are faced by the firefighters and civilians. Apart from the effects of wildfires on the natural environment, the main wildfire threats to rural communities are:

- Loss of life and adverse health effects due to heat and smoke
- Loss of private and public property and assets
- Damage and loss of agricultural products, productivity, and livestock

- Destruction of forests
- Negative impact on the tourism sector

Apart from rural communities, wildfires are also threatening the fringes of towns and even large cities.

Altogether direct and indirect impacts of wildfires on life and property of society and the financial losses involved may be higher and highly disproportionate to the damages caused to natural ecosystems, especially considering that many ecosystems in the Eastern Mediterranean and Southeast European will naturally recover after fire.

### ***Human casualties***

Death or injury caused by wildfire is a risk for both firefighting personnel and citizens

- The spread of wildfires is often very fast and unpredictable
- People may become entrapped by the flames and suffer from direct burns
- Fire smoke inhalation directly affects the human respiratory system. Thus, many people could suffocate from smoke when they are fighting or trying to flee from a fire
- Fires can lead to casualties among professional and volunteer firefighters because of heat exhaustion, smoke inhalation and body stress during a wildfire situation
- Heat exhaustion and stress, combined with the operation of firefighting vehicles and other firefighting equipment can lead to accidents
- Even minor injuries under these circumstances may result in loss of life.

The impacts of smoke pollution on human health effects may affect firefighters and people nearby the fires, but also people living in areas far away from the fires. Smoke inhalation has dangerous consequences to human health:

- Smoke from wildfires is a complex mixture of gases and particles which are dangerous to human health
- Fire smoke inhalation can cause a number of acute, short-term or long-term health effects
- Symptoms range from headaches and stinging eyes and throat as a consequence of short-term exposure to smoke, up to exhaustion accompanied by respiratory and cardiac problems
- The negative effect of smoke inhalation is deteriorated if the victim is already suffering from asthma, allergies or heart disease. In these cases smoke inhalation can be fatal.

Special attention has to be given to fires burning on terrain where unexploded ammunition (unexploded ordnance – UXO) and landmines stemming from previous armed conflicts still exist. Such fires have repeatedly resulted in human fatalities and injuries (see Section 2.4).



## ***Loss of property***

Homes, farms and whole rural communities are threatened by wildfires in two ways:

- Direct damage can occur when the flames or the radiant heat from the fire preheat and ignite an adjacent structure
- Flying embers can be transported by wind over great distances and be deposited on rooftops or even inside houses, igniting a flammable part of the structure such as furniture, curtains, etc.

An important factor significantly affecting the loss of property is the flammability of materials from which the buildings are constructed:

- In countries where countryside homes and farms are typically made of wood or makeshift materials, the losses during wildfires often reach hundreds of structures burned in a single fire event
- In contrast, where the houses are made of non-flammable materials such as natural rock, brick or concrete, the losses are much smaller.



## ***Economic impacts***

Economic loss from wildfires includes both damage to private assets and public property. Apart from the profound destruction of houses and infrastructures, the following major losses have been recorded in the Balkan region:

- The loss of annual agricultural crops due to wildfire can be very extensive, especially when wildfires occur just before the harvesting period. As a matter of fact, sparks produced from the harvesting machinery have been reported to ignite fires
- The destruction of perennial cultivations such as olive groves, fruit tree plantations or orchards with mastic trees are economically of greater importance because of the time needed to recreate these orchards, a process that often requires several years
- Smoke from large fires deposited to vineyards affects wine quality since it results to a 'smoked flavour' of the wine produced, thus reducing its quality and commercial value. Furthermore, the effect of deposited ash on the soil maintains the problem for a number of years
- A special case is the destruction of greenhouses and other infrastructure (e.g., irrigation networks) that involve significant capital loss that is not easily recovered by farmers; other losses include fences and agricultural outbuildings
- Livestock losses may occur on open grazing lands, paddocks, corrals and stables
- Telephone and electricity poles and wires can be damaged by wildfires, thus causing failure of communications and energy supply. They are also costly to repair.



### ***Forest products losses***

Significant economic damages in forests include the loss of forest products, e.g.:

- Timber: The extent of damage depends on the type (surface, crown, mixed) and the severity of the fire, the stand and tree characteristics of the burned forest areas and their intended uses (poles, lumber, chips for particleboard production, etc.)
- Firewood or raw materials for renewable energy (pellets)
- Non-wood forest products such as resin, seeds, herbal / medicinal plants.



### ***Tourism***

Wildfires often have detrimental and costly effects on local tourism. Evacuations of tourists from camping grounds or other accommodations are dangerous and costly. The negative image broadcasted from tourism areas affected or visibly endangered by fire usually result in cancellation of short term reservations. The effects of wildfires on scenic recreation areas are often detrimental and may last for several years. Thus, it is in the highest interest of local authorities to take all precautionary measures to secure the safety of visitors and to avoid long-term losses of income in the fire-affected touristic areas.



### ***Losses of non-market forest values***

Local communities and municipalities have an important ethical obligation to contribute to the protection of common global assets such as biodiversity and carbon sequestration:

- Biodiversity: Wildfires often cause serious loss of biodiversity, especially in fire-sensitive ecosystems
- Loss of carbon: Current international policies foster carbon sequestration by forests in an effort to combat the greenhouse effect. They provide motives for countries to increase their forest area cover, including monetary subsidy according to the Kyoto Protocol. Forest fires release carbon in the atmosphere primarily in the form of carbon dioxide and this translates directly into monetary losses.

### ***Other secondary impacts***

Significant secondary impacts of wildfires are caused by the destruction of the surface vegetation cover and duff layer, which are important for soil protection against erosion, especially in mountain regions. Severe wildfires which deplete the soil from protecting vegetation cover may result in:

- Increased erosion and thus loss of fertile and productive soil
- Landslides or mudslides which threaten structures and infrastructures (including roads) and even human lives
- Development of rapid floods (flash floods), which are most dangerous for settlements and human safety.

Other secondary impacts result from the burning of structures, infrastructures and “heritages of industrialization”, i.e. garbage dumps and other uncontrolled disposal of industrial waste disposal sites. Structures, businesses and garbage dumps contain household waste, electric appliances, synthetic and industrial fabricated materials, including batteries, and eventually radioactive materials. The combustion of these materials generates substantial amounts of air pollutants that are extremely hazardous to human health.



## 2.2 Wildfires Causes

According to statistical data more than 98 percent of all wildfires in the Balkan region are caused by human activities. Most wildfires result from negligence and the use of fire as a tool in agricultural practices. Very often agricultural burning practices are considered as tradition, but nowadays in most countries of the region such burning is against the law. The examples of wildfire causes below include other fire uses and sources, which are also very common in the region.

► In the following, advice is given to local community administrations on how to reduce the occurrence or consequences of fires caused by people.

### ***Agricultural burning***

The use of fire in the agricultural sector is common practice all over Southeast and East Europe. Fire is mainly used for:

- Clearing agricultural cultivations from harvest or pruning residues and stubble burning
- Improving the quality of pasture lands.

Very often these fires are not properly attended. Despite agricultural burning in most countries is illegal, nonetheless many farmers start fires and immediately leave the scene in order not to be arrested by the police. This is one of the main reasons why these intentional burnings often get out of control and spread to forests and settlements.

► *Local round-table discussions should be regularly held at community level in order to inform local land users and property owners about the legal situation of fire use; the risks involved when burning illegally, or when not obeying laws and regulations; Guidelines should be proposed to replace traditional burning by other methods that will reach the same goals (clearing agricultural fields, improving pasture) in a more safe manner.*

### ***Garbage dumps and other waste disposal sites***

Garbage dumps constitute a significant source of wildfires spreading from:

- Spontaneous combustion of fermenting waste that produces methane
- Garbage is often set afire to reduce its volume and extent of the waste disposal sites

- Household waste and garden waste burned in communities where there is no communal waste disposal service, due to lack of alternatives.

▶ *The management or closure of open garbage dumps and landfills must receive high priority in order to meet legal and environmental regulations, including the prevention of self-ignition or ignition by local people.*

▶ *Local round-table discussions should be regularly held at community level to inform local residents that garbage burning on private property is illegal because it involves a high risk of wildfires and also produces toxic air pollutants.*

### **Road and railway traffic, agricultural and forestry machinery**

Road and railway traffic are significant sources of wildfire ignitions. Sparks from the brakes of trains, or the heat of vehicle exhaust systems and catalytic converters can ignite dry fuel. Agricultural and forest machinery are in close contact with the combustible materials and constitute an important ignition source. Discarded cigarette butts are a very common source of ignitions along roads.

▶ *Local authorities in cooperation with government agencies or private companies should collaborate to reduce combustible materials along roads and railroad tracks in order to decrease the ignition potential. This would require regular employment of local workers to clear dry vegetation, prune trees and create open, accessible buffer zones with fewer trees, shrubs or grass layers. Railroad companies should be held responsible if they do not apply technically adequate measures such as spark arrestors at the exhaust pipes of engines, or appropriate materials for the brakes, in order to minimize the production of sparks.*

### **Electric power lines**

Electric power lines are a common cause of wildfires. Strong winds can cause electric arcs and short circuits between swaying electric lines, thus causing the creation of sparks that may ignite fine, dry fuels when they fall on the ground. Inadequately cleaned and maintained insulators may also cause the production of arcs on humid days. Power lines fallen by strong winds or due to poor maintenance of poles may also produce sparks. Fires under such windy conditions can spread and become large very quickly.

▶ *It is absolutely necessary to clear the vegetation immediately underneath and at a strip of at least 10 m across the electric power lines. Although this task is an obligation of the electric company, nevertheless local authorities should seek cooperation with the company in order regularly check and maintain the power line strips free of vegetation.*

### **Arson**

Arson is a major cause of wildfires in the Balkans. Fires are sometimes set to hide illegal forest logging, to conceal illegal cultivation of drug crops, or to create burned forests in which normally trees cannot be harvested, but post-fire salvage logging would be permitted. In some cases wildfires are set on purpose in order to clear forests and other natural vegetation, thus enhancing encroachment on burned public forest areas for subsequent land- use change (housing development, agriculture, etc.).

▶ *Local round-table discussions at community level should be conducted to inform land owners that encroachment and subsequent land use change of public burned forest lands is illegal even though the forest vegetation has been destroyed in these areas.*

## **2.3 Factors that affect Wildfire Behaviour**

There are three main factors that influence fire behaviour: The amount and characteristics of combustible vegetation materials, weather and topography.

## **Combustible vegetation materials**

Organic fuels – live (green) or dead – are flammable and carry wildfires:

- **Forests:** Leaves, needles, twigs of trees and herbaceous vegetation and duff and litter on the forest floor
- **Agricultural and pasture areas:** Agricultural residue, stubble, dry and unpalatable grass, and encroaching shrubs and trees.

There are certain parameters of combustible organic materials that determine how fire behaves:

- **Size of fuel particles:** Small leaves, twigs and grass burning more easily
- **Moisture content:** The moisture content or dryness of the combustible organic materials is determined by
  - *Air temperature:* High temperatures speed up the drying and flammability of organic materials. Less energy is required to bring these materials to ignition temperature
  - *Air relative humidity:* Decreasing relative humidity contributes to drying and increased flammability of dead organic materials
  - *Time since last rainfall and the amount of rain received:* This determines the moisture content and the drying rate of the fuel.

## **Weather**

Weather is perhaps the dominant factor that affects forest fire behaviour. Besides air temperature and relative humidity, wind is the most important factor influencing the spread of a wildfire:

- Wind speed has a strong influence on the intensity of a fire, the speed at which it spreads and its shape. Wind may also lift burning embers, such as bark, and carry them in front of the main fire, resulting in spot fires. The stronger the wind the faster a fire will spread
- Wind direction /change in direction is very critical for assessing the behaviour of a wildfire and deciding the appropriate fire suppression method or evacuation procedure. Human lives and property losses to wildfire mainly result from sudden and unexpected changes in wind direction. Changes in wind direction will cause shifts of the fire front. These shifts are dangerous if they occur suddenly and unexpectedly, and can convert relatively sedated fire flanks to active fire fronts, suddenly. Firefighters and community leaders therefore need a constant update of reliable weather forecasts regarding wind shifts.

## **Topography**

The third major factor that influences the risk and spread of wildfires is topography, especially in mountain regions:

- Slope: Wildfires spreading uphill will move faster than fires spreading downhill. While fires advancing downhill are spreading slowly and can be controlled easily, fires advancing uphill are burning very fast and are usually difficult to control. Uphill burning fires are the most important cause of accidents and fatalities
- Aspect: Southerly and westerly aspects receive more sun and are warmer and drier than northerly and easterly aspects. Fires burning on these sunny slopes will advance much faster than on northern and eastern slopes because the fuels are drier.

▶ *In conjunction with the preparation of a development of a “Community Fire Protection Plan” (see Section 3.2), local authorities in mountain regions with buildings or villages on mountain ridges, slopes and valleys, should be aware of the danger to human lives and property in such locations.*

## **2.4 Special Concerns: Fires burning on Contaminated Lands**

In many countries of the Balkan Region there are areas of forests and other lands that are contaminated by various types of industrial, chemical and radioactive pollutants or by the remnants of

armed conflicts such as unexploded ammunition (UXO) and land mines. Wildfires occurring in such areas may result in collateral damages such as chemical and radioactive air pollution and explosions. Fire prevention or suppression activities in such terrain are highly hazardous and require specialized expertise and equipment. Local people living inside or at the fringes of such contaminated areas must receive special instructions on how to deal with these risks.

▶ Areas contaminated by UXO and land mines should be mapped as *Red Zones* in which mechanical fire prevention measures and firefighting on the ground must be restricted and can be conducted only by specifically trained personnel with appropriate equipment. Community administrations and local fire services are responsible to mark these dangerous areas with visible, unambiguous marks.

### **SECTION 3 – Wildfire Preparedness**

Guidance is necessary for rural communities in order to be prepared for defending their homes, farmsteads and villages against wildfires. Good preparedness will enhance the resistance of a community to wildfire and will also facilitate the work of firefighters when they are called for fire suppression. Wildfire preparedness includes:

- Consultation with local experts and authorities responsible for fire management in forests, agricultural lands, nature reserves, national parks and natural / cultural heritage sites
- Development of a Community Fire Management Plan
- Efforts by individuals to reduce the fire risk in their own properties.

#### **3.1 Convene stakeholders and decision makers**

- ▶ *In the beginning of the planning process a core team should be formed made up of*
- Representatives from the local government and administration, local fire authority, and state agencies responsible for forest management and agriculture
  - Local representatives of the villages (to be identified and actively engaged)
  - Other interested organizations and stakeholders (to be encouraged to participate).

#### **3.2 Community Fire Protection Plan**

▶ *Considering the factors influencing fire behaviour, as described in Section 2, it is important to first identify the wildfire risk that the community may be exposed to. Development of a “Community Fire Protection Plan” involves several steps with different objectives:*

- Direct participation of local residents: Involvement of the local population in the development of a Community Fire Protection Plan will create awareness about the wildfire risk, will stimulate active participation and is likely to lead house and land owners to assume responsibility and prepare and defend their property against wildfires
- Analysis of past fire history: Study of past fire occurrence, causes and damages in the community and surrounding areas will lead to useful conclusions of what to do and what to avoid in advance and during a wildfire
- Risk assessment: Identification of local areas of high wildfire risk within the community will allow to prioritize measures to be taken for fire prevention and preparedness.

#### **Fire history and fire season**

- ▶ *Consulting historical records and narratives of past fires can allow a broad evaluation of*
- How often and at what time of the year have fires occurred in the region
  - Typical size of fires
  - Main types of vegetation burned
  - Causes of past fires.

This information will help to plan targeted hazard-reduction measures both geographically and seasonally.

### **Preparation of a Community Fire Protection Plan**

▶ *The preparation of a fire management plan at community level should involve active participation of land owners / land users concerned, and the people living at the fringes of villages or settlements at the interface with the surrounding forest, brush lands and agricultural lands. Other interested organizations and stakeholders should also be encouraged to participate.*

▶ *The basis for a Community Fire Protection Plan is the development of a Fire Management Map. One methodology to develop such a map is a Transect Walk during which a fire management specialist, the local community leaders and residents will collect information in the field. At the Transect Walk the fire hazards and fire sensitive zones along with the topography of the terrain will be assessed.*

The following information should be included in the map:

- Description of vegetation characteristics: The map should describe the type of combustible materials during the fire season, e.g., grass and bush on open pastures, agricultural residues, forests, but also the flammable materials within or at the edge of tree orchards. Visiting the forests and rangelands that surround the community during a *Transect Walk* will give an idea about the kind of vegetation that is prevalent. Consultation with local land managers such as local foresters and landscape planners will help to understand the vegetation patterns of the region, such as how quickly the fine vegetation grows and dies off and in which period this process takes place
- Community-Vegetation Interface: An assessment of houses, stables, barns, paddocks and other assets at fire risk should consider their proximity to flammable vegetation. Individual property and land owners should be made aware that they are responsible for protecting their own individual properties by taking fire prevention measures. The local government or administration will determine the scale of the wildfire risk of the whole community and will also identify the risks and possible limitations of future development in vegetated landscapes
- Terrain: If the village or individual farmsteads or summer houses are located in an area of steep terrain, the threats arising from wildfire are much higher. This is particularly the case for structures built on ridges, steep slopes or in steep gullies. These areas may be particularly hazardous because of the high intensity of fires burning uphill. Furthermore, in such terrain there may be limited access for fire services, or limited to no escape routes
- Road Conditions: Areas with few, narrow roads may be considered as being at higher risk in the event of a wildfire because a simple fallen tree may seriously hinder the ability of residents to escape or the ability of firefighting forces to access the fire for suppression purposes. Also, rarely used roads may become vital transport routes in the case of wildfire. The condition of such roads should be considered, particularly during the period just before the fire season.

This baseline map will then display the wildfire risk of

- The type of vegetation cover
- Forest and agricultural areas at risk for large-scale fire damage
- Individual houses / farmsteads scattered within the rural landscape
- Residential areas at the community's interface with rural vegetation
- Other critical infrastructure
- Areas contaminated by unexploded ordnance, land mines, or landfills.

While the development of this map through an active participatory process with local residents will be the base for prevention and preparedness planning, the map may also be used by the fire services during fire suppression. The map could help the firefighters to identify the risks during firefighting.

### **Evaluation with all stakeholders: Development of agreement on priorities**

▶ *Community leaders should use the Community Fire Protection Plan to facilitate a collaborative community discussion that leads to the identification of local priorities for reducing combustible materials, the ignitability of structures, and other issues of interest, such as improving fire response capability.*

▶ *After the finalization of the protection plan, the results will be communicated to the community and other involved parties and interested organizations. The firefighting organization must have a copy of the current Community Fire Protection Plan in advance of the fire season. It is even better if a representative of the organization participates in the development of the Plan.*

### **3.3 Realization of Wildfire Prevention and Preparedness at Community Level**

When implementing the Community Fire Protection Plan some of the actions for Wildfire Prevention and Preparedness at Community Level need to be coordinated by the local government. Local government is also responsible to provide advice and guidance to local individual residents and facilitate measures for the protection of private property by the owners. Such work should be done at times of the year when wildfire risk is low.

The detailed technical instructions for private property owners are provided in a separate Guidelines booklet. Thus, the following technical and organizational measures in fire prevention and preparedness for a wildfire situation are those that the local community administration has to take responsibility.

#### **Creation of Fire Buffer Zones**

Increasing the distance between flammable vegetation and property assets will result in decreasing the risk of their ignition during wildfires. Creation of Fire Buffer Zones in which vegetation and easily ignitable combustible materials are reduced or removed, reduces the intensity of an approaching wildfire (reduction of flame length and radiant heat) and, eventually, slows down or even stops the spread of the fire. On such cleared buffer zones is easier to fight fires and also to facilitate access to people in distress (e.g. for rescue and evacuation).

▶ *Therefore, the following action must be considered, dependent on the type of vegetation surrounding a village or an individual house or farm:*

- Perimeters of villages should be cleared of fine vegetation to a distance of 25 meters to create Fire Buffer Zones on which flammable vegetation is largely removed or reduced. Some trees may remain, but they should be widely spaced and pruned. All dead plant material on the ground should be removed regularly
- Isolated houses and structures should also be protected by a similar buffer zone, but this is in the responsibility of the resident or owner
- Gardens or vegetated spaces within the boundary of a residence or other asset should be kept similarly clear by the resident or owner
- Vacant plots within residential developments, in which often wild vegetation is growing, must be cleared by the owner or by local government
- Roads can be integrated and utilized as buffer zones by clearing combustible vegetation to a distance of 5-10 meters on each side.

#### **Access roads**

▶ *Access roads are necessary for firefighting and evacuation of local residents. In new developments, it is advisable to plan for all homes or assets to be accessed from two directions. This reduces the chance of residents becoming trapped by road barriers. Furthermore, the following measures will improve the safety of firefighters and local people:*

- Roads of all sizes should be maintained to remain drivable and kept clear of obstacles, such as fallen trees at all times. This will allow better access for firefighters and more escape options for civilians in the event of a wildfire

- Street names should be clearly and consistently signposted in order to reduce confusion in potential fire suppression activities
- House numbers should be clearly visible and consistently displayed for the same reason
- Parking should be forbidden on roundabouts or in narrow streets so that emergency vehicles can get through
- Trees growing alongside streets should not hinder the passage of emergency vehicles in any way. This means they should be sufficiently set back from the road and the branches should be pruned up to a height of 3-4 meters from the ground
- Turn-around points should be constructed at regular intervals on narrow roads to allow two fire engines to pass. This is in order to avoid the need for long and complicated reversing maneuvers – an operation that can be dangerous in the case of wildfire
- Fire hydrants should be designed into new developments and extend as far as possible along major roads beyond village boundaries. This will allow for faster filling of fire engines by avoiding the need for engines to travel long distances for water

### ***Emergency equipment and other non-specialized firefighting tools***

Besides the specialized firefighting equipment used by professional and volunteer firefighters, the local administration may be able to assist fire suppression operations by supporting the acquisition and maintenance of other fire emergency equipment such as water pumps, electricity generators, tractors and water tanks.

While the local fire brigade may be well prepared for suppressing structural and / or vegetation fires, almost all fire prevention work can be done with tools not specifically designed for firefighting.

The main aim of almost all vegetation fire preparedness work is to reduce the amount and continuity of easily combustible vegetation in the vicinity of assets, as explained above.

► *This can be achieved by tools that range from simple hand-tools to heavy machinery – tools generally used for day-to-day work in agriculture, road maintenance or construction work – both private and public.*

- Hand-tools that can be used for this purpose include rakes, hoes and shovels. Individual households and farms as well as local agencies managing forests and parks are highly likely to possess these items. In order to construct fuel breaks, it may be possible to collaborate with such parties in order to avoid the need of purchasing equipment specifically for this purpose
- Power tools including chainsaws and brush-cutters are similarly likely to be owned by farmers and land management agencies
- Heavy machinery regularly used for farming, such as tractor-towed ploughs and slashers, or machinery normally used for road construction such as graders and bulldozers, can be used to construct fire strips.

Cooperation and coordination between local authorities, land management agencies and landowners on the use of equipment may allow fire preparedness measures to be taken at relatively low cost for all involved parties.

### ***Preparedness for limiting the impact of a burning wildfire***

Despite the best preparation possible, it remains highly likely that a region that has in the past experienced wildfire will continue to do so. In this case, the measures above will go a long way towards limiting the damage caused by wildfire.

► *However, there are further measures that can be taken that will limit the exposure of the community to a wildfire by improving wildfire preparedness at an organizational level.*

- Communication plan: All technical means that are nowadays available should be used to prepare an alert / warning system to inform residents about a dangerous wildfire situation. Since mobile phones are becoming common, even in remote rural areas, it should be considered to create a community-wide emergency alert system (by SMS)

- Hotline: Besides national emergency telephone numbers (e.g., 112) community members should also be able to call the local administration to actively provide information about a fire situation, or to receive instructions on what to do in the case of a fire emergency
- Emergency Plan: An emergency plan in the case of a large fire disaster should be developed and should include preparedness measures concerning evacuation and safe shelters.

### **Special attention to people with disabilities**

People with disabilities and many of those individuals unable to evacuate themselves, see approaching danger, or hear announcements to evacuate, they are especially vulnerable to wildfires. People who are blind and/or deaf are unable to hear local radio announcements and would be unlikely to be watching (or listening to) television. Additionally, they are usually unable to drive themselves and to evacuate properly.

Preparedness at community level should also include:

- Emergency plans with updated press releases and brochures relating to steps to be taken by individuals with disabilities in preparation for wildfires and/or evacuation
- Enhanced hotline and alert systems that allow public safety entities to access a list of individuals who may need specialized assistance of some type in an emergency or evacuation
- Volunteer programs that can assist individuals during evacuation when they are unable to do so themselves
- Public safety programs able to assist individuals with disabilities in completing a home assessment regarding safety
- A recommended list of critical items to be evacuated in the event of wildfire emergency so that people with disabilities can have these items readily available
- Television media with caption emergency announcements whenever a real-time emergency announcement is made.