



EUROPEAN UNION

**Interreg - IPA CBC**  
Bulgaria - Turkey



**PARTNERSHIP**

Project with Ref No: CB005.2.11.067

# **“The European approach to Preventing Fires in the Cross-Border Region - Prevent Fires”**



**Ministry of the Interior of Bulgaria  
Communication and Information Systems Directorate**



**General Directorate of Forestry  
Vize Forest Management Directorate**

**2020**

This publication is produced with the financial support of the European Union through the Interreg-IPA CBC Bulgaria-Turkey Programme, with programme reference number CCI 2014TC1615CB005.



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**Prevent Fires**

## **Report on “European approaches and policies for prevention and protection against forest fires and disasters”**

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## 1. INTRODUCTION

This research study has been realized by the Bulgarian and Turkish experts in scope of the Interreg-IPA CBC Bulgaria-Turkey programme and the project “The European approach to Preventing Fires in the Cross-Border Region - Prevent Fires” with Ref No: CB005.2.11.067.

The field of study is Strandzha Mountain which covers the southeastern Bulgaria and the European part of Turkey. These two countries have similar common disaster risks like forest fires and floods and this programme provides a very good opportunity to overcome disasters with an effective cross-border cooperation.

The purpose of the research study is to harmonize European approaches and policies with the national and local approaches in Bulgaria and Turkey, and to exchange of good practices and gaps in existing local, regional and national systems and mechanisms for forest fire prevention in Strandzha Mountain.

Bulgarian and Turkish experts have been realized their research studies and they prepared separate reports presenting their findings. In this document, the reports of both teams are presented.

Turkish expert team concentrated on European approaches and existing EU policies related to prevention and preparedness to protect against forest fires and disasters, Copernicus Programme and European Forest Fire Information System (EFFIS), strategies, regulations and applications for prevention and protection from local disasters in Turkey, gaps between local and European strategies and applied measures, best practices in European union approaches in reduction of the risk from disasters, recommendations to increase the capacity of the local institutions in applying of European strategies and approaches, and finally suggestions for an effective cross-border cooperation between Turkey and Bulgaria regarding forest fires and disasters.

The research subjects of Bulgarian expert team were strategies and regulations for local disaster prevention and protection, existing EU policies and local policies for the prevention, mitigation and preparedness of forest fires and disasters, gaps in the analysis between local and EU strategies and the measures implemented, Disaster Response: The EU is strengthening its capacity, EU Civil Protection Mechanism, Emergency Coordination Center (ERCC), European Forest Fire Information System, modernization of the EU Civil Protection Mechanism, European projects and good practices, prevention and preparedness for protection against forest fires and disasters according to the Bulgarian legislation, existing systems for early detection of forest fires in the territory of the Republic of Bulgaria, fire monitoring tools, mobile drones for detecting forest fires, proposal for a model for an early fire detection system, using the latest technology, innovation in the early detection of forest fires, forest fire prevention, recommendations and measures to increase the level of prevention and preparedness for forest fire protection through transboundary actions.



## 2. TURKEY REPORT

### 2.1. Introduction

European Union has been analyzing the necessity of sharing national strategies of the EU members for prevention and preparedness against disasters. For this purpose, there has been funded some programmes by EU among the European countries. One of those programmes is the Interreg-IPA CBC Bulgaria-Turkey programme and “The European approach to Preventing Fires in the Cross-Border Region - Prevent Fires” Project is being realized within the scope of this programme. Our research study is one part of this project.

The study area of this project is Strandzha Mountain which covers the southeastern Bulgaria and the European part of Turkey. Both countries have similar environmental risks like floods and forest fires occurred in the region. So it is very important to share experiences in prevention, preparedness and intervention against forest fires and other disasters.

#### 2.1.1. Aim and Scope

The purpose of this study is to make researches on European approaches and policies relating to disasters, especially forest fires, to compare these indications to those in Turkey and Bulgaria, and to develop recommendations for adaptation of the local structure to the European standards.

Another subject is to exchange of good practices and gaps in existing local, regional and national systems and mechanisms for fire prevention and forest fire prevention in Strandzha Mountain with Bulgarian experts.

### 2.2. European Approaches And Existing EU Policies Related To Prevention And Preparedness To Protect Against Forest Fires And Disasters

#### 2.2.1. Organizational Structure of European Commission relating to Disaster Management

The European Commission (EC) is the executive body responsible for preparing the EU legislation, managing EU policies, allocating EU funds, implementing decisions and laws, and representing EU internationally (The European Union - European Commission - Overview). In the case of disaster management, European Commission has an important role of delivering aid throughout the world.

The European Commission has 6 priorities for 2019-2024, which have arisen from the discussions with the political groups in the European Parliament and from the European Council’s Strategic Agenda for 2019-2024. Among these priorities, “A stronger Europe in the World” stands for the humanitarian aid and civil protection.

There are institutions working on disaster management under European Commission. These institutions are as shown below:

- Joint Research Centre (JRC)
- European Civil Protection and Humanitarian Aid Operations (DG ECHO)
- Directorate General for Environment (DG ENV)



### 2.2.1.1. Joint Research Center (JRC)

The Joint Research Centre (JRC) is the European Commission's science and knowledge service which employs scientists to carry out research in order to provide independent scientific advice and support to EU policy.

The JRC carries out research in support of such policies in the areas of global safety and security, crisis management, disaster risk reduction and monitoring natural and man-made hazards. The activity plans, management plans, and annual activity reports are prepared by JRC.

The knowledge centers of JRC informs people about their scientific findings. Disaster Risk Management Knowledge Center (DRMKC) provides global scientific data and analysis of information about disasters and risks. It provides better knowledge, stronger evidence and a greater focus on transformative processes and innovation to improve the understanding of disaster risk, to build resilience and risk-informed approaches to policy making, and to contribute smart, sustainable and inclusive growth (JRC, 2018). The science-based policies and analysis are provided by JRC with the help of DRMKC.

The European Forest Fire Information System (EFFIS) is managed by JRC. It is the online system which provides the updated information about forest fires. It is an ideal platform for countries to exchange good practices on fire prevention, firefighting, restoration practices and other activities related to fire management, and for the European Commission to update the forest fire services in the countries on relevant initiatives at the European level.

### 2.2.1.2. Directorate General for European Civil Protection and Humanitarian Aid Operations (DG ECHO)

Directorate-General for European Civil Protection and Humanitarian Aid Operations (DG ECHO) aims to save human's lives by preventing them from the negative effects that may appear in the event of natural or man-made disasters. It has certain working fields as humanitarian aid and civil protection. Concerning humanitarian aid, it works on the subject of disaster preparedness as taking early action by monitoring systems, individual and organizational actions by coordinating Member States. For civil protection, DG ECHO is dealing with disaster management and civil protection mechanism which has an important role in response to disasters by supplying teams and equipment in case of disasters by the assistance through Union Civil Protection Mechanism (UCPM).

DG ECHO works in collaboration with the Union Civil Protection Mechanism (UCPM), which includes 34 participating states (All EU Member States, as well as Iceland, North Macedonia, Montenegro, Norway, Serbia and Turkey) and aims for disaster prevention, preparedness and response in the field of civil protection. This mechanism gets activated by the Emergency Response Coordination Centre (ERCC) in case of a request for assistance for civil protection is made by a participating country. ERCC coordinates the delivery of the resource to make sure the response to the disasters meets the needs of the request (DG ECHO, 2018).

#### 2.2.1.2.1. European Disaster Risk Management

The purpose of the European Disaster Risk Management is to help the populations in the EU countries overcome better with disasters. Issues related to disaster risk management are increasingly included in the main EU policy areas.

Disaster prevention and reduction of risks are the basis of EU's disaster risk management. These activities are promoted by EU to help Member States to develop policies for more efficient prevention and preparedness for disasters. Prevention studies are planned and realized in order to reduce the impacts of disasters and to increase the resilience of EU infrastructure, ecosystems and societies (European Civil Protection and Humanitarian Aid Operations - European Disaster Risk Management).





#### 2.2.1.2.2. Disaster Preparedness and Prevention

For disaster preparedness, measures are taken by governments and institutions to prepare for disasters and mitigate their effects. These measures may contain public trainings, expanding awareness, establishment of early warning systems, preparation of emergency plans. Preparedness against disasters plays an important role in strengthening of sensitive communities.

The European Commission promotes development of risk reduction and prevention activities. In 2016, the European Commission agreed on an Action Plan on the implementation of Sendai, in which an approach that supports disaster risk is prioritized for all EU policies. In addition, the EU allocates a significant part of its annual humanitarian budget for disaster preparedness projects. This fund is intended to develop national and local preparatory systems.

Through the EU Civil Defense Mechanism, it activates and supports local and national government structures in all countries around the world, especially in prevention and preparedness against disasters. Additionally, it is an opportunity for European citizens to participate in humanitarian aid projects thanks to the EU Aid Volunteers initiative. In this way, it is aimed to strengthen the capacities and resilience of vulnerable communities in non-EU countries by implementing joint actions between experienced humanitarian operators and local people (European Civil Protection and Humanitarian Aid Operations - Disaster preparedness).

#### 2.2.1.2.3. Union Civil Protection Mechanism (UCPM)

The Union Civil Protection Mechanism has an important coordination role during disaster response. In addition, disaster prevention and preparedness are also crucial for the mechanism. The decision about the union mechanism provides a framework for sharing information about risks and risk management capabilities at the European level, which takes into account the possible impacts of climate change and the need for convenient adaptation action, thereby bringing an effective and consistent approach to disaster prevention and preparation. Financial support is also provided for the training organization, exchange of experts and other prevention and preparedness actions (including cooperation projects, development of new tools such as satellite images, improved weather forecast, early warning systems etc) (European Civil Protection and Humanitarian Aid Operations).

European Emergency Response Capacity (Volunteer Pool) has been established to increase the preparedness of European countries to respond to disasters. This constitution allows the Participating States of the Union Mechanism to undertake different types of response capacities for use in Union Civil Protection missions. The Union Mechanism aims to facilitate the coordination of response activities in close cooperation with the relevant Participating State (s) in the event of a disaster.

Union Civil Protection Mechanism (UCPM) has a Civil Protection Pool, which collects the emergency response teams and assets including urban search and rescue teams, forest fire fighting capacities, emergency medical teams, water purification equipment, high-capacity pumping units, etc. The assistances are drawn from the pool. The offered capacities of the pool are shown in the following figure.

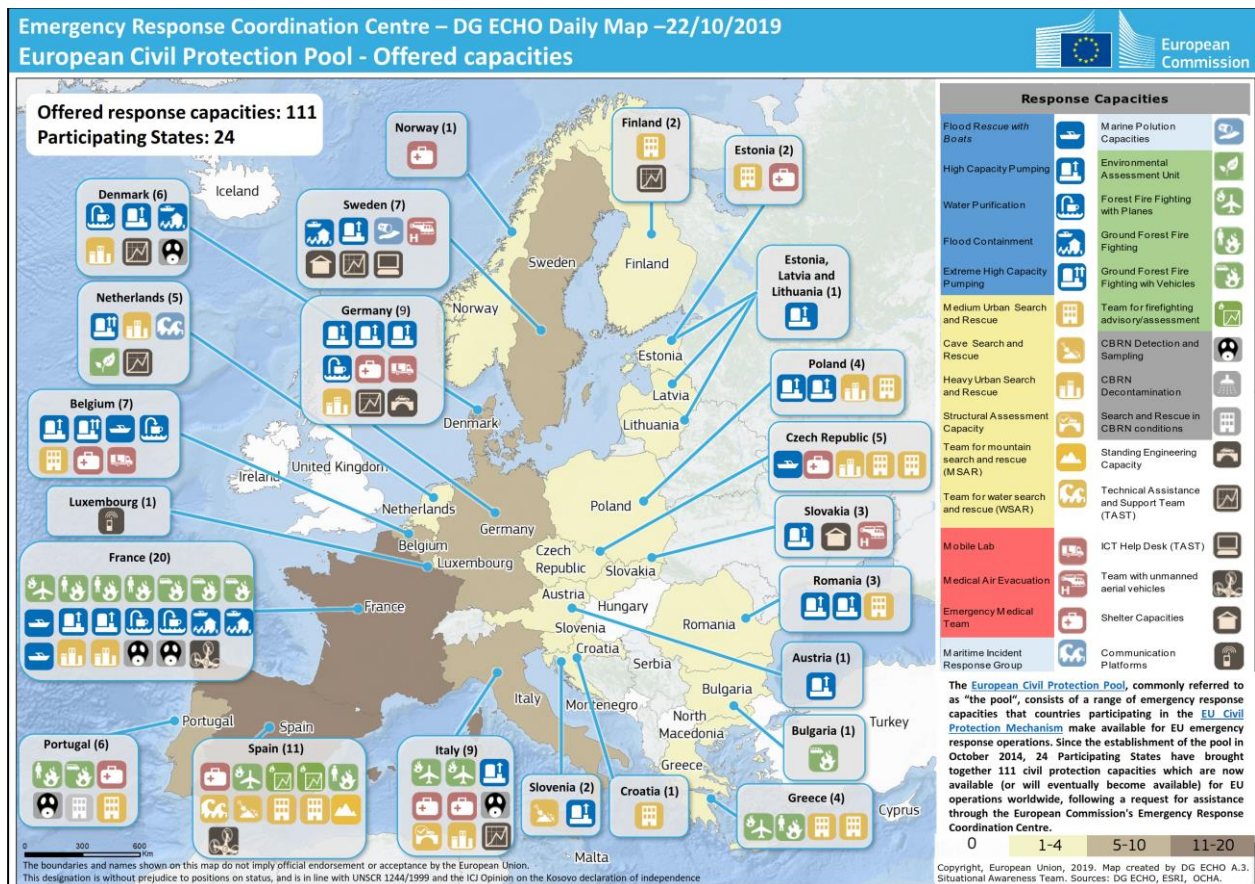


Figure 1 European Civil Protection Pool, 2019 (European Civil Protection and Humanitarian Aid Operations - CP Pool)

From an operational emergency management perspective, knowledge on disaster risks contributes to the work of national and sub-national civil protection authorities and the coordinating and supporting role of the Emergency Response Coordination Centre (ERCC) for response operations in the EU and abroad. In 2016 alone, the ERCC was engaged in 37 operations, including activations of the UCPM for assistance requests in the face of forest fires, flash floods and the European refugee crisis (DG ECHO, 2017).

### 2.2.1.3. Directorate General for Environment

The Directorate-General for Environment is the European Commission department responsible for EU policy on the environment. It aims to protect, preserve and improve the environment for present and future generations, proposing and implementing policies that ensure a high level of environmental protection and preserve the quality of life of EU citizens. It also makes sure that Member States apply EU environmental law correctly and represents the European Union in environmental matters at international meetings.

Their aim is to develop and facilitate the implementation of policies and legislation that contribute to enabling EU citizens to live well, within the planet's ecological limits, based on an innovative, circular economy, where biodiversity is protected, valued and restored and environment-related health risks are minimized in ways to enhance our society's resilience, and where growth has been decoupled from resource use.

In face of the increasing frequency and impacts of forest fires in the EU, and in collaboration with the Joint Research Center and the Expert Group on Forest Fires, the DG also stepped up its efforts to produce guidelines for wildfire prevention, and common criteria to assess wildfire risk at the pan-European level (DG ENV, 2018).



## 2.2.2. Disaster Management in European Union

In recent years, several disasters, especially forest fires and floods, have turned into major disasters all over the world due to climate change effects. Regarding this situation, cooperation between EU countries in disaster management and humanitarian aid has developed lately.

### 2.2.2.1. Disaster Risks in the EU

Union Civil Protection Mechanism legislation covers the risk assessments prepared by Participating States to European Commission. These are called National Risk Assessments (NRAs). The content covers details about disaster risks, the procedure, improvements and their completeness. The national risk assessment is crucial for the preparation of emergency planning procedures since it guides people regarding the possibilities of worst-case scenarios. The contribution of science to policy and decision-making to risk assessments have increased their reliability.

National risk assessments help to analyze the natural or man-made disaster risks and prepare their assessment for the need of a response. The response could both be at a national or international level.

Considering the risks, NRAs are useful elements for a country to prepare a structure based on risk information which generally creates a framework for the national disaster risk management. It is an important step to be taken for the establishment of prevention, preparedness and response planning as well as recovery. In addition, NRAs have an effect on disaster risk reduction, which is also crucial to decrease the possibility of disasters (DG ECHO, 2017).

### 2.2.2.2. EU Aid Volunteers

EU Aid Volunteers is the voluntary framework of European Commission for disaster management, and it is implemented by DG ECHO. It is the meeting point of volunteers and organisations participating from different EU countries having the aim of better management of disasters. People being EU citizen or a long-term resident in EU and over 18 can become an EU Aid Volunteer, after fulfilling needed tasks. They contribute to the worldwide projects made with the aims of helping and fostering the status of countries or communities under the negative effects of natural or man-made disasters.

As an EU Aid Volunteer, a person gets involved in humanitarian aid fields such as; food and nutrition, healthcare, shelter, water, sanitation and being educated in emergency situations. These fields require people with the knowledge and capacity of dealing with disasters, that is the reason why EU Aid Volunteers are trained by professionals to help them become well-prepared volunteers. In addition, capacity building is provided for local staff and volunteers of aid organisations in disaster-affected communities to build resilience to disasters. The organisations for voluntary work in EU are also supported by EU Aid Volunteers by providing technical assistance in order to give them the chance to participate in the EU Aid Volunteers initiative (ECHO-EU Aid Volunteers-Factsheet-Key Messages).

### 2.2.2.3. Copernicus Programme

Copernicus Programme is the European monitoring system for Earth Observation. There are different monitoring services in the programme. The National Risk Assessment (NRA) conveys the risks, which are in relation to three Copernicus Services as; Emergency Management, Security and Climate Change Services. The Emergency Management Service (EMS) is used for emergency response in the event of disasters. Also, it is a useful tool in other disaster management types as:

- prevention
- preparedness
- recovery
- risk and vulnerability assessment
- recovery plans



The EMS contributes to disaster management by mapping the hazards. The hazards mapped consist of: earthquake, volcano, flood, tsunami, landslide, storm, hurricane, cyclone, technological accident, border control and maritime surveillance. The European Union benefits from the EMS as it provides the reliable information about natural or man-made disaster risks across Europe. European Commission uses that information for taking action for disaster risk reduction and preparing action plans with a cooperation between Member States.

### Disaster Risk Management Systems- Early Warning Systems

The Emergency Management Services are used for the mapping of emergency situations caused by man-made disasters. The Copernicus EMS is composed of an on-demand mapping component providing rapid maps for emergency response and risk & recovery maps for prevention and planning and of the early warning and monitoring component (Copernicus Emergency Management Service).

There are three Copernicus systems established for mapping at European level as;

- European & Global Flood Awareness System (EFAS & GloFAS)
- European Forest Fire Information System (EFFIS)
- Drought Observatory

#### **2.2.2.3.1. Copernicus EMS – Mapping**

The Copernicus EMS - Mapping uses satellite imagery as the main data source and output maps are prepared for several disaster types like floods, fires, earthquakes, landslides, tsunamis, severe storms, volcanic eruptions, technological disasters and humanitarian crises.

The maps are produced in two temporal modes as rapid mapping and risk & recovery mapping. Rapid mapping provides geospatial information within hours or days after a disaster for the immediate organization of emergency management activities. The outputs of rapid mapping are produced to determine the situation before the disaster, to see the most affected area, to define the geographical extent of the disaster and to evaluate the intensity and scope of the damage. On the other hand, risk & recovery mapping is used for activities related to disaster prevention, preparedness, disaster risk reduction and recovery stages. Accordingly, reference maps and maps showing the situation before and after the disaster are produced (Copernicus Emergency Management Service – Mapping).

#### **2.2.2.3.2. European & Global Flood Awareness System**

The European and Global Flood Awareness Systems (EFAS & GloFAS) supply flood forecast information to relevant stakeholders supporting flood risk management at national, regional and global level. The forecasts are obtained using local-based data, satellite data and hydro-meteorological models. These forecast data provide many flood forecast products to users, like medium-range lead time, probabilistic, river basin wide, flash flood indicators etc.

The European Flood Awareness System (EFAS) is one service of the Copernicus Management Service. This service is aimed at supporting preparedness activities for flood events across Europe, especially in large trans-national river basins.

EFAS products are a set of maps and graphs that highlight possible future flood risk from the EFAS forecast simulations. These products are obtained through comparison the forecasts with reference flood thresholds and categorised in different lead-time:

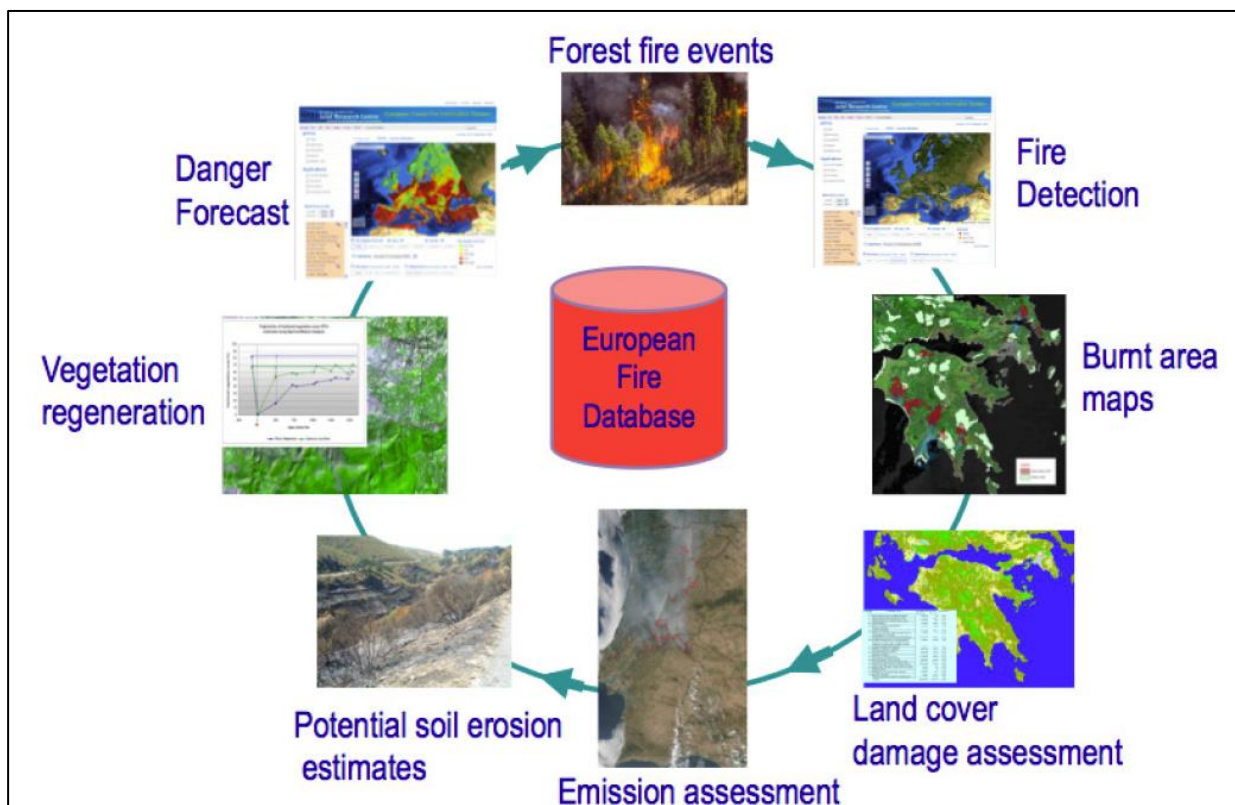
- Flash flood indicators (risk of flooding from flash floods, up to 5 days)
- Medium-range flood forecasts (upcoming flood events for the next 10 days)
- Seasonal hydrological outlooks (hydrological situation over the next 8 weeks)
- Flood impact forecasts (regions with expected impacts in the next 10 days) (Emergency Management - Overview)

### 2.2.2.3.3. The European Forest Fire Information System (EFFIS)

Its role is to support the services in charge of the protection of forests against fires in the EU and neighbouring countries, while also providing the European Commission and Parliament with information on forest and wildfires in Europe. EFFIS is part of the Emergency Management services of the Copernicus Programme. The EFFIS System is established by the Joint Research Centre (JRC) and DG Environment (ENV) as focal point for information on forest fires in Europe in 1998. It provides EU level assessments during both pre-fire and post-fire phases, thus supporting fire prevention, preparedness, firefighting and post-fire operations (Manuel Cardoso Castro Rego et al., 2018).

EFFIS includes, starting from the pre-fire state, the following modules (Copernicus Emergency Management Service - EFFIS):

- Fire Danger Assessment,
- Rapid Damage Assessment, which includes
  - Active fire detection
  - Fire severity assessment and
  - Land cover damage assessment
- Emissions Assessment and Smoke Dispersion,
- Potential Soil Loss Assessment, and
- Vegetation Regeneration.



**Figure 2** Fire cycle monitored in EFFIS (San-Miguel-Ayanz et al., 2012)

EFFIS is intended as complementary system to national and regional systems in the countries, which provides harmonized information required for international collaboration on forest fire prevention and fighting and in cases of trans-boundary fire events.



All EFFIS activities are coordinated with European Commission Directorate General for Environment to reach the Civil Protection and Forest Services of Countries which monitored by EFFIS.

There are currently 40 countries involved in the EFFIS network: Albania, Algeria, Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Finland, France, Former Yugoslavian Republic of Macedonia, Germany, Greece, Hungary, Ireland, Italy, Kosovo, Latvia, Lebanon, Lithuania, Montenegro, Morocco, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tunisia, Turkey and the United Kingdom (Copernicus Emergency Management Service - The EFFIS Network).

EFFIS applications are based on the use of remote sensing and geographic information systems. The fire hazard forecast is calculated from two meteorological forecast models managed by the French Météo-France and Deutsche Wetter Dienst (DWD), and then weather forecast is provided up to a week ago. Using these data, a common European fire danger index in accordance with the Canadian Fire Weather Index (FWI) is calculated.

MODIS sensor data from NASA TERRA and AQUA satellites are used for the detection of active fires and mapping of burned areas in applications where active fire detection and rapid damage assessment are performed. In addition, information on burnt areas with a size of over 40 hectares is obtained and processed on daily basis. The system architecture is based on web data services that allow real-time access to information through web mapping and web feature services. These data are integrated into national geographic information systems for additional analysis.

The European Fire Database was created in 2000 thanks to the cooperation of European countries with the European Forest Fires Commission. This database contains information on all individual fire incidents in Europe. Every country affiliated with the European Union records information about fire incidents in different details according to its own rules. In order to ensure a certain standardization, information of fire time, location of fire, size of fire and cause of fire are stored in the European Fire Database.

The Fire Danger Forecast module of EFFIS was established as a platform for the implementation of selected national fire weather indices across Europe. With this module, it has been ensured to extract consistent information for Europe, compare fire hazard levels between European countries or regions and to support cooperation between national services in cross-border fires.

In this forecast module, the Canadian Fire Weather Index system (FWI) has been used since 2007. The FWI System has six components rating fuel moisture content and potential fire behaviour in a common fuel type (i.e., mature pine stand) and in no slope conditions. Calculations are based on daily noon measurements of air temperature, relative humidity, wind speed and previous 24-h precipitation. The first three components of the FWI are numerical rating of the moisture content of forest floor layers with different drying rates and at various depths.

In order to detect active fires from satellite images, hot spots are detected using certain spectral band thresholds and some fire detection algorithms, and points that are much warmer than the surrounding areas are defined as active fires.

MODIS thermal activity product is used as satellite image for active fire detection in EFFIS. The geographical locations of active fires are determined automatically with the MODIS active fire product (San-Miguel-Ayanz et al., 2012).

#### 2.2.2.3.4. Drought Observatory

The EMS Drought Observatory (DO) is a service that provides drought-related information and early warnings for Europe and the world. The European Drought Observatory (EDO) is interested in European countries whereas the Global Drought Observatory (GDO) gives information at global basis.

EDO and GDO build on open web services and connect drought data providers and users from global to regional levels. Both of these services are run by the European Commission's Joint Research Centre.



The EDO portal contains drought information, graphs and time-series at European level. These data can be freely downloaded by the users. It is possible to compare several indicators or the values of a same indicator at different times using a tool enabled through EDO portal.

The monitoring of drought is based on the analysis of a series of indicators that represent different components of the hydrological cycle, such as precipitation, soil moisture, reservoir levels, river flow, groundwater levels, or certain impacts associated with a particular type of drought (such as vegetation water stress) (Copernicus - European Drought Observatory).

The Global Drought Observatory (GMO) has been developed for the humanitarian services of the European Commission by the Joint Research Center (JRC). This observatory serves as a source of information about droughts and their possible effects worldwide. The aim of this service is to monitor and forecast drought hazard and to estimate the dynamic risk of impacts in different sectors. It is also focused on sectorial risk assessment as hazard, exposure, vulnerability (Vogt et al., 2016).

#### 2.2.2.4. Cross- Border Cooperation

There should be a regional approach for disaster risks since the disasters have a possibility to happen irrespective of national borders. It is another concern of UCPM to take the risk management capacity of the EU to a regional level.

There are geographical groupings of some countries with similar disaster types made to show the disaster risks to a regional extent. There are cross-border cooperation programs of EU within “Interreg” as European Territorial Cooperation to assess risks at cross-borders and invest in risk prevention, risk preparedness and risk response as alerts of fires or pollution. The challenge of EU is to decrease the border restrictions to be able to create more integrated mechanisms at borders (DG ECHO, 2017).

#### 2.2.2.5. Sendai Framework

Disaster risks have importance in disaster management as mentioned above. European Union is taking part in UN Sendai Framework for Disaster Risk Reduction for its implementation. This programme is for the management of disasters with the contribution of disaster risks. It aims to inform about disaster risks and take action for disasters considering these risks in the preparation of disaster prevention, preparation, and management policies. There are certain fields as research and innovation, investment, competitiveness, gap definitions and so on. These are EU priority areas, which Sendai Framework contribute at a global level by creating a resilient environment with disaster risk reduction (European Commission, 2016).

### 2.2.3. EU Policies Regarding Prevention and Preparedness to Protect Against Forest Fires and Disasters

#### 2.2.3.1. Legal Framework and Policies Relating to Prevention and Preparedness for Forest Fires and Disasters

##### 2.2.3.1.1. EU Legislation on Forest Fires

[Council Regulation \(EEC\) No 2158/92 of 23 July 1992 on protection of the Community's forests against fire](#)

Forests contribute to the natural environment as they are protectors of agricultural lands and the countryside. The forest at the southern part of Europe are under danger of fire. That is why the aim of the Council should be to get organized to protect forests from fires with the contribution of Member States. It is possible to reduce the number of fires by focusing on the reasons of fire, fire prevention and forest protection measures. The way to cope with forest fires should primarily include the areas having severe fire risk, and the degree of fire risk should be a key focus to consider the prior areas. The areas which are periodically exposed to forest fires should be considered as high risk areas. The medium risk areas are the ones which do not



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periodically experience fire but have a major threat to forest ecosystems. The remaining areas are considered as low risk areas. Forest fire action plans including the causes of fires and improved systems of monitoring and systems of control should be prepared at areas having high and medium risks. These plans should include the information about the preventive methods and techniques of fire protection, also the fire monitoring and control systems. A data bank including the Member States should be created to improve the system of fire protection. There should be campaigns for giving information to public about forest fires. Also, the protective infrastructure as forest paths and firebreaks should be provided. The monitoring systems should be accessible by public to inform them. New technology will contribute to the improvement of monitoring systems. In addition to these, the coordination among Member States is another key point. They should exchange information about forest fires, evaluate the risk causes and degrees, develop strategies to reduce forest fires and collect data about the risky areas. They can be involved in the projects about information systems of forest fire, under the consultation with the Commission. There should be departments related to the forest fire regulations in Member States, and they should take regulatory measures involved in their regulations and laws to prevent irregularities (European Commission - Environment - Forest fires related EU legislation).

### Commission Regulation (EC) No 804/94 of 11 April 1994 laying down certain detailed rules for the application of Council Regulation (EEC) No 2158/92 as regards forest-fire information systems

This legislation was prepared to give the initial for establishing systematic information on forest fires to be used in protective and preventive methods of forest fire, in their evaluations and developing strategies for protection and reduction of causes. A set of information about forest fires needs to be collected from Member States, in the high and medium risk areas. Minimum common core of information is required from each state which consist of the information on forest fires about:

- the time of first alert
- date and time of first intervention
- date and time of the extinguish time of the fire
- location of outbreak of fire
- total burnt area
- breakdown of burnt area into wooded and unwooded land
- predicted cause of forest fire

These are needed to harmonize the adequate information on forest fires through a cooperation between Member States and the Commission. The establishment systems as information and monitoring will be possible with the gathered information (European Commission - Environment - Forest fires related EU legislation).

### Council Decision of 9 December 1999 establishing a Community action programme in the field of Civil Protection

The cooperation between Member States and the commission should be strengthened by establishing a Community Action Programme in civil protection field. The policies and actions about environment, sustainable development, scientific research and technology will be strengthened to improve EU's protection in case of environmental emergencies. These preventive, protective and responsive measures will be included in the Community Action Programme. Also, national policies will be included for an improved collection of experience and mutual assistance. In order to implement this plan, there are individual actions to be taken as;

- taking preventive measures against risks
- increasing the degree of preparedness
- detecting and studying the disaster causes
- improving forecasting and response methods
- giving public information, education and awareness to improve citizen's self-protectiveness





It is important to implement all these measures with close cooperation with Member States and each state should contribute with their national research fields (European Commission - Environment - Forest fires related EU legislation).

Regulation (EC) No 1485/2001 of the European Parliament and of the Council of 27 June 2001 amending Council Regulation (EEC) No 2158/92 on protection of the Community's forests against fire

The participation of rural communities as foresters and stock farmers to the fire prevention action plans is important since they have a wide knowledge about forestry and they can practise preventive silviculture and have a role in first-line firefighting. Fires are considered as threats to sustainable development in fire-risk zones. The system of information suggested in the first regulation(1992) which has enhanced the coordination on forest fires should be developed for preparing better prevention and monitoring, protection measures and analysis of the fire causes (European Commission - Environment - Forest fires related EU legislation).

Regulation (EC) No 2152/2003 of the European Parliament and of the Council of 17 November 2003 concerning monitoring of forests and environmental interactions in the Community (Forest Focus)

The monitoring facilities are integrated into the new scheme as “Forest Focus”. The exchange of information will be encouraged in the scheme as evaluations of the harmful conditions on forests to protect and promote the forests, support sustainable development and reduce the negative causes affecting forests. The protection of forests from forest fires is importance because of the impacts of climate change and the desertification caused by fires. The forests and the environment should be examined as a whole by monitoring; biodiversity, carbon sequestration, climate change, soils, air pollution and air pollution effects, factors having impact on forests and protective function of forests.

Also, monitoring the forest fire causes and their effects is needed. On another perspective, there should be a clear definition of “forests”, “other wooded land”, “other land”, and “forest fire”. There will be a systematic network of observation points to conduct the periodic controls and gather information. It is important to take the prevention subject into consideration within a broad perspective. Harmonised methods of collecting information between Member States is important to provide meaningful information about prevention against forest fires. The collected information should be comparable to enable a monitoring platform including geo- referenced spatial data. There should be specific mandatory manuals, parameters and optional monitoring methods to make a comparable data available. The monitoring criteria given above should be the key points to consider when collecting the data. The cooperation with other international bodies of the Commission and Member States in monitoring field is needed for the sustainable development of forests. There should be new agencies and authorities in each Member State for the controlling of data as handling and forwarding. Also, they should prepare reports on monitoring activities. The agents working in the field will be trained in fire prevention interventions. The data should be reliable by taking the following into consideration as;

- access to information
- public participation in decision making
- access to justice
- access to environmental information

The implementation will be done by the Commission itself. For the regulatory purposes, the Standing Forestry Committee will assist the Commission. The Forest Focus scheme will be open to candidate countries, Cyprus, Malta, Turkey and other European countries (European Commission - Environment - Forest fires related EU legislation).

### **2.2.3.1.2. EU Legislation on Other Disasters**

Decision No 1313/2013/EU of the European Parliament and of the Council on a Union Civil Protection Mechanism

The Union should focus on the initiatives as European Earth Observation Programme (Copernicus), the European Programme for Critical Infrastructure Protection (EPCIP) and the Common Information Sharing



Environment (CISE) for a better management in case of disasters. Risk assessment, risk management planning and risk management capability assessment is necessary by each EU member. Union Mechanism of preparedness is provided by Emergency Response Coordination Center (ERCC) which works 24 hours by following the events and assessing risks of disasters. On the other hand, Member states should develop new modules voluntarily for prevention (European Civil Protection and Humanitarian Aid Operations - Legal Framework).

Regulation No 375/2014 of the European Parliament and the Council on establishing the European Voluntary Humanitarian Aid Corps ('EU Aid Volunteers initiative')

There is a need of voluntary work for dealing with disasters efficiently and to increase the awareness of people about disaster preparedness subject. The capacity of EU on conducting the civil protection mechanisms should be supported with EU Aid Volunteers. Volunteers can cooperate with other nations to improve their international relations whereas they can also enhance the active European citizenship among its citizens. They should work on the humanitarian subject and try to fill the gaps in the field (European Civil Protection and Humanitarian Aid Operations - Legal Framework).

Communication from the Commission to the European Parliament, the Council and the Committee of the regions: rescEU

The EU should increase its capacity of disaster preparedness and management with a functional mechanism. The risk analysis and monitoring systems have a high importance. EU should use its funds extensively regarding disaster preparedness and response. There should be an integrated approach in the Union to prepare for disasters.

Disaster prevention is a subject which can be provided by the applications of preparedness and response activities. Union Civil Protection Mechanism conducts its process, and UCPM should be strengthened. Also, this legislation highlights the importance of climate change adaptation, disaster preparedness, early warning systems and knowledge management initiatives such as Disaster Risk Management Knowledge Center (DRMKC) which are the key points to be supported for disaster prevention. It is indicated that DRMKC is a useful platform for developing the European Civil Protection Knowledge Network (European Civil Protection and Humanitarian Aid Operations - Legal Framework).

Decision (EU) 2019/420 of the European Parliament and of the Council of 13 March 2019 amending Decision No 1313/2013/EU on a Union Civil Protection Mechanism (6,8,14,23,28)

The disaster prevention in EU follows the creation of risk assessments and risk management capability assessments which are prepared regularly. Also, the information about the risks having cross-border impacts should be shared by Member States. The climate change is taken into consideration since it is a contemporary major problem. In addition to risk assessments, the risk maps are prepared to increase the efficiency of prevention and response activities. The consultation mechanisms are important for the coordination of commission and member states. The regional and local authorities have an important role in prevention and management of disasters. Union Civil Protection Network should be established to increase the training exercises of civil protection in the national authorities and services of Member States. They should take the necessary actions for disaster prevention which are compatible with the decisions made in Sendai Framework for Disaster Risk Reduction 2015-2030, the Paris Agreement under the United Nations (UN) Framework Convention on Climate Change and the UN Agenda 2030 for Sustainable Development (European Civil Protection and Humanitarian Aid Operations - Legal Framework).

Implementing Rules - Commission Decision, laying down rules for the implementation of Decision No 1313/2013/EU of the European Parliament and of the Council on a Union Civil Protection Mechanism and repealing Commission Decisions 2004/277/EC, Euratom and 2007/606/EC, Euratom

Union Civil Protection Mechanism aims to increase the cooperation between the member states to ensure the prevention and response in case of natural and man-made disasters. ERCC should be in close contact with Member States all the time to be able to monitor and get prepared for disasters (European Civil Protection and Humanitarian Aid Operations - Legal Framework).



## 2.3. Strategies and Regulations for Prevention and Protection from Local Disasters in Turkey

### 2.3.1. Applications on Prevention and Protection from Disasters in Turkey

Turkey is vulnerable to many natural and man-made disasters, including forest fires, earthquakes, landslides, and floods. There are several public institutions working on prevention, protection, preparedness and loss reduction against disasters. These institutions and their responsibilities are mentioned in following parts.

#### 2.3.1.1. Forest Fire Management

Activities on prevention and extinguishing of forest fires in our country are developed and implemented by the state. Forest fire management in Turkey is carried out under the responsibility of the General Directorate of Forestry, affiliated to the Ministry of Agriculture and Forestry. There are 263 forest management directorates under 28 regional directorates. Forest fire management composed of early detection, prevention and control activities (Ministry of Agriculture and Forestry - General Directorate of Forestry - Organizational Structure).

The regulations relating to prevention, protection, risk reduction and intervention against forest fires are listed below (Ministry of Agriculture and Forestry - General Directorate of Forestry - Legislation):

- Forest Law No. 6831 dated 31.08.1956
- Implementing Regulation No. 15729 on the Works to be Performed by the Officials in the Prevention and Extinguishing of Forest Fires dated 09.10.1976
- Regulation No. 26569 on Arrangement of Forest Road Network Plans dated 01.07.2007
- Regulation No. 27825 on Establishment and Mission of the OGM Provincial Organization dated 24.01.2011
- Regulation No. 28387 on Establishment and Duties of Research Institute Directorates dated 17.12.2012
- Communiqué No. 285 on Application Principles for the Prevention and Extinguishing of Forest Fires dated 1995
- Communiqué No. 292 on Planning, Construction and Maintenance of Forest Roads dated 12.03.2008
- Circular No. 6534 on Information and Communication Technologies dated 03.12.2007
- Circular No. 6550 on Geographic Information Systems Working Principles and Procedures dated 07.02.2008

Efforts for prevention and management of forest fires in Turkey are carried out basically by forest management directorates and forest sub-district directorate units. These works are performed within the scope of the circular called "Application Principles for Prevention and Extinguishing Forest Fires" prepared by OGM and "Implementing Regulation on the Works to be Performed by the Officials in the Prevention and Extinguishing of Forest Fires" issued in accordance with the article 69 of the Law No. 6831.

In order to be prepared for forest fires, the collaboration activities to be carried out between the General Directorate of Forestry and other public institutions are determined by the "Regulation on the Works to be Performed by the Officials in the Prevention and Extinguishing of Forest Fires". In accordance with this regulation, the Commission on Combating Forest Fires convenes under the chairmanship of governors in provinces and district governors in districts until the end of March every year. The decisions taken in this meeting are shared with the Ministries of Education, Public Works, Transportation, Finance, Interior Affairs, Justice and National Defense (current Ministries on related issues) and their Local Units, General



Directorates of Turkey Electricity Generation and Distribution, PTT, TRT, Turkish Airlines, Turkish State Meteorological Service and Religious Affairs Directorate General (Communiqué No. 285 on Application Principles for the Prevention and Extinguishing of Forest Fires dated 1995).

The legal measures taken for the prevention of forest fires stated in the communiqué called "Principles of Application in the Prevention and Extinguishing of Forest Fires" with No. 285 are as follows:

- According to the 74th article of the Forest Law, the entrance and exit to the forests will be restricted with the approval of the Governorship or completely banned when necessary during the dry months when there is a high forest fire probability.
- Decisions taken by the Governorship to control forest areas with high probability of fire will be announced. In these announcements, criminal proceedings will be declared for those who do not comply with the decisions.
- According to the 74th article of the Forest Law, a decision will be taken by the Commission for Combating Forest Fires convened under the Governor's Office for joint control and patrol duties between the General Directorate of Forestry and law enforcement agency and Gendarmerie.

There are 3 basic strategies used by the General Directorate of Forestry to manage forest fires in Turkey:

- Forest Fire Prevention (Training and awareness raising)
- Extinguishing (Early warning, rapid and effective response)
- Rehabilitation (Afforestation of burned areas)

### 2.3.1.1.1. Forest Fire Prevention Activities

On the purpose of forest fire prevention in Turkey, actions such as awareness raising and training activities for OGM staff and the public continues throughout the year.

#### a. Awareness Raising Activities for Intended Population

In this respect, it is aimed to develop and raise environmental awareness and to give information about the forest ecosystem through trainings especially for school-age children. Another aim of these trainings is to create a more sensitive society in the future for the protection and continuity of forests. For this purpose, various conferences are organized in the schools by the Regional Directorate of Forests during the training season, theater performances are organized through the squirrel children's theater channel, brochures, posters and promotional materials about forests are distributed to the students.

There are 21 thousand villages in and next to the forests in our country and the population of these villages are approximately 7 million. The nature and intensity of forest-public relations is an important factor in the success of fire prevention and extinguishing activities. The forest villagers, who continue their agricultural activities in the forest and adjacent areas, sometimes cause negative effects on forests, especially forest fires. For this reason, on-site awareness and training activities for forest villagers are carried out intensively by Forest Regional Directorates.

Within the scope of the Training Plan for Forest Villagers Action Plan, statistics of the last ten years forest fires within the borders of the Regional Directorates have been analyzed and the areas that forest fires are concentrated have been determined. The project "Training of the People through Mobile Education Teams" is being carried out to train, warn and raise awareness against forest fires in regions, which are designated as Special Fire Prevention Zones.

In order to make maximum use of local radio, internet broadcasts and televisions, which play an effective role in reaching larger audiences, programs that describe the importance of forests and forestry activities in our country are provided at prime times. Documentaries and spots on forest theme prepared for use in radio, internet and television are shown especially during the fire season on local TVs and radios.



Military units provide great support, especially in fire fighting activities. Since dispatch and fighting methods in fire are very important, military units are trained on issues related to extinguishing techniques, coordination and life safety. Local fire brigades are also an important source of support in firefighting. Although they have experience in city fires, they do not have sufficient experience in forest fires. For this reason, information meetings are held on the behaviors of forest fires, extinguishing techniques and ensuring coordination during the fire (Ministry of Agriculture and Forestry, 2019).

### b. In-Service Trainings for OGM Staff:

In order to be successful in forest fires, in-service training activities given to OGM personnel continue throughout the year. In this context;

- For the training of technical personnel, emphasis is put on issues such as raising awareness of the public in order not to create forest fires, fighting methods against potential forest fires, use of GPS, vehicle tracking systems and first aid. The training is based on the experience and images acquired from the previous fire seasons. In this context, trainings on Fighting Forest Fires are carried out, in which measures to be taken in combating forest fires are evaluated. These trainings are attended by Regional Deputy Directors, Forest Fire Fighting Branch Managers, Protection Branch Managers, Forest Management Directors, Deputy Directors and Forest Sub-district Chiefs working in the Regional Directorates.
- Periodical trainings for forest fire workers are carried out on fire extinguishing techniques, first aid and other technical issues. Water truck operators are subjected to practical training on “Advanced Driving Techniques” at certain times.
- On-the-job trainings are provided for all managers and other technical staff working in the Regional Directorates, which are sensitive in terms of forest fires.
- Fire workers are subjected to on-the-job training by the Regional Directorates and kept ready for duty at any time. These trainings are supported with course videos and educational brochures prepared by taking advantage of the shooting made during the previous fires.
- In the fight against forest fires, team commander, front chief, front officer, fire chief, land and air vehicle officers and technical personnel who carry out supply works are trained in computerized training simulator at the International Forest Fires Training Center in Antalya (Ministry of Agriculture and Forestry, 2019).

### c. Forest Fire Fighting Facilities and Silvicultural Applications

The forest road network planned to carry out various forestry activities of the General Directorate of Forestry is the main element in the fight against forest fires. Forest roads are maintained and open for transportation before the fire season begins. Strips are created using Fire Resistant Species, which act to prevent the spread of fires at the edges of Fire Safety Routes. Since these facilities will also be used as wind curtains, pruning works are carried out without interruption.

Regarding the determination of fire sensitive areas at the country level and determination of the plans and projects to be implemented for these areas; Circular No. 6976 “Rehabilitation of Burning Forest Areas and Fire Resistant Forests Plant Project” (YARDOP) has entered into force. The technical and administrative principles on which fire-prevention facilities and related works are based are specified in this circular. YARDOP projects are carried out in forested areas that are burnt and are sensitive to fire and must be made resistant (Ministry of Agriculture and Forestry, 2019).

### d. Intervention to Forest Fires

Reconstruction has been reached in line with international cooperation in the efforts to respond to forest fires. Accordingly, a team system consisting of 1 first intervention vehicle, 3 water trucks, 1 water tanker,



1 ground crew when necessary, has been established and this team acts as the pioneering intervention team in potential forest fires.

When the weather conditions are critical for forest fires, forests are kept under constant control by crews with motorcycles. At least two special teams have been formed in order to make urgent interventions in every directorate that is sensitive to fire.

Early detection and intervention are important in extinguishing fires before they grow. Teams are provided to be deployed to respond to forest fires within 15 minutes at the latest. Emergency Response Teams are established from the current staff in order to extinguish the fires that may occur before and after the fire season (May-November period).

First response vehicles, water trucks, construction equipment and air vehicles are used for response to forest fires. In addition, natural and artificial water ponds and fire pools where the aircraft get water are constructed by OGM (Ministry of Agriculture and Forestry, 2019).

### **2.3.1.1.2. Development in prevention of forest fires during the recent years**

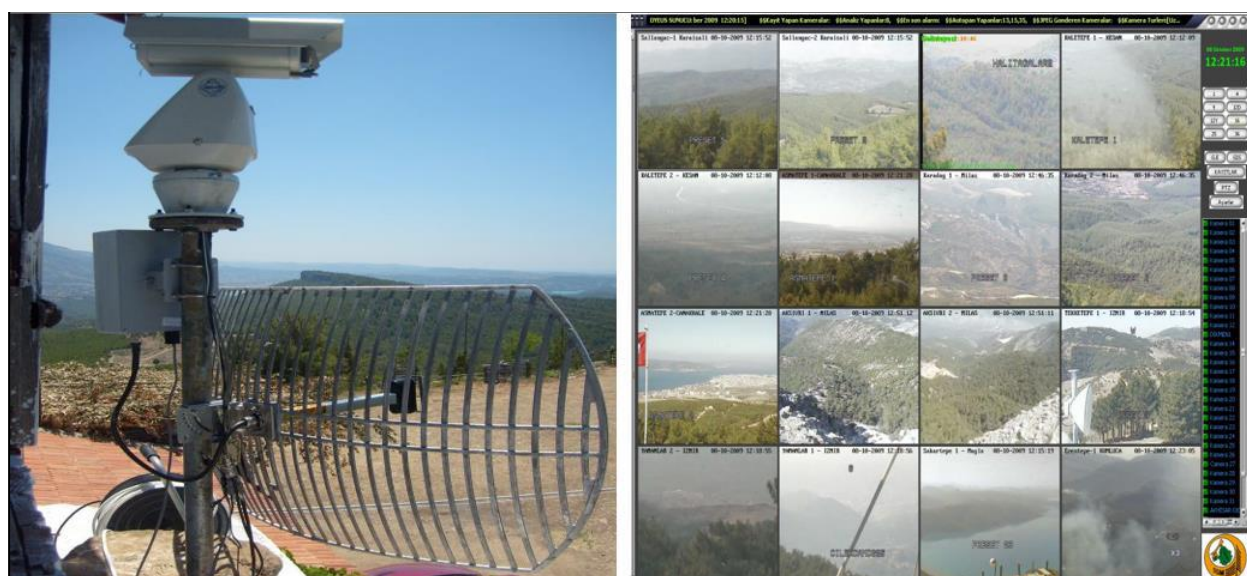
Concerning forest fires, awareness raising activities are carried out at every level of the society by using effective communication tools. In this context; public spots for children and adults were prepared and published in prime-time. Banners with information and warnings about forest fires are hung in areas sensitive to forest fires. In addition, a 3D movie prepared for the purpose of informing and raising awareness about forest fires has been screening in a new traveling truck in these regions.

At the International Forestry Training Center in Antalya, domestic and foreign trainees continue to be given theoretical and practical trainings on forest fires.

Provisions related to forest fires are added to the permits issued to organizations operating in or near the forest. The personnel of the Energy Production and Distribution companies are trained on forest fires. Forests are monitored by attaching a camera to wind turbines that have appropriate features.

Meteorological data are evaluated on annual, monthly and daily basis, and all relevant units are constantly and regularly warned up. In addition, fire sensitivity classification of operational directorates was re-evaluated and fire sensitivity map for past fires was updated considering the last 20 years of fire statistics.

Forest Fire Early Warning System in Turkey has been further developed in recent years. Fire watch towers are being modernized to detect forest fires and report them to response teams as soon as possible. In this context; 250 cameras are used in 125 watchtowers as remote detection of forest fires and automatic fire detection systems. In addition, 15 unmanned Observation Towers (Smart Towers) started to operate and Mobile Fire Observation Towers (unmanned and Solar Powered), 25 domestic production, were put into use in regional directorates of Istanbul and İzmir (Ministry of Agriculture and Forestry, 2019).



**Figure 3** The early warning system for detecting forest fires (JRC, 2018)

The Forest Fire Management System has been developed and turned into a superior software where all recording, tracking and reporting processes can be done on a web-based basis. In addition, Fire Management System is integrated into ORBİS (Forestry Information System). Studies are carried out in order to make the duty and flight tracking of aircrafts from the ORBİS module. Monthly and instantaneous meteorological fire risk maps are integrated into the forest fire module. Studies on the construction of multi-criteria fire risk maps are ongoing.

With the Rehabilitation of Burning Areas and Fire Resistant Forests Project (YARDOP), arrangements have been made to facilitate the construction of fire-prevention facilities. With the stand maintenance, the amount of combustible materials has been reduced and measures have been taken to prevent the cover fire from turning into a hill fire, and activities continue within this scope.

Fire Management Plan Drafts have been created in cooperation with experts from Faculty of Forestry in Karadeniz Technical University for the selected pilot regions. In 2017, Fire Management Plans of 10 Forest Management Directorates in Istanbul Regional Directorate of Forestry were prepared and put into practice. In total, fire management plans of 25 Forest Management Directorates in 9 regional directorates are completed in Turkey up to the present (Ministry of Agriculture and Forestry, 2019).

### 2.3.1.1.3. Fire Management Plans

Fire Management Plans have been started to be prepared as of 2017 on the basis of Forest Management Directorates within the General Directorate of Forestry.

In these plans, the physical characteristics of the area within the boundaries of the management directorate and the forest structure with flammable substance content are analyzed. According to the results of the analysis, forest fire hazard and risks are evaluated. Accordingly, in terms of fire risk, spatial risk analysis of fires is performed and potential fire starting points are identified. In terms of hazard assessment; taking into consideration the potential fire severity, the spread rate and the peak fire potential are determined and the areas under fire risk are determined.

As a result of the hazard and risk assessments, the fire management areas are determined, the priorities and practices to be implemented in these areas are documented. In addition, the activities to be performed in terms of preventing forest fire, being prepared for fires and combating fires are set out in the plan (Istanbul Forest Management Directorate, 2018).



### 2.3.1.2. Disaster Management

The disaster risk management in Turkey has been developed in recent years initiating reforms to reduce and manage disaster risk and to strengthen the relevant institutions. Several legal regulations have been put into effect in accordance with the developing conditions and requirements over the years, starting from the Civil Defense Law No. 7126, which was first issued in 1958 on disasters.

Legal regulations regarding disaster prevention, protection, risk reduction and intervention are listed below (Disaster and Emergency Management Presidency (AFAD) - Laws and Legal Decision):

- Civil Protection Law No. 7126 dated 13.6.1958
- Law No. 7269 on the Measures to be Taken Because of Disasters dated 25.5.1959
- Law No. 5902 on Organisation and Duties of Disaster and Emergency Management Presidency dated 17.06.2009
- Law No. 6306 on Transformation of the Areas Under the Risk of Disasters dated 31.05.2012
- Decision of Council of Ministers No. 2011/1320 on The Establishment, Duty, and Working Principles of Turkey Disaster Risk Reduction Platform dated 21.02.2011
- Implementing Regulation on Sanctuary dated 25.08.1988
- Implementing Regulation on Establishment, Duties, Work Methods and Fundamentals of Civil Protection Search and Rescue Teams dated 21.07.2000
- Implementing Regulation on the Buildings to be Constructed at Disaster Risk Areas dated 14.07.2007
- Implementing Regulation on Protection of Buildings From Fire dated 19.12.2007
- Implementing Regulation on Framework and Standards of Provincial Disaster and Emergency Directorates and Civil Protection Search and Rescue Directorates dated 17.12.2009
- Implementing Regulation on Administrative Status, Duties, Work Methods and Fundamentals of Civil Protection Experts and Their Education dated 05.08.2010
- Implementing Regulation on Disaster and Emergency Management Centers dated 19.2.2011
- Implementing Regulation on Canine Search Team Working Principles dated 31.05.2011
- Implementing Regulation on Disaster and Emergency Management Presidency Research, Survey and Project Preparation Methods dated 10.01.2012
- Implementing Regulation on Emergency Situations at Workplaces dated 18.06.2013
- Implementing Regulation on Disaster and Emergency Response Services dated 18.12.2013
- Implementing Regulation on 112 Emergency Call Center Establishment, Duty and Work Principles dated 16.05.2014
- Implementing Regulation on Disaster and Emergency Management Presidency Turkey Earthquake Data Center System dated 28.08.2015
- Instruction on Presidency of Disaster Emergency Management Legal Advisor's Duty, Authority, and Work Methods and Fundamentals dated 24.10.2016
- Instruction on Turkey Disaster Risk Reduction Platform dated 25.12.2018
- Circular No. 32850907-010.06.02/19499 on Application of Turkey Disaster Response Plan (TAMP) and Disaster Management and Decision Support System (AYDES) dated 2015
- Circular No. 67105415-010.06.01 on Disaster Risk Reduction System (ARAS) dated 30.10.2019

Turkish Government established the Disaster and Emergency Management Presidency (AFAD) in 2009 in order to extinguish the authority confusions between institutions and consolidate entire authorisation of





disaster and emergency response under one institution. The Disaster and Emergency Management Authority is an institution that provides cooperation among all the institutions and organizations of the country for planning, directing, supporting, coordinating and effective implementation of the necessary activities in order to prevent disasters and reduce their losses, respond to disasters and complete post-disaster recovery efforts. AFAD, headquartered in Ankara, carries out its activities with Provincial Disaster and Emergency Directorates that are affiliated to the governor in all provinces and Disaster and Emergency Search and Rescue Union Directorates in 11 provinces (Disaster and Emergency Management Presidency (AFAD)).

In 2014, Turkey's National Disaster Response Plan (TAMP) was carried into effect to guide to all disaster and emergency response.

#### 2.3.1.2.1. Turkey National Disaster Response Plan (TAMP)

The purpose of the Turkey Disaster Response Plan (TAMP) is to define the roles and responsibilities of the service groups and coordination units that will take part in disaster and emergency response activities, and to determine the basic principles of response planning before, during and after the disaster (AFAD, 2013).

TAMP includes all of the ministries, institutions and organizations, private organizations, NGOs and natural persons who will take part in disaster and emergency response in any type and scale that may occur in our country.

Objectives of the National Disaster Response Plan are;

- to rescue life,
- to return interrupted life and activities to normal as soon as possible,
- to perform intervention studies quickly and in a planned manner,
- to protect and maintain public health,
- to protect property, environmental and cultural heritage,
- to reduce economic and social losses,
- to prevent secondary disasters or reduce their effects,
- to ensure the efficient use of resource (AFAD, 2013).

Planning principles of TAMP can be examined in two different topics:

##### a. Basic Principles

- Comprehensive (Preparation, intervention, pre-improvement stages)
- Covering all types and sizes of hazards
- Including the roles and responsibilities of all main and support solution partner
- Based on immediate mobilization of national, regional and local disaster response capacity

##### b. Complementary Principles

- Effective planning
- Flexible and scalable structure
- Improvement and development
- Coordination, cooperation and solidarity
- Information management and communication
- Compliance with relevant legislation (AFAD, 2013)

TAMP is prepared with a tactical approach to define the roles and responsibilities of service groups and coordination units that will take part in disaster and emergency response activities. TAMP describes the

intervention organization system, which is adaptable, flexible and modular according to the type and scale of possible disasters and emergencies as an upper plan that shows how to carry out intervention and emergency actions at national and local level.

According to TAMP, ministries, institutions and organizations should prepare their national service group plans together with their support solution partners according to the tactical approach expressed in Figure 4, and they should establish the service group teams in these plans, and determine the duties, powers, responsibilities and workflows of each team.

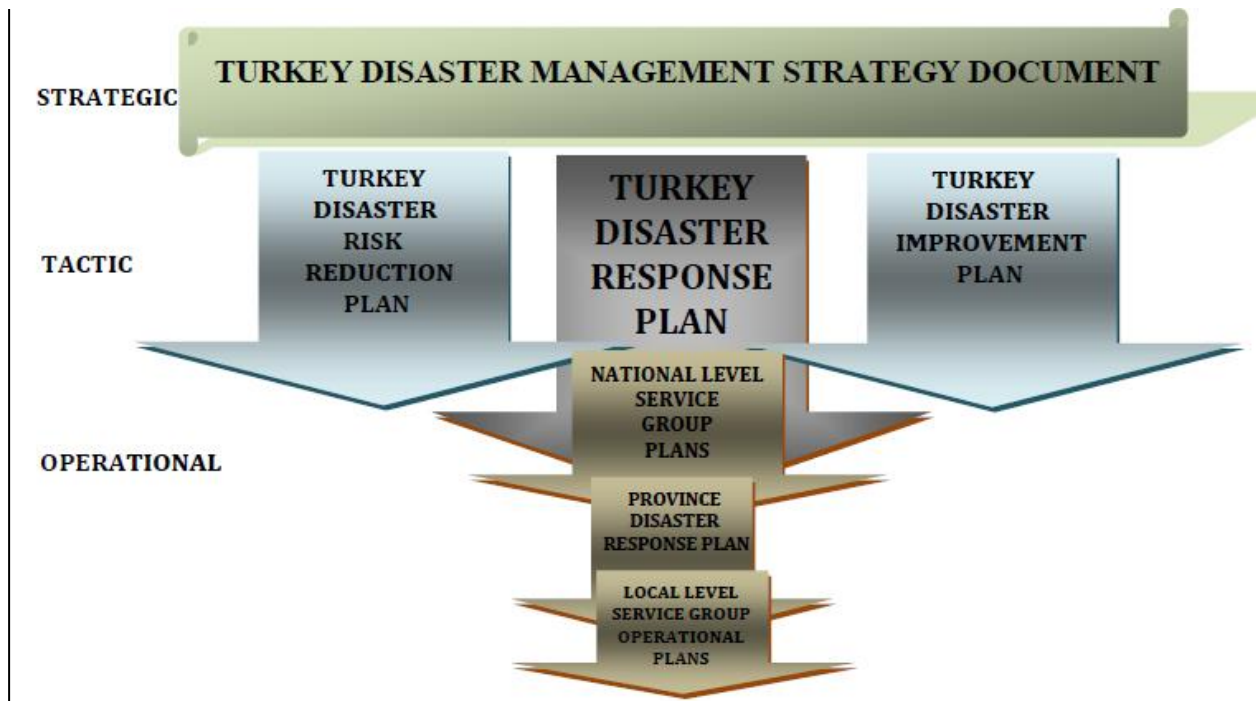


Figure 4 Plan Types in TAMP (AFAD, 2013)

The ministries, institutions and organizations that will serve in the field are specified in the Disaster and Emergency Management Centers Regulation according to the types of events related to large-scale natural disasters, collective population movements, fires, technological accidents, chemical, biological, radiological and nuclear accidents or incidents, air and sea accidents, dangerous and epidemic diseases. The Disaster and Emergency Supreme Board decides which types of events will be prepared at national level within the scope of TAMP. Relevant institutions prepare their plans within six months from the notification of the decision.

In the national level service group plans, planning and capacity building should be done considering all disaster types. It is determined in advance which service groups should act for which types of disasters.

In the districts where a Disaster and Emergency Management Center is established, district disaster response plans are prepared by taking into consideration the provincial disaster response plan. For the other districts, the provincial plans are prepared to cover all of districts. The ministry, main solution partner at the national level, the provincial organization of the institution should prepare the provincial service group operation plan at the local level together with other support solution partners. In the operation plans; communication system and information, meeting places, transfer planning, report and form samples, personnel to be assigned to teams and sub-teams in intervention studies, tools, equipment, tools, equipment resource inventories, work flows, shift planning and standard operation procedures should be included (AFAD, 2013).

Both national and local level plans should be prepared by taking into consideration following subjects:



## Prevent Fires

- To determine the dangers and risks that may be encountered during the task as much as possible
- To identify all possibilities and capabilities within the responsibility area of its service group as power and resource
- To develop the capacity as much as possible in order to reduce the risks and losses encountered during the task
- To Perform preparations at all levels against all disasters and emergencies
- To ensure cooperation and coordination between relevant institutions
- To Update all information regularly
- To organize training and drills on the subjects included in the field of duty and to participate in other related drills
- To organize the establishment, duties, working procedures and principles of the service group and teams in detail, and to ensure their implementation by national and local level teams (AFAD, 2013)

### Intervention Process

Effective response management consists of three stages: preparation, intervention and pre-improvement. Preparation activities composed of:

- Identifying of available resources
- Making plan
- Getting organized
- Preparing tools-equipment and tools
- Building capacity, taking advantage of new technologies
- Installing, developing and testing early warning systems
- Organizing training and drills
- Evaluation (AFAD, 2013)

#### **2.3.1.2.2. Preparation for Disasters**

The most important way to prevent disasters is preparedness. Disaster and Emergency Management Authority (AFAD) carries out preparatory activities to prevent natural events from turning into disasters.

In July of 2019, Disaster Preparedness Year was launched in Turkey by AFAD for the establishment of a culture of disaster preparedness. In this context, AFAD Accreditation System, Turkey's Disaster Risk Reduction Platform, Disaster Risk Reduction System (ARAS) and Volunteering Project were implemented. At the same time, within the framework of Disaster Preparedness Year, drills were prepared for disaster preparedness throughout the country (Disaster and Emergency Management Presidency (AFAD) - Disaster Preparedness Year).

The AFAD Accreditation System has been developed in order to provide conformity certificates to private sector organizations, NGOs and volunteer citizens who want to take part in Turkey's Disaster and Emergency Management System and to participate in AFAD coordination studies when needed.

Disaster Risk Reduction Platform is a formation that is proposed in the Hyogo Framework Action Plan and is also emphasized in the Sendai Framework Document where disaster risks are aimed to be reduced.

The objectives of Turkey's Disaster Risk Reduction Platform relating to disasters and emergencies are;

- Prevention of hazards,
- Increasing the sensitivity of the society to disasters,
- Ensuring continuity of risk reduction studies,



- Integrating risk reduction into plans, policies and programs at all levels.

Disaster Risk Reduction System (ARAS) is a web-based application where susceptibility and hazard maps can be created using different statistical models from landslide, rockfall and avalanche inventory data, and result maps can be shared with other institutions. This system has been developed in order to determine disaster risks in a scientific way and to take necessary measures against disasters in a timely manner.

As in previous years, AFAD organized various drills at the provincial, regional and national levels throughout the country in the Disaster Preparedness Year. Ministries, other public institutions and organizations and non-governmental organizations participated in these drills. These activities conducted within the scope of TAMP aimed to test the activities of 26 service groups such as search and rescue, health, nutrition, shelter, energy, infrastructure, psycho-social support (Disaster and Emergency Management Presidency (AFAD) - Disaster Preparedness Year).

#### 2.3.1.2.3. Volunteering Project of AFAD

With the AFAD Volunteering Project, it is aimed to determine the areas of duty, to increase their capacities through trainings and to monitor their performance within the volunteering system, in order to involve persons who want to be volunteer in any stage of disaster management.

AFAD Volunteers are trained in areas needed (health, nutrition, psychosocial support, shelter, search and rescue, etc.) before, during and after the disaster, so that they can work more effectively in every stage of disasters and thereby the society will be more resistant to disasters and emergency situations.

Project Objectives are:

- To establish the AFAD Volunteering System to win, retain and encourage volunteers with reflex and initiative, high response speed, and organized work with AFAD teams in activities to be carried out in Disasters and Emergencies
- To ensure that the competencies of AFAD Volunteers are developed through trainings, activities and exercises
- To minimize the material and non-material damage caused by disasters and emergencies and to make the society more resistant to disasters and emergencies with the support of AFAD Volunteers
- To provide a more effective service to communities affected by disasters and emergencies
- To contribute to the promotion of volunteering awareness in the society (Disaster and Emergency Management Presidency (AFAD) - Disaster Preparedness Year)

### 2.3.2. Applications on Prevention and Protection from Disasters in Kırklareli

#### 2.3.2.1. Forest Fire Management Plans in Kırklareli Province

Forest Fire Management Plans for 2018-2022 have been prepared for Forest Management Directorates within the Kırklareli province border. There are three forest management directorates in this region:

- Kırklareli Forest Management Directorate
- Vize Forest Management Directorate
- Demirköy Forest Management Directorate

With these plans, forest fire response activities are planned to prevent fires that may occur within the boundaries of the management directorates and to minimize the damages of possible fires. At the same time, it is foreseen to protect the ecological, biological, landscape and cultural resource values of the region and to ensure the continuity of the existing ecosystem structure.



## Prevent Fires

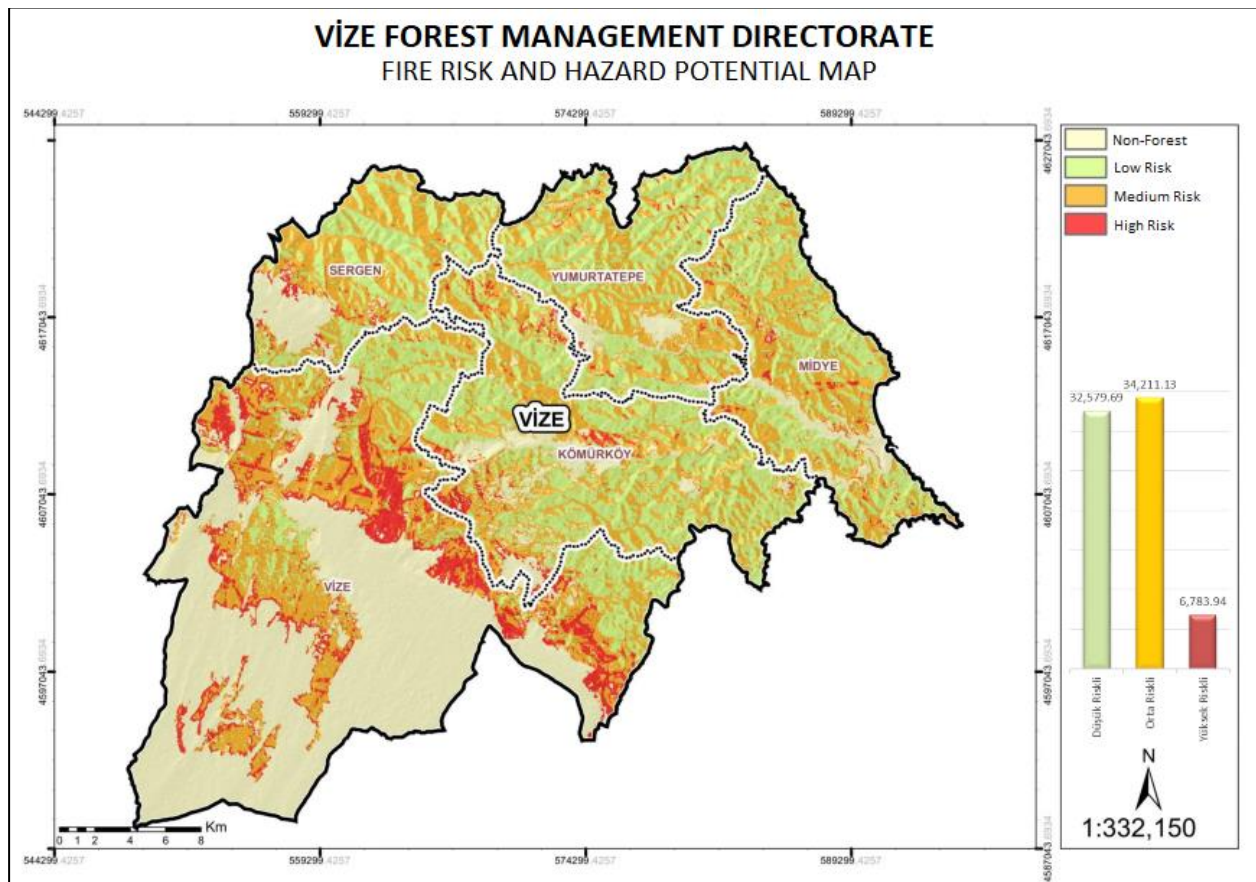
The main purpose of fire management plans is to minimize forest fire hazard and risk potentials, through trainings, awareness activities and field-specific combustible applications, to reduce carbon emissions from fire, to protect the natural values of forests and to prevent damage to the people living in the planning area.

Within the scope of the plan, activities and practices of fire prevention, preparedness against fire, fire fighting and using fire as a management tool were organized. Accordingly, training and awareness activities to be carried out before the fire, planning of fire safety roads and lanes, arrangement of flammable materials on the roadside, training, organization of fire teams and cooperation activities with institutions and organizations in the region were discussed.

The boundaries, physical properties, climatic and weather conditions, past fire data, fauna and flora characteristics and current status determinations of the directorates were carried out during the plan construction phases. After preparing the geographical and non graphic data regarding the planning regions, an integrated management plan was prepared by taking stakeholder opinions. During the preparation of the Fire Management Plans, Forest Sub-district Directorates' Forest Management Plans, past forest fire data, and the views and suggestions of the village headmen in the planning unit, non-governmental organizations, representatives of the relevant institutions and organizations regarding the plan were used.

During the planning works, fire hazard and risk potential maps were produced for each month in the fire season. Considering these maps, fire management zones have been determined, these zones have been evaluated in terms of physiographic factors, fire risk and danger situation, fire behavior potential, risk situation of settlements and difficulty of intervention, and consequently, priorities and practices to be done for each zone are detailed. In addition, the activities to be carried out in the areas of fire prevention, preparedness and firefighting have been specified. In the conclusion part of the plan, determinations regarding the current situation of the region obtained from the analysis studies and future suggestions were included (Vize Forest Management Directorate, 2018).

Fire Risk and Hazard Potential Map that is prepared for Vize Forest Management Directorate is given below as an example:



**Figure 5** Fire Risk and Hazard Potential Map of Vize Forest Management Directorate (Vize Forest Management Directorate, 2018)

### 2.3.2.2. Existing Local Approaches for Prevention of the Disasters in Kırklareli

Within the scope of the project studies, a survey was conducted with officials from various public institutions and non-governmental organizations in Kırklareli. In this study, it is aimed to obtain information about the current situation in Kırklareli about prevention, preparedness and response of disasters.

In the survey, the following questions were asked to the participants:

- Do you carry out precautionary measures, interventions and mitigation studies regarding forest fires and disasters?
- What are the responsibilities and authorities of your institution when forest fire or other disasters occur? Can you briefly give information?
- Do you carry out awareness-raising and training activities against potential forest fires and other disasters for the people living in your region and employees?
- Could you give information about responsible personnel, vehicles and equipment in your institution against forest fire and other disasters?
- Do you carry out activities (training, seminars, meetings etc.) to increase institutional capacity on disasters basis?
- Are there any non-governmental organizations or volunteers you are in contact with?
- If a disaster occurs in Turkey's border with Bulgaria, is it determined which Bulgarian institution and authorities your institution will contact and how the coordination will be?



## Prevent Fires

- Has your institution previously been involved in any disaster-related prevention or intervention activity?

A number of evaluations were made according to the answers of the participants. Some of the institutions and organizations in the region carry out precautionary measures, interventions and mitigation studies regarding disasters according to their authority and responsibilities.

The activities of local institutions regarding forest fires and disasters are detailed below:

- The Directorate of Agriculture and Forestry provides training to the people of the region to prevent stubble fires that cause forest fires. In addition, the Ministry is informed by determining agricultural fires. TARSİM meetings are held regarding natural disasters, and the producers operating in the region are informed about the insurance coverage of disasters.
- According to the information given by the Turkish Armed Forces official in the region, the organization is formed by establishing firefighters, search-rescue and safety evacuation teams from soldiers. The teams in the institution are ready for the tasks to be given if the governor's request and the Ministry of National Defense approves. In each call-up period, the teams are renewed and the staff is trained, exercises their tasks are reinforced by performing drills.
- Vize Municipality always supports the Forest Management Directorate relating to forest fires. Providing personnel and vehicle support in disaster situations are among the responsibilities of the institution. Fire trainings and drills are held in line with the requests. In order to increase the institutional capacity concerning disasters, trainings were provided for the personnel.
- Messages are sent to the local farmers and institution members during the stubble period by the Vize Chamber of Agriculture, and warnings are given to avoid burning stubble.
- The responsibilities and powers of the Directorate of National Education are to ensure communication and coordination on disasters. The Directorate periodically provides information to parents, teachers and students in schools through conferences, seminars and meetings. In case of forest fire or other disaster, the situation is immediately shared with the upper authorities. In line with the instructions of the upper authorities, studies are carried out in coordination with the schools and institutions connected to the directorate. Seminars and trainings on disasters are held at least twice a year, and earthquake and fire drills are realized.
- The Police Department intervenes in disaster events with tools, equipment and personnel as long as it is assigned. During forest fires, the Forest Management Directorate is assisted by the department as a reinforcing force. Meetings are held to increase the institutional capacity on the basis of disasters and this issue is included in the plans of the department.
- During the patrols carried out by the Gendarmerie Command in the area of responsibility, farmers and citizens who have a picnic are constantly warned not to burn stubble, or not to make a fire for a picnic or cleaning. It is among the responsibilities of the command to ensure that teams arrive in the region as soon as possible in the event of a forest fire, to warn the public about the fire, and to ensure the safety of evacuation if necessary. Seminars and drills related to natural disasters are held within the institution at certain periods.

As a result, the activities of the institutions in the region for disasters are generally informing and warning of the local people, and support of institutions that are equipped with personnel for disaster management and response actions. Most institutions do not have personnel specifically responsible for disaster prevention or response. When necessary, mostly police and military units support disaster management efforts. As a general evaluation, public institutions do not have a continuous contact and collaboration with



civil society organizations and volunteers regarding disasters. There is no existing organisation plan to determine which institutions and authorities to contact, how the coordination will be, what the authority and responsibilities of the local institutions will be during a disaster that may occur in Turkey-Bulgaria border area. In addition, the institutions interviewed have not had any disaster prevention or intervention studies in the past.

### 2.4. Gaps Between Local and European Strategies and Applied Measures

There are some gaps to be improved and differences between Turkish and European strategies and applied measures in terms of prevention and preparedness to protect against forest fires and disasters. The gaps and deficiencies detected are as follows:

- In recent years, studies on disaster prevention has accelerated in Turkey. However, it would be beneficial to further develop these activities, to take examples from the studies carried out in EU countries and to ensure harmony.
- Awareness and training activities for the public relating to disaster prevention and preparedness remain a bit insufficient in Turkey. It is important to develop and spread such activities using all potential media channels.
- Volunteering mechanism in Turkey remains a bit insufficient in preparedness and intervention processes both for forest fires and other disasters. Present volunteering mechanisms for disasters and forest fires should be further developed, relevant legislation should be detailed, people should be informed and encouraged to participate in these formations. It is also important to create a common database that includes a volunteer pool and to effectively use this database in emergency situations in order to reduce the damages.
- There are not enough projects about prevention, preparedness and intervention against forest fires carried out by universities, research institutions and NGOs. These institutions should be encouraged to realize such studies on forest fires. Additionally, there is a need to improve the curriculum on forest fires in forest faculties.
- There is a need to improve the exchange of ideas and information between universities / scientists and institutions operating in disaster prevention, preparedness and response. For this purpose, it will be beneficial to organize meetings and trainings at certain periods and to realize projects.
- There is a need to develop cross-border cooperation in the stages of disaster prevention, preparedness and response. For this reason, it is necessary to develop and maintain collaboration with neighboring countries regarding potential risk scenarios in border regions.
- Procedures for disaster management at local level in cross-border areas are not sufficient. Development of communication, information sharing and cross-border cooperation between persons responsible for disaster response on both sides at the borders is necessary.
- There is a need to develop early warning systems related to disasters and to generalize the systems available in certain regions nationwide or at least in high risk areas.
- There is a lack of scientific events on disaster prevention, preparedness, intervention strategies and disaster risk management that scientists and technical experts doing research in different countries or regions can share information about their recent studies and findings.





## 2.5. Best Practices in European Union Approaches in Reduction of the Risk from Disasters

In recent years, European Union called for new disaster management activities including an integrated approach to cope with disasters in European Countries. With this call, EU aims to increase cooperation and sharing best practices in disaster management under one platform. There is a research report called "Good Practices in Disaster Prevention" prepared within the scope of EU-funded Programme for the Prevention, Preparedness and Response to Man-made and Natural Disasters in the ENPI East Region (PPRD East) in 2013. According to the researchers who prepared this report good practices are defined as practices which has cost efficiency in terms of economic, environmental and social. Additionally, efficiency of implementations, sustainability, and suitability may be the other measures of effectiveness (Rademaekers et al., 2013).

There are some good examples according to disaster types given in the "Good Practices in Disaster Prevention" Report:

### Floods and storms:

Floods and severe storms represent two of the most widespread hazards in Europe due to climate change and caused many damages in most European countries in a different way. As reported by the European Environment Agency (EEA), between 1998 and 2009, Europe faced over 213 major floods that caused significant damage and a total of more than 1000 people died. Among the events resulting in the largest overall economic losses were the floods in Central Europe. As a result, EU countries developed different policies and implementations (Rademaekers et al., 2013).

- Flood Resilient Cities - Multi-State
- Cross Border Cooperation - Rhine 2020 - Germany, Netherlands
- Preliminary Flood Risk Assessment - UK
- Flood Awareness Campaign - UK
- Flood Hazard and Risk Mapping - UK
- Early Warning Systems - France, Italy
- Implementation of EU Floods Directive - Italy
- Floods Directive relevant terminology - Multi-State

### Earthquakes and tsunamis:

There are international criteria and standards on hazard mapping and design of earthquake resistant structures. Some countries (Greece, Italy, Turkey) have already taken into account international best practices. Micro-zoning is another earthquake prevention is used as a practice, which has been developed since the 1960's starting predominantly in New Zealand and Italy. Italy, Greece, and Turkey, for example, all have building codes that can be considered good practice cases.

- Disaster and Emergency Management Presidency (AFAD), a New Disaster Management Structure - Turkey
- Microzonation for Earthquake Risk Mitigation: Applied Research Project - Turkey
- Istanbul Earthquake Rapid Response and Early Warning System (IERREWS), after Decree of Council of Minister on 2001 Fiscal Year - Turkey
- Earthquake Disaster Information System for the Marmara Region - Turkey
- Eurocode 8 - Portugal
- Probabilistic Seismic Hazard Analysis (PSHA) for Seismic Zonation for Portuguese National Annex of Eurocode 8 - Portugal



- Integrated Observations from NEAR Shore Sources of Tsunamis (NEAREST): Towards an Early Warning System - Portugal
- CEA: Tsunami alert Centre for the western Mediterranean - France

#### Heatwaves, droughts and forest fires:

Because of forest fire is the main problem especially in Mediterranean EU countries, drought disaster implementations are very weak in Europe. Both drought, heatwaves and forest fires implementations must be integrated with people who are the one of main problems of these disasters.

- Plans for adaptation to extreme temperatures - Austria, France, Greece
- Early Warning System - Portugal
- Implementation of Drought Management Plans – Bulgaria, Cyprus, UK
- Albufeira Agreementart 19 "Droughts and Water Scarcity" – Portugal, Spain
- Guidelines for the identification of areas subject to drought - Italy
- Monitoring systems - Italy, Spain, Romania
- Liguria Regional Forest Plan - Italy
- Restoration of brook systems (Beekherstel) - Brabant NL
- Greek National Plan for Combating Desertification (GNCCD) - Greece
- Laws for the forest fire prevention Spanish Ministry of the Environment and Rural and Marine Affairs - Spain
- Fire Risk Mapping - Italy
- Wildfire Groups - UK
- Forest Fire Early Warning System - Germany, Italy
- Evora Protocol for Cross Border Cooperation - Spain, Portugal

#### Horizontal measures:

Horizontal measures are expressed as multi-sectoral and/or multi-hazard measures and practices relating to disaster risk prevention.

- London climate change adaptation strategy - UK
- Integration of risk assessment and disaster prevention in planning system - Norway
- Regional governance model (Emilia Romagna) - Italy
- Sweden's National Platform - Sweden
- Public and schools outreach - Sweden
- Vigilance system - France
- Insurance system - Spain

## **2.5.1. Best Practice Examples for Disaster Management Systems**

### **2.5.1.1. The French Vigilance System**

Disaster risk management is one of the major concerns for France. The main Disaster Risk Management mechanism of France is named Vigilance System which is focused on operational response on-site then on prevention, based on weather forecast (Borretti et al., 2012). Vigilance System is relied on common language as 4 - color scheme. These colors are showing different risk levels in administrative division of national territory which is logical to planning and crisis management.



A 24-hour time frame that combines satisfactory forecast security with sufficient advance warning for action. This provides wide potential risk forecast linked to meteorological criteria as a Vigilance map. The system shows risk of 5 types of hazards like; high winds, flooding, storms, snow and avalanches with a cooperation with a flood prediction network and takes into consideration of features in relation to tropical cyclones (Borretti et al., 2012). France has management and institutional measures from National to local level.

One of the specialties of the Vigilance System in terms of best practices is that it includes resilience activities by helping people and communities who suffer from disaster, and combine with protecting people and property from sustainable development.

### 2.5.1.2. Transboundary Cooperation and Sustainable Development in the Rhine Basin

The Rhine connects many countries and settlements from the Alps to the North Sea in Europe. The Rhine passes along Switzerland, France, Germany, Luxemburg, the Netherlands, Austria, Liechtenstein, Wallonia and Italy. These countries and regions are members of the International Commission for the Protection of the Rhine (ICPR) founded in 1950 to improve the sustainable development of the river and its catchment (Schulte-Wülwer-Leidig et al., 2018). Flood prevention and flood risk management relating to the Rhine are some of the major objectives of ICPR.

After extreme floods in the Rhine in 1993 and 1995, integration of policies became even more important and Rhine states started to work in collaboration to take more effective flood prevention measures. An Action Plan on Floods was accepted by the ICPR in 1998. This Action Plan has four action targets as reduce damage, water levels, improve flood forecast and risk awareness. It has specified a structure for exchange of information and coordinated implementation of the European Floods Directive (FD) among the countries along the Rhine basin.

The European Floods Directive (DR) is concerned with the management of flood risk to reduce negative consequences on human health, environment, cultural heritage and economic activities due to floods. According to the Directive, extensive cooperation between countries is required for flood management in international river basin regions.

According to the Floods Directive, the Flood Risk Management Plan (FRMP) has been prepared for the Rhine basin for the period 2016-2021. Member countries have been implementing their measures according to this plan and the preparation of the second plan for the period 2022-2027 is under discussion recently.

Principles and targets determined for the FRMP are;

- Responsibility, solidarity, proportionality and clear task distribution
- Synergy with other EU environmental policies
- Sustainable and integral flood risk management
- The security level has to be ecologically, economically and socially compliant
- No 100% security, always residual risks ((Schulte-Wülwer-Leidig et al., 2018)

This plan contains flood risk management cycle targets as prevention, protection, preparedness, crisis management and recovery.

In order to evaluate the effects of measures for flood risk reduction and to plan future activities, a GIS based system “ICPR FloRiAn (Flood Risk Analysis)” was developed by the ICPR. By means of this system, spatial analysis can be made using flood maps, economic flood risk and the results of the risks to human health, environment and cultural heritage can be measured.

The prediction of floods and the announcements made before the flood incident occur significantly contribute to the reduction of the damage. For this reason, countries of the ICPR cooperating internationally share data regularly and make predictions. Through the national mobile applications made available to citizens in these countries, prior warnings can be made regarding the water levels or storms on the Rhine basin (Schulte-Wülwer-Leidig et al., 2018).



### 2.5.1.3. MEFISTO Mediterranean Forest Fire Fighting Training Standardization Project (European Procedure for forest fire fighting)

The overall objective of the MEFISTO Project is to develop procedures to enhance the cooperation capacity between countries to increase the efficiency and effectiveness of combating forest fires on a Mediterranean scale. These procedures also involve determination of high-quality standards in fire-fighting training systems for all European countries and increasing information sharing. For this purpose, an efficient and standardized training protocol has been developed in the project through the joint work of institutions representing the Mediterranean stakeholders. Accordingly, international cooperation against forest fires was brought to an advanced level by creating interoperability opportunities among the training centers in the Mediterranean countries of the EU. Within the scope of the project, training programs relating to organizations, protocols and procedures that have been implemented in neighboring countries have been created in order to improve cross-border fire extinguishing activities, to make these activities more efficient, and to provide safety for the transfer of human and material resources from one country to another in case of need (Catarino et al., 2018).

#### Procedures for Cross-Border Collaboration

With the MEFISTO Project, the procedures, responsibilities of the countries and the validity conditions of the protocol have been determined that should be implemented in the countries / regions that have signed an official agreement on the joint work relating to forest fires. Accordingly, subjects included and not included in the protocol, rights and duties between departments, techniques to be applied in fire and duration of support have been defined.

According to different forest fire scenarios, procedures have been established on how the support provided by countries from land and/or air and how the operational chain of command will be.

This Protocol can be applied in two different situations:

1. In border regions (determined by taking into account the distances where the spread conditions can rapidly expand the fire from one area to another) whose distance from the border is determined in cooperation agreements between countries or regions
2. In areas outside of border areas in major fires or special emergencies requiring external support

Actions to be taken in order to coordinate forest fire fighting tools in different countries/regions have been determined within the scope of the MEFISTO Project:

- Exchange of information and documents about current works, discussing ideas and being open to performance improvement in periods other than the fire season
- Exchange of information among experts to increase technical knowledge and professional skills
- Organizing meetings and seminars to explain collaboration protocols, to improve and update protocols
- Joint studies to verify the assumptions defined in the protocol
- Organizing trainings, of which contents are mutually approved, attended by European Forest Fire Fighters and other important relevant technicians

The MEFISTO Project emphasized the importance of sharing map data between countries and providing certain GIS standards for the compatibility of the data. Spatial location data of water points, fire hydrants, runways etc. should be shared between countries within their borders. It is necessary to ensure that each country has up-to-date maps for both its region and the neighboring country of the protocol.

It is very important to keep up-to-date maps showing the forest road network in combating forest fire. For this reason, it is also recommended to apply the results and methodologies developed in the FORCIP + project funded by DG ECHO. In this project, it is aimed to improve the use of rural road network in cross-border cooperation activities in emergency situations, especially forest fires.

In the project report, it was also mentioned that the fire extinguishing equipment used by different countries having standard features and compatible with each other will increase the effectiveness of fire suppression



activities. Currently, there is no equipment standardization at European scale. It is also stated that the lack of information about the resources of other countries will be a major problem. For this reason, it is necessary to share the information of water resources and fire hydrants in each country.

Technical meetings should be held between the countries before the fire season begins every year. Each country should share information about its operational regulations and fire-fighting resources for that year and this information should also be shared among countries in written form. These meetings are also of great importance in terms of gathering responsible institutions in the countries and officials working in forest fire response activities and sharing their experiences.

Preparatory activities should include other issues listed below:

- Operational procedures
- Communication systems and procedures
- Coordination of aerial means
- Coordination of means on the ground
- Command post

Each year, after the fire season, it is necessary to organize meetings where the results of the analysis of the cross-border forest fires are evaluated and shared. The lessons learned from these meetings will contribute to the improvement of future forest fire fighting efforts and the development of political or operational measures (Catarino et al., 2018).

### 2.5.1.4. HOLISTIC Project

In the report named “Forest Fires - Sparking firesmart policies in the EU”, it is mentioned that the HOLISTIC project, co-financed by the European Union through the 2007-2013 IPA Adriatic cross-border cooperation programme, is a successful example relating to reduction of the number and impact of forest fires and promotion of fire prevention among rural communities. This Project was realized with the partnership of eight Adriatic countries (Albania, Bosnia and Herzegovina, Croatia, Greece, Italy, Montenegro, Serbia and Slovenia).

Within the scope of the project, joint initiatives and pilot projects were carried out to improve fire prevention policies, fire regulations and intervention-coordination mechanisms in the region, and direct and indirect long, medium and short-term measures were implemented.

In this project, it is aimed to develop common guidelines and standard procedures for policy, institutional improvements, legal and institutional arrangements on the prevention and protection of fires and the protection of public and historical buildings from earthquakes (Croatian Forest Research Institute - Adriatic Holistic Forest Fire Protection (HOLISTIC)).



## 2.6. Conclusion and Recommendations

### 2.6.1. Recommendations to Increase the Capacity of the Local Institutions in Applying of European Strategies and Approaches

As a result of the research study, some recommendations are specified benefiting also from the report of 2015 Peer Review Turkey, relating to increasing the capacity of local institutions in Turkey in applying of European strategies and approaches regarding disaster prevention and preparedness. These recommendations are mentioned below:

- Improving disaster prevention efforts will make the disaster management system in Turkey stronger.
- It will be good to carry out more activities to raise public awareness about disaster prevention and preparedness.
- It will be useful to analyze whether existing legal regulations and policies need to be updated relating to prevention and preparedness against disasters.
- Developing measures to be taken for disaster prevention in line with the Sendai Framework will contribute to adaptation to the EU Civil Protection Mechanism.
- More opportunities should be provided for projects in which disaster prevention capacity is developed. Particular attention should be given to climate change adaptation and sustainable development.
- Disaster risk analyzes should be developed by considering issues such as climate change and sustainable development, and the results should be generalized in the field of urban planning.
- Efforts should be made to develop new policies aimed at increasing the resilience of the public to disasters, disaster prevention, preparedness and improving risk management.
- As local governments, it is necessary to ensure that municipalities play a more active role in disaster management related issues. It will be beneficial to increase the number of municipal personnel to be involved in disaster prevention and response activities and to train them regularly.
- Large-scale meetings should be organized to increase the sharing of information, technology and experience between public institutions, universities and local governments at the national level. In addition, organizing annual scientific conferences on prevention, preparedness, intervention strategies and disaster risk management that technical experts can participate will also contribute to the development of disaster management in Turkey.
- Regarding disasters such as forest fires and floods, stakeholder groups consisting of local people and representatives of local non-governmental organizations can be created. Organizations related to activities can be realized on disaster prevention, harm reduction and intervention in which these groups will participate, and relevant representatives can be kept in touch with each other.
- Volunteering Project regarding disasters in Turkey, which was launched by AFAD, has been continuing. However, it is important to continue working on developing the volunteering program, increasing the number of volunteers across the country, encouraging the public in this regard and improving volunteer training. In addition, the volunteering program on forest fires needs to be developed.
- For the development of disaster management, it is important to analyze the disasters that occur annually and the trends in disasters due to climate change and to use the lessons learned in the development of measures to be taken in the next period.



- It is very important to generalize the existing early warning systems related to disasters across the country.
- Turkey should be contacted with neighboring countries on issues related to disaster management and cross-border cooperation, ensuring that officials in disaster management in both countries are in contact with each other and organizations, where these authorities can share their knowledge and experience on disasters, should be organized. It will be beneficial to ensure the continuity of projects on disasters with neighboring countries (Peer Review Report Turkey, 2015).

### 2.6.2. Recommendations for the Cross-border Cooperation between Turkey and Bulgaria

In this section, some suggestions for the activities that can be carried out for the development of cross-border cooperation between Turkey and Bulgaria regarding forest fires and disasters are presented:

- It is important to communicate mutually the contact information of the institutions and authorities that have powers and responsibilities related to forest fires and disasters in the border region of Turkey and Bulgaria, and to keep this information up to date. It is necessary to notify the information of the authorities from Forest Management Directorates, Forest Sub-district Directorates, AFAD Provincial Directorates, etc. in the border region of Turkey to the authorities in Bulgaria in order to carry out communication and more effective intervention in emergency situations. Likewise, the information of the authorities in the border region in Bulgaria should be transferred to the Turkish authorities and updated periodically.
- Annual meetings should be organized where the officials of the institutions to take part in forest fire and disaster situations in the two countries come together, exchange information about the forest fire and disaster prevention and preparedness activities they have carried out and joint cross-border emergency response plans are developed. The participation of technical experts working on forest fires and disasters of both countries to these meetings will increase the efficiency of the plans and collaborations to be developed.
- It may be beneficial to prepare fire risk maps for forest areas in the border region by both countries and to integrate these maps to obtain a common forest fire risk map. Countries should decide together at what distance this work will be carried out for the region. This work can also be realized under a joint project.
- In case of joint intervention to a forest fire that may occur in the border region of Turkey and Bulgaria, it will be beneficial to share the locations of the water resources that will be needed and the maps showing the forest fire routes within the framework of the protocols.
- Common monitoring and early warning systems related to forest fires and other disasters that may occur in the border region should be established or efforts should be made to integrate the existing systems of the countries.
- It is important to ensure the continuity of joint projects on disaster prevention, preparedness and effective response activities between the two neighboring countries.

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## 3. BULGARIA REPORT

### 3.1. Introduction

The challenges of today confront Europe with many challenges that are interconnected and require a holistic approach to addressing them.

Adaptation to climate change and disaster risk management are problems for which much information is available, some of which will be summarized in this report in order to track progress, good experience and existing gaps and useful recommendations will be made. The research conducted will contribute positively not only to the project but also to the institutions that have competence in the issues under consideration.

I start with the current topic for

#### *Climate change: what the EU is doing*

The current climate change on the planet is changing the world. In the last two decades, the 18 warmest years since measurements have been recorded, and extreme weather events such as forest fires, high heat and floods are increasing in Europe and elsewhere.

#### *Facts:*

✓ **Scientists warn that without urgent action, global warming is likely to exceed 2°C levels from pre-industrialization by 2060, and may even reach 5°C by the end of the century.**

✓ Such an increase in global temperature will have devastating effects on nature, leading to irreversible changes to many ecosystems and subsequent loss of biodiversity. Higher temperatures and more intense meteorological phenomena will also bring huge costs to the EU economy and hamper countries' ability to produce food.

✓ Climate change is a global challenge that requires a global response. The EU is determined to help increase global ambitions and is a leading example.

✓ The EU is one of the signatories to the Paris Agreement, whose aim is to limit global warming to well below 2°C and to endeavor to limit it to 1.5°C.

✓ EU countries have approved the objective of achieving climate neutrality by 2050 in accordance with the Paris Agreement.

#### *The EU's response to climate change*

The EU has set ambitious measures and targets for reducing greenhouse gas emissions. To achieve this, he has set emission targets for key sectors of the economy.

#### **The 2020 targets**

The first package of EU climate and energy measures was agreed in 2008 and sets targets by 2020. These are:

- a 20% reduction in greenhouse gas emissions (compared to 1990)
- increasing the share of renewable energy by up to 20%
- increasing energy efficiency by 20%

**The EU has already exceeded these targets. As of 2017, greenhouse gas emissions have been reduced by 22%, ie. 2% above the original target of 20%.**

#### **The 2030 targets**

- as a binding EU target, achieving at least 40% reduction in EU greenhouse gas emissions by 2030 compared to 1990 levels.



- a target of at least 27% share of energy from renewable sources in energy consumption
- increasing energy efficiency by at least 27%
- Complete the completion of the internal energy market by meeting the 10% target of existing electricity interconnection and by connecting energy islands, in particular the Baltic States and the Iberian Peninsula.

### 3.2. Research on strategies and regulations for local disaster prevention and protection

In the 2014-2019 period, legislative changes were made in the Bulgarian legislation related to:

- climate change trends and the analysis of response capabilities, but most of all risk management capabilities, the main focus being on prioritizing prevention measures and related organizational training;
- the need to align with European legislation.

Below are briefly the main changes in the DPA for the period 2014-2018 <sup>1</sup>.

**The following regulatory framework is considered in the report:**

#### 1. Disaster Protection Act (DPA) <sup>2</sup>

In response to the new legal requirements, a *Council on Disaster Risk Reduction* has been set up at the Council of Ministers.

Of particular importance in this respect is the development and updating of:

- *National Disaster Risk Reduction Strategy*;
- *National Disaster Risk Reduction Program*;

*In recent years, reducing the risk of disasters, in particular prevention, has become a global priority.* The proof is the documents adopted by the Member States of the European Union, as well as the United Nations' Hyogo Framework for Action 2005-2015 <sup>3</sup> 'Building resilience for nations and societies', which also calls on each responsible country to establish a *National Platform and Reduction Strategy are proof disaster risk*.

2. The national targets for the implementation of the Europe 2020 Strategy are set out in the *National Reform Program of the Republic of Bulgaria*.

3. *The National Development Program: Bulgaria 2020 (NDP BG2020)* is the leading strategic and programming document that specifies the goals of the country's development policies by 2020.

It is in line with Bulgaria's commitments at European and international level, but it is paying off the country's aspirations for choosing a national path to progress.

#### *National Development Program: BULGARIA 2030*

The vision, goals and priorities of the National Development Program BULGARIA 2030 have been approved by Council of Ministers Decision No. 33 of 20 January 2020.

The document sets out three strategic goals - accelerated economic development, demographic boom and reduction of inequalities, for which targeted policies and interventions are envisaged, grouped in five interconnected and integrated development axes - Innovative and Intelligent Bulgaria; Green and Sustainable Bulgaria; Connected and integrated Bulgaria; Responsive and fair Bulgaria; Spiritual and Vital Bulgaria.

4. *National Climate Change Adaptation Strategy and Action Plan*. By adopting the strategy, Bulgaria will fulfill its international obligations as a party to the United Nations Framework Convention on Climate Change, the Kyoto Protocol <sup>4</sup> and the Paris Agreement <sup>5</sup>.



- ✓ At national level, the development of the strategy is enshrined in the Climate Change Mitigation Act.
- ✓ The document outlines the strategic framework and priorities for adapting to climate change by 2030.
- ✓ The aim is to reduce the vulnerability of the country to the effects of climate change and to improve the capacity to adapt environmental, social and economic systems to the impacts of climate change.
- ✓ The plan details activities for each of the sectors, including the required financial resources, expected results, responsible institutions for their implementation.

For the first time in Bulgaria, a *macroeconomic analysis* has also been prepared. The analysis assesses the socio-economic impact of climate change impacts. The calculations show that if no action is taken, climate change will have a negative financial impact, possibly dampening the country's economic growth by 2050.

### 5. National Disaster Risk Reduction Strategy (NDRRS) 2018-2030 <sup>6</sup>:

- ✓ The document outlines the vision for reducing the risk of disasters and accidents on the territory of the country and is prepared after a thorough analysis of the disasters that have occurred in recent years, which have killed human lives and caused significant economic and social damage.
- ✓ The NDRRS recognizes the international approach to ensuring policy coherence for disaster risk reduction, adaptation to climate change and sustainable development, according to The Sendai Framework for Disaster Risk Reduction 2015-2030 <sup>7</sup>, the Paris Agreement on Climate and the United Nations Sustainable Development Program to 2030, "Transform our world."

## 3.3. Review of European and local approaches, existing EU policies and local policies for the prevention, mitigation and preparedness of forest fires and disasters

Several European strategies that define the legislative environment in Europe at the moment are considered.

### 1. Cohesion policy

*The main objective* of EU regional policy, also known as 'cohesion policy', is to tackle the territorial, social and economic imbalances that exist between different EU regions. Regional policy covers all regions and cities in the European Union, helping to support job creation, increase business competitiveness, achieve economic growth and sustainable development, and improve the quality of life of citizens.

### 2. Europe 2020 Strategy

The Europe 2020 Strategy, adopted by the European Council in June 2010, is a multilateral strategy for sustainable growth and jobs for the next decade, designed to help Europe emerge stronger than the worst economic crisis in the world since 30's of the twentieth century.

The aim of the Europe 2020 strategy is to ensure that the economic recovery of the European Union following the economic and financial crisis is supported by a series of reforms to build solid foundations for growth and jobs by 2020. *The aim of the Europe 2020 strategy is also backed by 7 flagship initiatives at EU and EU level:* Innovation Union, Youth on the Move, Digital Agenda for Europe, Europe for Resource Efficiency, Industrial Policy on the Globalization Era, the New Skills and Jobs Agenda and the European Platform against Poverty.

### 3. A European Security Strategy - Securing Europe in a Better World

The European Council adopted the European Security Strategy (ESS) in December 2003. It first set principles and clear goals for promoting the EU's security interests.

However, no state is capable of dealing with the complex problems of modern times alone.



## Prevent Fires

The European Union is inevitably a global factor, it should be prepared to take its share of the responsibility for global security and for building a better world.

**4. The EU's Climate Change Adaptation Strategy.** The strategy adopted in April 2013 aims to increase resilience across the EU by enhancing the preparedness and capacity to respond to the effects of climate change at all levels of government.

*The strategy has three main goals:*

- Encouraging Member States to take action: Encouraging all Member States to adopt comprehensive adaptation and funding strategies to help them build adaptation capacity and take action. Supporting urban adaptation through the initiation of a voluntary commitment based on the Covenant of Mayors initiative (which, since 2015, has been combined with the Covenant of Mayors in the field of climate and energy <sup>8</sup>);
- EC Climate change adaptation actions at EU level by further promoting adaptation in key vulnerable sectors such as agriculture, fisheries and cohesion policy, which ensure that Europe's infrastructure is more sustainable and boost insurance against natural and man-made disasters;

Annex 1 - List of EU legislation and regulations

Annex 2 - List of legislative acts and regulations of the Republic of Bulgaria

### Conclusions from the study in items 3.2. and 3.3.:

- ✓ *The current legislation in the Republic of Bulgaria is harmonized with the relevant European legislation;*
- ✓ *The approach of the Risk Reduction Strategy 2018-2030 is extremely pragmatic and follows the global practices;*
- ✓ *The Disaster Protection Act transposes the Sendai Framework Program, the EU Action Plan (SWD (2016) 205 final / 2) on the Sendai Framework for Disaster Risk Reduction 2015-2030.*
- ✓ *Reducing the degree of exposure and vulnerability of people to weather-related threats is a common critical priority for both climate change adaptation (ACC) and disaster risk reduction (DRR).*
- ✓ *As noted in the United Nations (UN) Disaster Reduction Coordination System, sustainable development is not possible without significant efforts to reduce disaster risk (UNISDR 2015).*

### 3.4. Gaps in the analysis between local and EU strategies and the measures implemented

The SWOT analysis of “Disaster Risk Management” and specifically “Forest Fire Risk Management” has been made from the study of the current legislation in Bulgaria.

#### SWOT disaster risk management analysis

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>✓ Existence of EU regulatory and regulatory framework in the country;</li> <li>✓ Existence of strategic and programming documents at national level for the development of the sector;</li> <li>✓ Good experience in disaster prevention and suppression;</li> <li>✓ Qualified experts in disaster risk management</li> <li>✓ Concept for the establishment of an Early Warning and Alert System (SRPS) for the population throughout the country;</li> <li>✓ Creating more effective early warning and alert systems and greater public awareness of the health risks of climate change and disasters;</li> <li>✓ Availability of methodologies and instructions of particular importance for the favorable future development of the sector;</li> <li>✓ Accumulated experience and good practices in the implementation of projects under programs and funds financed by European funds and established sustainable contacts of relevant structures from neighboring countries and the EU;</li> </ul>	<ul style="list-style-type: none"> <li>✓ Low / lack of exchange between scientists and practitioners;</li> <li>✓ Missing procedures / traditions on how to respond to disasters in cross-border areas;</li> <li>✓ The system for early warning and warning of the population in case of disasters has not been completed in the whole territory of Bulgaria;</li> <li>✓ There is a lack of access to the lessons learned and conclusions from them to develop strategies for disaster risk reduction;</li> <li>✓ The exchange of good practices for disaster prevention and training is not stimulated;</li> <li>✓ Low R&amp;D investment in the economy as a whole and in the disaster risk management in particular;</li> <li>✓ A general lack of awareness and understanding of the specific impacts of climate change and the needs of disaster risk management, both among society and among specific stakeholders;</li> <li>✓ Insufficient financial resources provided for SDR activities in the sectors concerned;</li> </ul>



Opportunities	Threats
<ul style="list-style-type: none"> <li>✓ Uniform disaster management guidelines are needed to be enshrined in a new directive of the European Union;</li> <li>✓ To unify a standard for disaster response;</li> <li>✓ Improvement of coordination and interaction between institutions for disaster prevention and elimination;</li> <li>✓ Increasing public engagement and volunteering in disaster prevention and control;</li> <li>✓ Establishment of modern monitoring and control systems;</li> <li>✓ The interaction of institutions, such as municipal administrations, is particularly important in undertaking their obligations with regard to preventive action and for owners of high-risk enterprises to take the actions required by law;</li> <li>✓ Better governance by incorporating disaster risk management into key sectoral policies;</li> <li>✓ Shifting the focus from suppression to prevention within integrated disaster management;</li> <li>✓ Raising the awareness and preparedness of the population at risk;</li> <li>✓ Enhancing European cooperation on disaster risk management through effective synergies between European and national policy objectives and territorial governance.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Increased frequency of climatic adverse events, such as longer droughts, hot flashes, heavy rainfall, floods;</li> <li>✓ Increased economic losses from meteorological and climate-related disasters;</li> <li>✓ Expected increase in mortality due to extreme weather events, summer heat, floods and fires;</li> <li>✓ There is a lack of timely and full funding for disaster prevention and protection;</li> <li>✓ No financial resource has been provided for the completion of the National Early Warning and Disclosure System (NEWDS);</li> <li>✓ Lack of cross-border procedures with the neighboring countries for joint action in forest fires and disasters.</li> </ul>

The SWOT analysis below is prepared on the basis of the Rural Development Program 2014-2020 and the National Strategy for Forestry Development in the Republic of Bulgaria for the period 2013 - 2020.

### SWOT analysis of forest fire risk management

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>✓ Existence of EU regulatory and regulatory framework in the country;</li> <li>✓ Existence of strategic and programming documents at national level for the development of the sector;</li> <li>✓ Good experience in the prevention and restoration of forest damage from forest fires, natural disasters and catastrophic events;</li> <li>✓ Qualified personnel in the fire safety activity;</li> <li>✓ Provision of up-to-date fire fighting equipment for early extinguishing of forest fires;</li> </ul>	<ul style="list-style-type: none"> <li>✓ Low / lack of exchange between scientists and practitioners;</li> <li>✓ Missing procedures / traditions on how to respond to large forest fires in transboundary areas;</li> <li>✓ No unified system for monitoring, detection and early warning of forest fires has been established / partially built;</li> <li>✓ There are no traditions in natural and man-made disasters;</li> <li>✓ Lack of specialized high-pass vehicles for patrol and initial attack and sufficiently non-combustible protective clothing for fire-fighting cores;</li> <li>✓ There is no single information system for detecting, reporting and analyzing forest fires in the country;</li> <li>✓ There is a lack of access to the lessons learned and conclusions from them to develop strategies for reducing the risk of forest fires;</li> <li>✓ The exchange of good practices for fire prevention, fire safety and training is not encouraged;</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>✓ To harmonize standards of response to forest fires and erosion to be enshrined in a new directive of the European Union;</li> <li>✓ Improvement of coordination and interaction between institutions for forest fire prevention and suppression;</li> <li>✓ Increasing public engagement and volunteering in forest fire prevention and control;</li> <li>✓ Construction of modern control systems</li> <li>✓ Interaction with other state institutions, and especially with municipal authorities and forest owners, requires development, and it is particularly important that they undertake their responsibilities with regard to preventive actions and activities in their forests;</li> <li>✓ Redirecting the focus from extinction to prevention within the framework of integrated fire management;</li> <li>✓ Raising the awareness and preparedness of the population at risk;</li> <li>✓ European cooperation in the field of forest fire risk management through effective synergies between European and national policy objectives and territorial governance;</li> <li>✓ Restoration of forest potential damaged by fires and other climate change related natural disasters;</li> <li>✓ Elaboration of methodology and classification of forests by degree of risk of forest fires;</li> </ul>	<ul style="list-style-type: none"> <li>✓ There is a lack of timely and full funding for fire fighting activities in and near forest areas;</li> <li>✓ Stubble burning continues to have a negative effect due to widespread non-compliance by farmers;</li> <li>✓ Lack of specific forest fire prevention and control policies, such as manual or mechanical removal of combustible material in forests, chemical treatment to reduce flammability, livestock grazing and controlled burning (preventable fires);</li> <li>✓ Lack of financial resources for carrying out afforestation activities;</li> <li>✓ Destruction of forests by fires;</li> <li>✓ Shortage of specialized high-speed vehicles for patrol and rapid response in the initial suppression of forest fires.</li> <li>✓ Poorly equipped fire-fighting depots, lack of clothing and fire-fighting equipment;</li> <li>✓ Lack of the necessary technical equipment of the municipalities for monitoring and direct extinguishing of forest fires;</li> <li>✓ Risk of natural disasters and forest fires</li> </ul>

### *Annex 3 - Recommendations from the 2015 peer review in Bulgaria*



### Conclusions: Future activities should be in the direction of:

- ✓ Capacity building for research, education and dissemination of results;
- ✓ Achieving integrated forest fire management;
- ✓ Improving coordination and interaction between institutions at national, regional and municipal level in disaster risk management

## 3.5. Disaster Response: The EU is strengthening its capacity

### Europe provides:

#### Humanitarian Aid

Based on international humanitarian principles and as outlined in the European Consensus on Humanitarian Aid, the EU provides humanitarian assistance based on needs to people affected by human and natural disasters, with particular attention to the most vulnerable victims. Assistance shall be addressed impartially to the population concerned, regardless of their race, ethnic group, religion, gender, age, nationality or political affiliation.

#### Civil Protection

Civil protection assistance consists of state aid granted for or immediately after a disaster in Europe and worldwide. Assistance takes the form of assistance in kind, deployment of specially equipped teams or experts to evaluate and coordinate support in law. When a disaster overcomes a country's ability to control it, other participating countries intervene and provide assistance.

- Established in 2001, *the Union Civil Protection Mechanism* includes 34 countries - the 27 EU Member States, as well as Northern Macedonia, Iceland, Montenegro, Norway, Serbia and Turkey. The Union mechanism is based on a number of instruments: 1) **The European Civil Protection Reserve** provides a voluntary reserve of pre-determined response assets by the participating countries and a structured procedure to identify potential capacity gaps; 2) **The Emergency Response Coordination Center (ERCC)** functions as an operational core, facilitating coordination of rescue activities at all times of the day; 3) **The Common Emergency Communication and Information System (CECIS)** aims to improve emergency communication through a web-based alert and notification application, and 4) **a network of trained experts**, that can be mobilized in no time. The Civil Protection Mechanism was strengthened in 2019 with the creation of **resceEU**, a new reserve of capabilities already in place during the months of forest fires in 2019. It is expected to expand to other areas of medical emergency cases or chemical, biological, radiation and nuclear incidents. It will be used as a last resort and will be resorted to when a Member State has exhausted its own resources and cannot be supported by other Member States, as they are, for example, in the face of disasters of the same nature.
- *The European Voluntary Humanitarian Aid Corps* <sup>9</sup> was created in the form of *the EU Humanitarian Aid Volunteers Initiative* in March 2014. Strengthening the EU's humanitarian response capacity, the initiative aims to increase the resilience of vulnerable communities in third countries. Its budget for the period 2014-2020 is EUR 147.9 million.
- In its humanitarian interventions, DG ECHO does not individually implement assistance programs but finances operations through a network of more than 200 partners (*NGOs, UN agencies and international organizations such as the Red Cross and Red Crescent Movement*).



## European Disaster Risk Management

### What is?

The EU places disaster prevention and risk reduction at the heart of disaster risk management to help an EU member. Countries are developing policies to better prevent, prepare and respond to disasters. Preventive actions aim to reduce impacts and make societies stronger for future disasters. Increasing the resilience of infrastructure, ecosystems and societies is an essential element of effective disaster prevention. Disaster prevention is related to preparedness and response.

### Why is this important?

Climate change, population growth and urbanization will exacerbate the effects of extreme climatic conditions with the resulting loss of life. Disaster risk management helps populations cope better with disasters. Disaster risks are therefore included in key areas of EU policy, including health, the environment, adaptation to climate change, development, cohesion, agriculture, transport, energy, research and innovation. Disaster risk management activities, such as risk assessment, vulnerability and population exposure, fit into EU policy-making.

### How does it help?

- *Mapping key risks across Europe*
- *Prevention and preparation missions (Advisory missions)*
- *Research and knowledge sharing*
- *Peer reviews*
- *Strengthening international cooperation*

## 3.6. EU Civil Protection Mechanism - Objectives and structure of the Mechanism

The Union Civil Protection Mechanism (USPM) was established in 2001. This legal framework was established by Decision No 1313/2013, which has been in force since 1 January 2014 (hereinafter referred to as the Decision)<sup>10</sup>. The mechanism has two main objectives. Firstly, it aims to enhance cooperation between the Union and the participating countries<sup>11</sup>. Secondly, the mechanism seeks to facilitate coordination in the field of civil protection with a view to improving the effectiveness of systems for the prevention, preparedness and response to natural and man-made disasters. The EU Civil Protection Mechanism is a relatively new instrument created by a European advice to better manage natural and man-made disasters.

***The main role of the Mechanism is*** to facilitate collaboration in civil protection interventions in the event of major disasters that require immediate emergency response. Such disasters can be caused by natural, technological, radiological and environmental factors, including accidental marine pollution and acts of terrorism that occur or threaten to occur inside and outside the European Union.

***The purpose of the Civil Protection Mechanism is*** to add value to European civil protection structures in accordance with the principle of subsidiarity by providing assistance on request by the country concerned. Such a need may arise if the preparedness to respond to a country's emergency is not sufficient to provide an adequate response due to lack of resources. By pooling the civil protection resources of the participating countries, the Mechanism can provide better protection for citizens as well as natural and cultural landmarks and property. Since its inception, the Mechanism has provided civil protection in many different cases of natural and man-made disasters, facilitated cooperation between Member States on prevention, preparedness and emergency response, coordinated action at European level to avoid duplication, ease of effort, and satisfaction addressing the real needs of the regions concerned.

***The main units in the structure of the Mechanism are:***

- Monitoring and Information Center (MIC)





- Common Emergency Communication and Information System (CECIS)

### ***The new Civil Protection Mechanism***

The legislative framework<sup>12</sup> builds on an established system that has proven to work well. The main responsibility for disaster management remains with the Member States. The new Mechanism focuses much more on prevention, risk management and disaster preparedness, including training organization, simulations, exchange of experts and the development of new elements such as building a database with voluntarily provided and pre-guaranteed disaster response resources from Member States. For these reasons, the legislative framework includes measures that will help us We are better prepared for any disaster and which will ensure close partner- ship between Member States.

The main focus is in the following directions:

- ✓ enhancing the culture of prevention and preparedness for disaster relief;
- ✓ replacing improvised actions with a pre-planned approach;
- ✓ support Member States in developing their capacity.

The EU Civil Protection Mechanism also covers:

- ✓ measures related to risk assessment and risk management planning;
- ✓ improved assessment of available assistance and better identification and addressing of potential serious shortcomings in rapid response capacity;
- ✓ more cost-effective and better coordinated transport of people and equipment to the countries concerned;

In addition, States shall:

- ✓ carry out risk assessments at national and sub-national levels and submit a summary of the basics every three years to the European Commission as of 22 December 2015;
- ✓ develop and refine their national and sub-national disaster risk management plans;
- ✓ provide the European Commission, every three years with the development of the relevant guidelines, an assessment of their risk management capabilities at national and sub-national levels or in the event of significant changes; participate voluntarily in the so-called Peer review to evaluate risk management capabilities.
- ✓ In the field of civil protection, more training is expected for staff outside of their own country, more training for adequate response to rescue operations or the construction of field hospitals, more active exchange of experts, and closer cooperation with neighboring countries. The reform focuses on both emphasizing the importance of prevention, preparedness and adequate response in the event of a natural or man-made disaster. ***The new Mechanism anticipates ongoing developments in key areas such as:***
  - development of civil protection response modules;
  - Identification of experts and mission teams within the EU;
  - using what has been learned to develop training, exchange of experts;
  - host country support agreements (how to get support);
  - use of geospatial information / satellite maps (Copernicus Crisis Management Service), both for preparation and for operational work.

## **3.7. Emergency Coordination Center (ERCC)**

### **What is?**

The Emergency Response Coordination Center (ERCC) is at the heart of the EU Civil Protection Mechanism and coordinates the provision of assistance to disaster-stricken countries such as aids, expertise, civil protection teams and specialized equipment. The Center provides rapid deployment of emergency assistance and acts as a coordination center between all EU Member States and the six additional participating States, the country concerned, as well as civil protection and humanitarian aid experts. The Center operates around the clock and can assist any country in or outside the EU affected by a major disaster at the request of national or UN bodies.



### Why is this important?

A well-coordinated response to human-caused disasters and natural hazards at European level can avoid duplication of relief efforts and ensure that assistance is tailored to the needs of those affected. In order to reduce the burden on contributing countries, the Emergency Response Coordination Center can liaise directly with the national civil protection authorities of the needy country and can also financially support the delivery of civil protection teams and assets in the affected country.

### How does it help?

#### *Cooperation on civil protection and development of the EU's emergency response capacity*

The ERCC has staff and a trained duty system. A 24-hour presence guarantees real-time monitoring and an immediate response day and night.

The Center manages a reserve of pre-absorbed assistance from EU Member States and participating countries that can be implemented immediately. These countries can commit deployment readiness resources as part of a faster and more coherent European response when the need arises.

In 2019, the EU strengthens the collective European disaster response by developing a reserve capacity known as rescEU and using it as a last resort when the capacity of the Member States is already fully utilized.

The ERCC has a situational center that operates continuously.

The main operational functions of the ERCC include: acting as a Commission and EU crisis monitoring and coordination platform; a communication center between participating countries, the country concerned and experts deployed in the disaster area; development and dissemination of information products; facilitating coordination between civil protection and humanitarian aid operations. These features are supported by a web-based alert and notification application known as CECIS<sup>13</sup>.

The ERCC is complemented by the *European Emergency Response Capacity: "Voluntary Disaster Response Resource Fund"*, which collects pre-allocated funds from participating countries that are ready to use, but only at the request of the Commission. The Voluntary Resource Fund is one of a number of innovations introduced by the new solution to address weaknesses in the previous mechanism<sup>14</sup>. In particular, the Resource Fund aims to help achieve the following objectives: moving from reactive and ad hoc coordination to a pre-planned, pre-agreed and predictable system, as well as identifying and addressing critical gaps in disaster response in a cost-effective way.

## 3.8. European Forest Fire Information System (EFFIS)

The Joint Research Center (JRC) of the European Commission (EC) set up in 1998 a research group to work specifically on the development and implementation of modern methods of assessing the risk of forest fires and mapping of burnt areas on a European scale, developing the envisaged ones. Fire assessment methods. These activities led to the development of the European Forest Fire Information System (EFFIS), which became operational in 2000.

EFFIS is constantly expanding, supported by research carried out at JRC and supported by other services of the European Commission and European countries. Since 2015, EFFIS has been part of the EU's Copernicus Emergency Management Program (EMS).

EFFIS was created through the joint efforts of EU countries and services and is open to all European countries. In addition, an agreement was reached to extend the system to all non-EU Mediterranean countries. At the same time, the initial fire damage forecasting and assessment modules were improved and additional modules were developed.

### The EFFIS network

- There are currently 40 countries participating in the EFFIS network: Albania, Algeria, Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Finland, France, the former Yugoslav



Republic of Macedonia, Germany, Greece, Hungary, Ireland, Italy, Kosovo, Latvia, Lebanon, Lithuania, Montenegro, Morocco, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tunisia, Turkey and the United Kingdom. The network is coordinated by JRC and DG ENV.

- EFFIS provides specific support to the Brussels Emergency Coordination Center (ERCC), which provides real-time information during the fire season.
- The EFFIS network meets regularly twice a year, in the spring and in the fall; before and after the main fire season.

### 3.9. Modernization of the EU Civil Protection Mechanism

#### RescEU

##### What is?

In March 2019, the EU strengthened all components of disaster risk management by upgrading the EU Civil Protection Mechanism. The result was a rescEU and the aim is to improve both the protection of citizens from disasters and the management of emerging risks. RescEU includes a new European Capacity Reserve, which initially includes a fleet of firefighting aircraft and helicopters. However, the scope of rescEU goes beyond forest fires and is expected to include response to other threats such as medical emergencies or chemical, biological, radiological and nuclear incidents.

##### Why is this important?

The European Union has a key role to play in coordinating disaster response inside and outside Europe. Disasters have affected all regions of Europe in recent years, causing hundreds of casualties and billions of damage to infrastructure and the environment. Floods, storms, forest fires, earthquakes and man-made disasters have tested countries' response capabilities. In addition, security concerns have become more complex. Climate change is expected to exacerbate the impact of disasters in the future.

##### How does it help?

When the magnitude of an emergency exceeds a country's capacity to respond alone, it may request assistance through the EU Civil Protection Mechanism. Once activated, the EU sends through the Emergency Response Coordination Center the proposal for assistance provided by its Member States and participating countries. To ensure an effective disaster response at all times, a Reserve Response Capacity Reserve ("rescEU") was created in March 2019. The reserve will only be used as a last resort when national funds are exhausted and capacity is registered in Europe. In addition to creating the rescEU, the new legislation provides for a number of elements that reinforce the existing mechanism, namely:

##### A stronger EU disaster response

RescEU is based on an analysis of EU disaster risks and the existing gaps in disaster response and preparedness activities in the Member States.

##### RescEU has been operating since the 2019 forest fires season

National firefighting aircraft and helicopters that were not used in 2019 are made available to the EU. Member States' response was positive and 6 Member States (Italy, Spain, Croatia, Sweden, Greece and France) participated in the transition year in the reserve.

In the summer of 2019, the EU created *a transitional fleet of firefighting aircraft* and already uses it twice to fight forest fires - in Greece and Lebanon. In a July Communication, the European Commission called for *more vigorous EU action against deforestation and forest degradation* and is committed to further action, incl. Making the European Forest Fires Information System a worldwide tool for monitoring forest fires.

**Copernicus** is an EU program aimed at developing European information services based on satellite observations of the Earth and in situ data (not space). Copernicus is a user-driven program and the information services provided will be freely and openly accessible to its Users, mainly government bodies.

*Two partner networks are preparing a common European directive on uniform standards for forest fire fighting.*

### Conclusions from the items 3.5., 3.6., 3.7., 3.8. and 3.9.:

- ✓ *In cases where Member States are affected simultaneously by multiple and unexpected disasters, both natural and man-made, collective capacity is insufficient. In order to overcome this shortcoming and the emerging risks, all Union instruments should be used in conditions of full flexibility, including by encouraging the active participation of civil society. Member States should take appropriate preventive action to maintain at a certain level national capabilities sufficient to adequately deal with disasters.*
- ✓ *Risk prevention and management include reformulating policies and institutional frameworks, as well as strengthening local, national and regional capacities to develop and implement risk management measures while coordinating a wide range of actors. It is crucial that risk maps take into account both the risks posed by current climate variability and the projections for the trajectories of this change.*
- ✓ *Local and regional authorities, given that they are the first to intervene in the aftermath of a disaster, should develop models of cooperation where communities can share good practices, enabling them to help develop their resilience with regard to natural disasters.*

## 3.10. European projects and good practices

*The EU is becoming the second largest source of scientific publications on forest fires worldwide, with the US leading the field of research and innovation in the field.*

### Annex 4 - Challenges to public policies

#### PROJECT PORTFOLIO AND FINANCING INSTRUMENTS

EU-funded forest fires projects are under consideration, most of them funded by the current Horizon 2020 program and the last two Framework Programs (ie FP6 and FP7). A total of 56 projects were considered. The types of projects range from large-scale integrated projects<sup>15</sup> to smaller projects and individual scholarships under the Maria Skłodowska-Curie program<sup>16</sup>. Other research projects focusing on the demonstration of effective forest fire management have been funded through the LIFE<sup>17</sup> program or the Civil Protection Mechanism<sup>18</sup>.

The EU contribution to the projects under consideration amounts to EUR 103.2 million (Table 1).

Table 1<sup>19</sup>. Sources of EU funding and related investment for the 56 forest fire research projects considered.

Table 1

Framework Program / Action	Number of projects reviewed	EU contribution (EUR million)
Sixth Framework Program	1	12.6
Seventh Framework Program	17	47.6
Horizon 2020 (2014–2017)	11	23.5
LIFE program	7	4.9
Civil protection mechanism	18	7.5
Coordination actions	1	0.1
Cross border cooperation	1	6.9
<b>Total</b>	<b>56</b>	<b>103.2</b>

The projects are divided into six thematic areas corresponding to the sequence of forest fire risk management activities. (see Table 2).

Table 2

Thematic area	Projects	Specific areas
1. Fire science	16	1.1. Fire behavior
		1.2. Fire Ecology
		1.3. Spatial and temporal models of fire
		1.4. Social aspects of fires
		1.5. Effects of fires on climate change
2. Fire prevention	21	2.1. Fire Meteorology and Fire Risk Assessment
		2.2. Management of forests and combustible materials
		2.3. Preparing for a fire
		2.4. Wildlife - city link
3. Fire detection	4	3.1. Ground, air and space monitoring
4. Extinguishing fires	20	4.1. Fire Extinguishing Techniques
		4.2. fire safety
		4.3. Technological means
5. After fire recovery	6	5.1. Damage and loss assessment
		5.2. Recovery
6. Fire integration	5	6.1. Integrated fire management

### Conclusions:

✓ *"European funding is a significant factor for Bulgaria's economic growth, and its effectiveness is the result of the rational management of EU operational funds and the formulation of adequate national priorities and solutions for achieving economic convergence."*

✓ *"European funding can be identified as a process designed to support the Member States' proportional and balanced integration through the EU budget, representing the funding strands for the year under the Multiannual Financial Framework and EU Financial Instruments - Funds and Policies".*

✓ *"European funding as a financial interaction at Community level in order to ensure a fair and efficient distribution of resources between Member States and to achieve high economic growth, sustainable development and competitiveness".<sup>20</sup>*

## 3.11. Prevention and preparedness for protection against forest fires and disasters according to the Bulgarian legislation

### Disaster Protection Act determines:

Preventive action <sup>21</sup> is implemented to reduce the risk of disasters and includes:

1. Disaster risk analysis and evaluation;
2. Disaster risk mapping;
3. Disaster risk reduction planning;
4. Development and implementation of programs and projects for disaster risk reduction;
5. Categorization of settlements according to the number of potentially affected population;
6. Identification of critical infrastructures and their sites and risk assessment for them;
7. Critical Infrastructure Protection Measures;
8. Disaster protection planning;
9. Setting norms for spatial planning of the territory, design, implementation and maintenance of the buildings in connection with disaster risk reduction;
10. Establishment and maintenance of monitoring, early warning and alert systems;
11. Providing places and conditions for temporary accommodation of the victims (affected) in disasters;
12. Provision of collective and individual remedies;



13. Training and practical preparation of the central and territorial bodies of the executive power, response forces, voluntary units and the population.

In **Appendix 10<sup>22</sup>: Assessment of the Disaster Risk Management sector of the National Strategy and Action Plan for Climate Change Adaptation** states that:

The Government has set up an Interdepartmental Commission for Reconstruction and Assistance (ICSD) with the Council of Ministers to cover the extraordinary and unexpected costs that may arise from disasters (natural or man-made) or other events, such as the massive migration of refugees in recent years. The ICSD budget is planned at the beginning of the financial year. Over the past few years, about \$ 70 million or roughly \$ 43 million has been allocated. (but at least 15 percent of them should be invested in prevention). The line ministries, district and municipal authorities have the right to apply to the ICSD for reimbursement of disaster-related expenses. In Bulgaria, there is a strong legal and institutional basis for disaster risk management, which will ultimately support long-term resilience to climate risks. Impressive efforts have been made to decentralize responsibilities for preparedness, prevention and response at the district and municipal levels and to build the necessary capacity at this level to fulfill these roles.

In **Appendix 4: Assessment of the Forest Sector to the National Strategy and Action Plan for Climate Change Adaptation**, in the section on Climate Change Adaptation Opportunities, it is advisable for Bulgaria to engage in several groups of measures to assist the adaptation of Bulgarian forests to climate change and their potential consequences, reduce the overall vulnerability of the forest sector and increase its economic viability and sustainability. One of them is:

**Establishment and maintenance of national systems for early detection and prevention of forest fires, long-term monitoring of natural disturbances and monitoring of forest resources, thus reducing losses from natural disturbances and ensuring proper planning of activities and adaptation of forests in areas with elevated areas:**

- Establishment of a national system for early detection and prevention of fires and timely response;
- Establishment of the national system for long-term monitoring of natural disturbances;
- Starting and regular implementation of the National Forest Inventory;
- Integration of the available information base and newly established information systems into a single modern spatial-related national forest resource information system;

### *Strategic Plan for the Development of the Forestry Sector 2014-2023*

- The plan contains 20 Operational Goals (OG), which are in line with the *National Forestry Sector Development Strategy for the Republic of Bulgaria 2013-2020* (NFSDSRB), and 102 activities to achieve the objectives. All operational goals are related to adaptation to climate change, one of the goals being:
- OG 3 “Increasing the Effectiveness of Forest Fire Prevention and Fighting and Illegal Action in Forests”;

### **Conclusions item 3.11.:**

✓ *Fires susceptibility maps have been prepared for the territory of Bulgaria, marking the areas affected by fires in the past. However, given the changing climatic conditions leading to prolonged dry and hot periods and the increased concentration of more flammable vegetation (eg commercial pine plantations), fires are expected to become more frequent and occur in areas that historically they were not predisposed to them.*

✓ *The research shows the need to change the process of prioritization of financing and accordingly increase the share of invested funds in planned preventive activities, as well as to take measures to increase the share of compensated losses through the possibilities of insurance.*

✓ *For the strategic objective of "improving the knowledge base and awareness of adaptation to climate change", the top priorities include the creation of coordinating body for climate change mitigation*



and adaptation, and the launch of a research program to support the adaptation of forests to climate change.

✓ For the strategic objective of "improving and conserving forest resources", the key priorities are: promoting management strategies that maximize species, genetic and structural diversity; establishment of a national rapid fire detection and response system, as well as a national system for long-term monitoring of natural disturbances; and undertaking a national forest inventory.

### 3.12. Study of existing and existing systems for early detection of forest fires in the territory of the Republic of Bulgaria

#### 1. „Southwest State Enterprise“ SC, Blagoevgrad.

##### **Fire observation towers for the detection and registration of early-stage forest fires, positioned in the territorial range of Southwest State Enterprise SC, Blagoevgrad.**

To improve the work on forest fire prevention and their timely suppression, Southwest State Enterprise SC constructed and commissioned measure 226, "Restoring forest potential and introducing preventive activities", *nine fire observation towers*. In the administrative building of Southwest State Enterprise SC there is a separate *Center for monitoring and control* of the fire environment, which gathers information from all nine towers, which receives signals from the fire towers and their thermal cameras in real time on the territories of: TC DGS Blagoevgrad, TC DGS Kresna, TC DGS Sandanski, TC DGS Katunci, TC DGS Dikchan, TC DGS Garmen, TC DGS Gotse Delchev, TC DGS Mesta and TC DGS Eleshnitsa. At a height of 25 meters is mounted a multisensor, consisting of two cameras-thermal imaging with a radius of 5 kilometers and a color day camera with a radius of 15 kilometers. The positioning of the towers is at the highest possible point of the observed area. Fire towers are installed near high-risk plantations. Nine towers are active and detect ignition in their range.

The fire towers record all the ignitions in the forested areas monitored.

**2. SC DGS Kosti** has implemented a project under measure 226 of the RDP with the subject of **Establishment of an integrated video surveillance system on the territory of SC State Forest Enterprise Kosti**. *Three metal towers - Modular Observation Complexes (MOCs) for video surveillance for forest fire prevention* in the area of "Diado Valcho" and "Balabana", land of the village of Kosti, Tsarevo municipality and Kurvu peak in the Kurvu area, land of Slivarovo village, municipality of Malko Turnovo are put into operation.

In recent years, since the video surveillance system was installed, there have been no fires in the territory of the DGS Kosti TC, which is why we do not have actual data from its operation.

*System features:*

- ✓ video surveillance on the territory of the company, which also provides indirect assistance to the law enforcement services, especially in the territory covering the border area;
- ✓ Obtaining up-to-date weather information - temperature, humidity, atmospheric pressure, wind speed;
- ✓ high quality camera images of the modular observation complexes over a period of several minutes;
- ✓ rapid monitoring of the condition of the observed forest masses and localization of the emerging fire;
- ✓ Maintaining continuous visual contact with the place of the fire spread in order to coordinate the crisis management activities more effectively;
- ✓ the frames coming from the modular observation complexes are stored for a period of 3 months, and the alarm images are stored for 1 year to be analyzed subsequently;
- ✓ Through a standard web browser, an authorized user can connect to the system remotely at any time and from any place where Internet access is available. All modules and components can be administered by officials through an interactive web site. The system presents to the operator in the web



space simultaneous real-time video, meteorological information and GIS data through a web geographical system;

- ✓ allows direct observation of the surveillance camera in a given area of interest, thus achieving the fullest possible adaptation to the needs of the user. Surveillance cameras can be moved along three axes: 360 ° rotation; tilt: + 33 ° to -83 ° to the horizontal axis; 35x optical magnification;
- ✓ creation of an archive of data obtained from the modular observation complexes for the last 90 days of the observation period.

The disadvantage is the large number of false alarms detected by camcorders, as they are sensitive in the visible spectrum based on smoke (smoke) recognition during the day and flame recognition at night. The system accounts for the alarm, the atmospheric conditions (fog, clouds, shadows, dust particles), the reflection of light and human actions, which requires it to be monitored (controlled) by an operator - a person who rejects false alarms.

### 3. Forest fire early detection system in Vrachanski Balkan Nature Park

On the territory of the Vrachanski Balkan Nature Park there is a system for early detection and warning of fires in the territory of the park and its adjacent territories. The system includes *three fire towers equipped with a FLIR scanning complex including a thermal and imaging camera, connected to a server and FAEDO software analyzer.*

The system allows to provide information to other state and municipal bodies through a remote connection through a control center at the office of the Vrachanski Balkan Nature Park Directorate. Through the center, access to information and a database can also be ensured through a mobile phone.

The system was built in 2014 and put into operation in 2015 and is still operational. In the area of the Vrachanski Balkan Nature Park, 1 issue is to be built by the Berkovitsa Regional Forest Directorate, which will also cover part of the uncovered part of the park.

The technology is robust enough to be able to be deployed nationally (of course after some reconfigurations), provided it is secured by staffing potential for centralization.

Faedo is a complete software solution for monitoring, auto-detecting, locating and tracking forest fires.

#### Conclusions from the item 3.12.:

- ✓ *The single center for monitoring and control of the fire situation in Blagoevgrad District is controlled and monitored by operators who are on duty during the daylight hours. They maintain telephone and radio communication with forest enterprises on site, process and analyze the information received in case of ignition. In the event of a fire, there is a function in the tower system that captures and archives the location, the ignition time, the direction of fire and the signals to the forest enterprises.*
- ✓ *In the last years since the video surveillance system was installed, no fires have occurred on the territory of DGS Kosty TE, and therefore no actual data from its operation have been reported. The disadvantage is the large number of false alarms.*
- ✓ *The technology applied in the Vrachanski Balkan Nature Park. is robust enough to be able to be applied nationally after some reconfiguration. All information processing takes place at observation towers. The FaedoCam application, in real time, gives the user images and the ability to control the cameras installed on the observation towers.*

### 3.13. Fire monitoring tools

Fire prevention actions should cover the areas and areas classified by Member States with a high or medium risk of fire according to their protection plans<sup>23</sup>. Great efforts have been made worldwide to successfully detect forest fires at their earliest stage. From a methodological point of view, two types of human observation are known:



**Direct monitoring** <sup>24</sup> - performed at monitoring sites. This solution is not always appropriate because of the inability to achieve constant concentration in humans. Long-term observations make mistakes;

**Semi-automatic or automated surveillance** - remotely based on video surveillance systems. These types of systems are proven to be effective because they carry out a continuous monitoring process and minimize the human error factor.

The following tools for monitoring forest fires are used **for direct monitoring**:

Formations that can be created for direct observation are:

- ✓ volunteer pools;
- ✓ String groups;
- ✓ companies with specific interests such as landscaping, hunting, mountaineering, amateur companies, commandos, etc. who also act or provide assistance in the field of forest protection;
- ✓ rescue or first aid teams involved in forest protection;
- ✓ intelligence and guidance groups;
- ✓ environmental organizations and associations.

Forest fire prevention is defined as a set of actions taken before a fire begins, namely:

✚ Complete cleaning of the objects - waste (paper, plastic, etc.); dry forest material (leaves, needles and small branches); live vegetation (grasses, shrubs, branches); grass; shrubs (removal and removal of the undergrowth);

✚ Construction of fire clearings <sup>25</sup>;

✚ Tree trimming - aims to increase the distance between the crown and the ground to prevent the fire from being transferred to the upper floor or turned into a mixed type fire.

✚ Forest roads can serve a variety of purposes: facilitating access in the event of forest fires, providing access for preventative fire fighting.

There are currently different methods of forest fire monitoring:

**Satellites** - Observation from Space

**Air** - aircraft security

**Traditional methods** - instrumental and visual observation

### 3.14. Mobile drones for detecting forest fires

#### UNMANNED AERIAL VEHICLES (DRONES) FOR THE DETECTION OF FOREST FIRES

The disadvantages of ground-based monitoring equipment are limited coverage. Satellite systems are effective over large territories, but are difficult in many hot spots. Piloted aircraft are usually large and expensive. In addition, pilot safety is also a risk that must be taken into account.

Unmanned aerial vehicles (UAVs) with computer-based remote sensing systems are becoming an increasingly attractive and realistic option. In addition to being faster and more mobile, UAVs are also relatively cheaper to continuously monitor and detect forest fires. The integration of UAVs with remote sensing techniques may also refine existing methods. In addition, UAVs can operate in hazardous areas that cannot be reached safely by humans. These are the reasons that have made UAV one of the solutions that are currently drawing the world's attention to forest fires.

Initially, a UAV system for forest fire detection was developed by the US Forest Fire Laboratory (USFS) (Wilson and Davis 1988). A team of researchers from the University of Cincinnati, supported by the West Virginia Department of Forestry (WVDF), uses a UAV system called Marcus Safir to test the system's ability to detect wildfires.

Computer-vision drones are an increasingly realistic option for remote sensing systems, providing fast, mobile and low-cost alternatives to monitoring, detecting, and even combating forest fires.



The integration of UAVs with remote monitoring techniques is also able to meet the critical requirements of spatial, spectral and temporal resolution. In addition, UAVs allow the execution of long-term, monotonous, and repetitive tasks beyond human capabilities. This has caused worldwide attention to UAV applications for forest fire monitoring in recent years<sup>26, 27, 28, 29, 30, 31, 32</sup>.

**Computer video system for detecting and alerting fire by UAV developed by the University of Salamanca, Spain<sup>33</sup>.**

### **General Architecture and Design Requirements for an UAV-Based Automatic Forest Fire Monitoring and Detection System.**

The system covers the functions of monitoring (finding a potential fire), detection (triggering an alarm to inform the fire operators or initiating additional diagnosis and prognosis), diagnostics (determining the location and extent of the fire and tracking its development) and forecasting (forecasting of the future evolution of the fire based on meteorological conditions). These functions are performed using a single UAV or a team of several equipped with different types of sensors in conjunction with a central earth station.

The goals of using UAVs are to detect fires as early as possible, to predict their development and to provide the real-time information needed to successfully combat them.

Detection, diagnosis and prognosis systems typically include:

- various sensors, video and thermal cameras, including GPS positioning system receivers as well as MEMS sensors (accelerometers and gyroscopes);
- specific algorithms and strategies for monitoring, detection, diagnosis and prognosis of fire;
- control systems for both single and multiple UAVs;
- systems for localization, placement and control of several UAVs for optimal coverage of fire zones. Such systems are based on real-time information provided by the on-board visual device for daytime and infrared, both for night and day surveillance. Monitoring is based on information from sensors and camera images and (or) signal from processing algorithms;
- specialized ground station, which includes communication equipment, ground calculations, categorization of fire detection, tracking and forecasting with automatic fire or alarm warning, as well as all equipment necessary for the safe and efficient operation of the UAV<sup>34</sup>.

At the fire search stage, the ground control station splits the mission for each UAV according to the terrain characteristics and capabilities of the individual UAVs, including their onboard sensors<sup>35</sup>.

**Real-time monitoring of forest fire by unmanned aerial vehicles, developed by the Department of Electrical Engineering, Politeknik Negeri Semarang, Jl. Prof. H. Soedharto, S.H., Tembalang, Semarang, Jawa Tengah, 50275, Indonesia**

This study aims to develop a real-time forest fire monitoring system using UAVs. Five sensors are used. The first is a temperature sensor that measures the temperature in the observed forest. The other sensors are a barometer, GPS for positioning, inertial sensors and a compass sensor. GPS and inertial sensors are used for navigation. The barometer measures air pressure, which is used as a reference for maintaining UAV height. Inertial sensors (accelerometer and gyro) are used to evaluate the position of the vehicle. The temperature data from the sensor and the GPS data are processed. The results are sent to the server for access online and in real time on the website. The experimental results show that the system can detect seven hot spots in the first trial and nine hot spots in the second test<sup>36</sup>.

Communication between the UAV and the ground station uses a telemetric data link with a frequency of 433 MHz. When a drone detects a temperature that exceeds the threshold in a given coordinate, then the website display places a marker at that location. Temperature data is also displayed on a contour map. The stability of UAVs in the air was mentioned as a problem.

### Satellite-based monitoring video systems

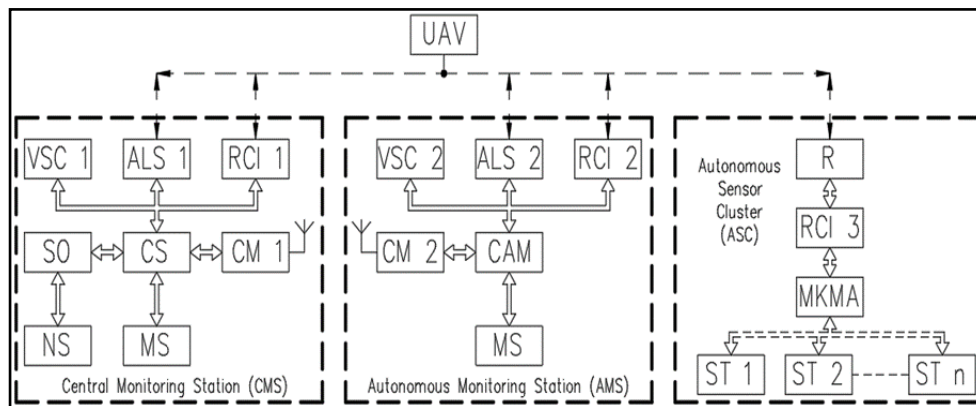
Satellite monitoring has many advantages, especially when monitoring large areas. Such systems have been developed and their results can be seen in relevant publications, some of which are <sup>37, 38, 39, 40, 41</sup>.

These publications would be useful in developing a future unified surveillance system across Europe. It should integrate into a single system with the national monitoring systems of European countries.

## 3.15. A proposal for a model of an early fire detection system, using the latest technology

### MODULAR MULTIFUNCTIONAL FIRE DETECTION SYSTEM

Based on a thorough review of the scientific literature and publications on the problems of monitoring and detection of forest fires presented above, one solution is proposed in line with best practices. In **fig. 6** presents a model for building a "Modular Multifunctional Forest Fire Detection System". The system is designed as a modular structure so that it can easily adapt to any particular terrain, meeting the requirements of security, efficiency, low cost and easy maintenance to the maximum.



**Figure 6** Modular multifunctional forest fire detection system

The main module of the system is the Central Monitoring Station **CMS**. It includes the human factor - the operator of the system **SO**, who makes the final decisions on each case and has a direct connection with the National Disaster Management Service **NS**, which in turn receives or sends information to reciprocal cross-border services **CBS**, as well as to related satellite systems. The **SO** system operator manages the monitoring process and receives information through a central server **CS**, in which the incoming information is processed and stored, and its actions are recorded. The **CS** is connected to the weather station **MS** and the video surveillance cameras **VSC1** (infrared and video), the information from which is analyzed and stored. The weather station **MS** provides the necessary information for the analysis of precipitation, wind speed and direction, outside temperature and humidity, as well as air pressure. Alarm messages are generated and archived on the server to the operating system operator **SO**, who makes an adequate decision, according to the information. An unmanned UAV aircraft (drone) is also provided to the system. For this purpose, the **CS** must have a wireless communication interface **RCI1** through which it can coordinate flight and exchange information with the drone. The use of a drone always raises the issue of landing control. Manual operation is safe as long as there is a trained operator. Automatic landing on a small site, commensurate with its dimensions, can also be made with differential GPS, but at a significantly higher cost and an annual fee.

Using the experience and real results of the following dissertations <sup>42,43</sup>, one can find a solution to the problem by implementing an automatic UAV landing system using an automatic landing site **ALS** with electronic pseudoconical scanning. <sup>44, 45, 46</sup>.



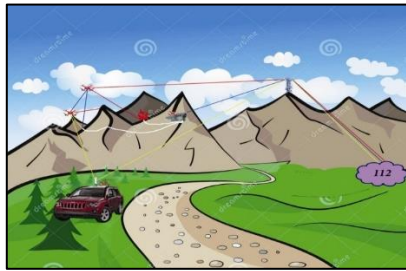
They are under development at the Department of Radio Communications and Video Technology at the Faculty of Telecommunications at the Technical University of Sofia and the results are very good. The site with a laser optical curtain has been patented. The designs being developed are reliable and inexpensive and have good prospects for implementation.

In the scheme, **ALS1** serves the automatic landing of UAVs at the CMS landing site. The landing is autonomous and the CS is only engaged with a landing or take-off permit. The dimensions of the site can be limited to 1-2 m. The next one or more identical modules in the system is the autonomous monitoring station **AMS**. There is no human operator in it, and the management and decisions are made by a computer for analysis and control **CAM**. It analyzes the information from the video surveillance cameras **VSC2** (infrared and video). In the presence of a fire alarm, the data is automatically transmitted to the operator of the system **SO** in the CMS for a final decision. He may order a UAV take-off for close-up and have the information from that inspection as quickly as possible. Through the wireless communication interface **RCI 2**, the CAU computer communicates with the UAV during flight if the CNS has no drone connection. The information received from the review is processed and sent to the CMS. For this purpose, the CMS and AMS modules have a communication link through their communication modules **CM1** and **CM2**, whose task is to provide a secure connection between the two stations for transmitting information and managing them. The choice of these communication modules depends on the specific conditions and location of the stations. The AMS also has an ALS2 automatic landing site, which expands the area of UAV autonomous flights and the possibilities for more information and faster response. The third module of the system includes one or more autonomous ASC sensor clusters. They are intended for the installation of hard-to-reach places with a small perimeter of surveillance and lack of coverage from the monitoring stations or cells of mobile operators. Sensor terminals **CT1** ÷ **CTn**, covered in a local area network<sup>47, 48, 49</sup>, are placed at different fire hazardous places (for example tourist paths or shelters).

The sensor data is processed in a microcontroller for network management and data analysis **MKMA**, which also plays the role of a data concentrator in the network. The processed data is transmitted to one of the monitoring stations via the data concentrator and the remote communication interface **RCI3** (if possible in the field). It is possible to use and install in the appropriate place an RF repeater **R** for this communication. When this is not possible, there is a periodic UAV flight over the ASK area where data from it is collected and transmitted to the CMS. For this purpose, the drone must periodically reach the range of contact with the relevant **AMC**.

The proposal for **multifunctionality** of the system is that it can **search for lost tourists in mountainous areas where there is no coverage of mobile operators**. There are several such cases annually in Bulgaria, some of which end tragically, as was the case this year in Stara Planina. The mobile operators understand where the communication with the mobile phones of the tourists has been lost. Rescue crews are sent, helicopters and drones fly with infrared and video cameras, but to no avail. If a drone is provided with a repeater or micro cell of a mobile operator simulated programmatically by digital radio, then when flying over the search area, the tourists' mobile phone can be contacted and quickly detected. For this communication there are the least problems in the presence of snow cover, forest vegetation, etc. For more efficient operation of the system, one mobile application "Rescue in the Mountain" can be made. Through it, tourists activate their handset in a mode to limit their unnecessary calls, in order to store batteries and at the same time to be in "listening" mode when coverage is lost, in order to answer a possible call from the cell mounted on the drone. In this way, you can communicate with the tourists you are looking for or at least find out where their mobile phone is.

In **Fig. 7** is an illustration of the operation of the multifunctional system. A Dreamstime mountain image was used, with an image of the National Service Telephone 112 (**NST-112**) functioning for emergency calls in the European Union. The car illustrates a mobile version of the CMS, because in the event of a disaster, the services are getting as close as possible to the ground. At the top of the mountain, you can see an observation tower, which can be a mobile operator or AMS, but has a direct connection to the CMS directly or via the NST-112. The scheme also includes a tourist hut (mountain shelter, rest station, ski run), which can have a supportive activity in case of fire with a view to quicker response due to their proximity to the terrain.



**Figure 7** Illustration of how the multifunction system Works

The same applies if you are looking for lost tourists in the mountains. If the disaster is in an area where there is no direct visibility from the tower, there is also no coverage of the mobile operators or for another reason, the mobile CMS or the hut, UAVs can be sent to inspect the "hidden" terrain and transmit the information to the mobile CMS or NST-112. From there, appropriate measures can be taken in conjunction with a rescue unit from the hut.

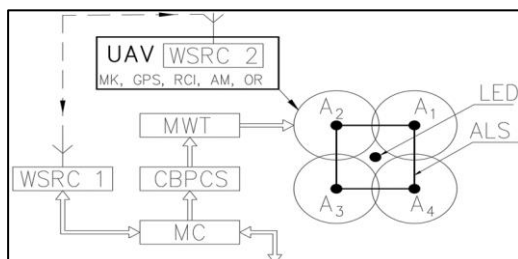
### Pseudo-conical automatic landing site

In **Fig. 8** is a functional diagram of an automatic landing site ALS.

It contains a master controller **MC**, which is connected to the CS of CMS or the CAM of AMS, from where it receives the basic landing commands. The automatic landing algorithm is in the memory of the MC and is executed automatically in conjunction with a reciprocal microcontroller **MK** mounted on board the UAV. The communication is carried out respectively via a standard wireless interface for close communication **WSRC1** and **WSRC2**. On board the UAV are also **GPS** receiver, remote communication interface **RCI**, altimeter **AM** and optical receiver **OR**.

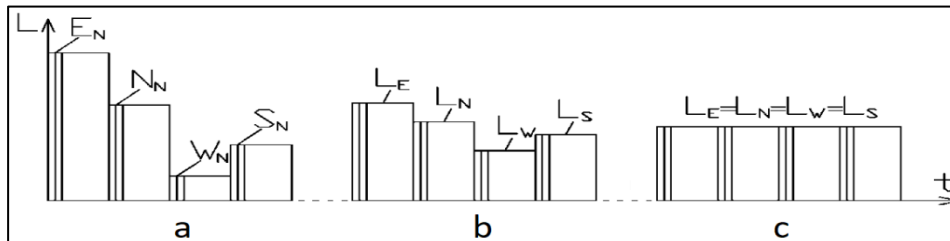
The main controller MC and the arriving near the site UAV are connected through the two WSRC`s. This communication synchronizes the scanning process and the automatic landing process. The scanning is carried out by means of a control buffer for the pseudo-conical scanning **CBPCS** and a microwave transmitter **MWT** with four antennas with directional diagrams **A1**, **A2**, **A3** and **A4**, shown in the figure. At the center of the automatic landing site ALS there is an LED laser diode with a narrow directional diagram vertically upwards.

The UAV flies at predetermined GPS coordinates, which with sufficient accuracy directs it above the directional diagrams of at least one of the four antennas. The antennas emit a consistent identification code for the site, as well as an identification code for each beam  $E_N$ ,  $N_N$ ,  $W_N$ , and  $S_N$ , which are oriented east, north, west, south. The latter indicates the drone in which direction to point so that it can fall above the center of the landing site. For this purpose, the level of signals from each beam  $L_E$ ,  $L_N$ ,  $L_W$  and  $L_S$  is continuously measured in the UAV. When these levels are leveled, this means that the UAV is located just above the center of the landing site (Fig. 9 a, b, c).



**Figure 8** Functional diagram of an UAV automatic landing site

The laser diode LED emits an optical signal upwards, which is received by the optical receiver OR into the drone and serves to "lower" the UAV on it to the ALS. The AM altimeter in the distance control drone is also included for smooth landing. During landing, the equality of the L levels of the four beams is still monitored.



**Figure 9** Diagram of pseudoconical scan signals

The scheme is borrowed from the pseudocannon scanning radar method and has the advantage that the landing control algorithms are simpler, but the disadvantage is the more complex antenna systems to achieve the necessary directional diagrams. This problem is about to be solved at the Technical University - Sofia.

Another solution that would also produce very good results at a low cost is to develop a system with optical directional signals that can be more easily formed with suitable lenses. Such an idea has been claimed for a patent for an invention<sup>50</sup>. It operates on the same principle as the pseudo-conical automatic landing site scheme described above. Here, the UAV is guided by optical signals generated by several laser diodes. This system is easy to implement with low cost and high reliability. There would be a problem in heavy rain or snowfall, but then there would hardly be a fire risk to require a UAV flight.

### 3.16. Innovation in the early detection of forest fires

#### INNOVATIVE RESEARCH AND SOLUTIONS FOR EARLY FOREST FIRE

Many schemes are currently proposed based on optical spectral analysis for fire detection, but obstacles in forest areas can reduce the effectiveness of spectral monitoring. An innovative system using the Internet of Things (IoT) sound spectrum analysis, which utilizes a wireless speaker system to detect fire and distinguish the difference in sound between the crown and surface fire<sup>51</sup>.

The same article also proposes a new type of power source: a wood-energy device that uses the biological energy of living trees to generate electricity. An analysis of the sound spectrum on the data collected by the audio sensors is presented and then the classification algorithms developed by the authors are tested. The results show that the acoustic frequency of the corona fire is about 0-400 Hz, while the surface fire frequency varies from 0 to 15,000 Hz. According to the simulation experiments, the recognition rate can reach about 70%.

The architecture of the remote monitoring system is based on LoRa technology. There are a number of sensors built into the RF subsystem for various applications.

**Powering endpoint sensors (terminals)** is one of the problems to be solved in the implementation of monitoring systems implemented on observation towers or directly in the forest where there is no electricity grid. The choice of power supply is determined by the power consumption, the life time of the system and the conditions for its maintenance. In all cases, battery power is required, the problem being to decide what batteries to put in and how to ensure that they are recharged. The easiest solution is solar photovoltaics. They are cheap and have a long life span, but they only work with solar energy, so they are combined with a wind generator. Such a combination is a good solution to the problem and has been implemented in Tundzha Municipality, Bulgaria.

Forest areas are usually in remote areas, but battery use is not an environmentally friendly solution<sup>65</sup>. To solve this problem, researchers have done some related research and found experimentally that energy from living trees can be extracted.

The principle of generating electricity is the voltage caused by differences in the pH of Xylem and the soil of the trees.



This article provides information about a prototype of a wood-powered wireless sensor. The results of the study of energy production during the day are shown. Expected in the summer, the voltage exceeds 1V, but in the winter there are good results in excess of 0.6V. It is unexpected that the tree has cyclical moments when the voltage drops by about 15-20%.

### Conclusions

A new technology for wildfire monitoring is proposed, using sound spectrum analysis based on the Internet of Things. Some relevant studies have been carried out which have shown that different combustion materials emit different combustion noises or different noise spectrum from a fire. Due to the specific differences in the characteristics of the plants and soil, it has been found that electrical voltage between them arises. This provides an opportunity to improve the technology of energy harvesting from the environment, which can gather the power from living trees to maintain the regular operation of sensor nodes. The signal processing algorithm determines whether the type of fire is a corona fire or a surface fire.

**Meanwhile, an interdisciplinary team** of robotics and biologists at IIT-Istituto Italiano di Tecnologia in Pontedera (Pisa, Italy) published an article "How Plants Can Generate Electricity to Power LED Bulbs." They show that living plants can generate electricity. They claim that a "hybrid tree" made of natural and artificial piezoelectric sheets can act as an innovative "green" electric generator that converts wind into electricity. The EU-funded Growbot project, which aims to implement bioinspired robots to stimulate the generation of electricity from trees. The success of this project will be a strong impetus for the emergence of new Internet of Things technologies in the fight against forest fires.

**There are other innovative power solutions.** Considerable attention is paid to the operation of "piezoelectric power combines" to convert mechanical energy into usable electricity. Good results have been obtained through piezoelectric strips that convert wind into electricity. It charges a super capacitor or battery - they are mounted on a natural or artificial tree and feed the sensor module mounted on the tree<sup>52</sup>.

### Innovative Early Forest Fire Warning System: Hydrogen based fire detection

Existing fire monitoring systems identify the fire at an early stage when intense smoke appears. However, monitoring can be significantly impeded by various landscape contours and other factors. Therefore, tests have been carried out on a hydrogen sensor developed at Humboldt University Berlin, which can be used to detect forest fires in the early stages before flames are generated<sup>53</sup>. The sensor is based on a process called "pyrolysis" - a thermal transformation from organic material, which releases hydrogen when heated and impending ignition.

The results of the experiments show that hydrogen is a selective pyrolytic product and is suitable as the earliest indicator for forest fires. Hydrogen molecules are small enough to penetrate the lattice structure of the detector and cause a change in the dielectric constant of the capacitor and hence its capacitance. Its functional characteristics are such that the sensor is sensitive to the presence of hydrogen and can serve as a signal source for early forest fire.

## 3.17. Forest fire prevention

### Forest fire prevention includes:

- **Emergency planning** - Evacuation plan
- **Awareness raising** – training or other educational activities for different target groups
  - *Internal communications;*
  - *Public information and education;*
  - *Masmedia - Television;*
  - *Media - print / radio;*
  - *Increasing the visibility of fire services.*



## Prevent Fires

- **Ready for fire**
  - **Forest Fire Preparedness Action Plan**
  - **Preparedness for local forest fires**
  - **Municipal Disaster Plans need to include measures such as:**
- ✚ Forestry - the creation of mixed, varied and deciduous forests that are more resistant to fires and timely carrying out various types of felling and cleaning of dry and fallen mass in the forests.
  - ✚ Technically - plowing of mineralized strips along the borders of forests bordering agricultural land.
  - ✚ Organizational:
    - Announcement of a fire-hazardous season for the forests;
    - Population awareness and prevention campaigns aimed at the population;
    - Placing warning signs in designated places;
    - State forest enterprise and State Hunting Enterprise (DGS);
    - Construction of fire kernels by the employees of each State Forest Enterprise and and State Hunting Enterprise;
    - Establishment of trout groups in each settlement in whose territory there is a forest fund;
    - Construction of fire-fighting depots equipped with equipment for extinguishing forest fires in each State Forest Enterprise and State Hunting Enterprise;
      - Interaction with the authorities of the Fire Safety and Civil Protection GD and the local authority for immediate extinguishing of forest fires;
      - Appointment of fire monitors in each State Forest Enterprise and State Hunting Enterprise during the fire season;
      - Annually update the plans for fire protection of the forests of each State Forest Enterprise and State Hunting Enterprise and coordinate them with the Fire Safety and Civil Protection GD;
      - Preparation of a regional program for the Regional Directorate of Forestry for the protection of forests from fire;
      - Preparation of monthly duty schedules for employees of State Forest Enterprise and State Hunting Enterprise during the fire season;
      - During the fire season, especially during holidays and weekends, providing additional monitoring of the most visited areas by tourists and citizens in the forest fund;
      - Development of mutual warning schemes in the event of ignition and fire in forests;
      - Conducting briefing to all forest owners and land holders, forest users, shepherds, beekeepers, owners and users of real estate located in or adjacent to the forest fund about forest fire safety rules, as well as and be notified in writing of their duties.
- ✚ **To protect the population:**
  - localization of the area of fire to prevent ignition of adjacent residential and public buildings;
  - switching off the electricity transmission network passing through the fire area /if necessary/;
  - clearing and plowing strips to prevent the spread of fire;
  - bringing into force the forces and means designated for action;
  - evacuation of the population at risk of fire;
- ✚ **Allocation of duties and authorities and persons responsible for implementing the measures envisaged**
- ✚ The reaction involves:
  - *Warning;*
  - *Implementation of emergency measures to reduce the impact;*
  - *Disclosure;*
  - *Rescue operations;*
  - *Temporary removal and accommodation of the population left without shelter;*
  - *Management and elimination of environmental incidents.*





### Conclusions from the item 3.17:

- ✓ *In recent years, disaster risk reduction has become a global priority.*
- ✓ *Building a culture of disaster protection at all levels of government in society through training and greater publicity.*
- ✓ *Reducing significant risk factors and increasing preparedness for disaster response and disaster recovery is an important operational objective.*
- ✓ *Disaster risk management is implemented through the impact on them through prevention, preparedness, response and recovery measures at national, regional and municipal level based on a risk assessment carried out.*

## 3.18. Recommendations and measures to increase the level of prevention and preparedness for forest fire protection through transboundary actions

I will look at information on this topic at two levels: national and cross-border.

### At the national level:

By Decision No 621 of 25.10.2019, the Council of Ministers approved the National Strategy and Action Plan for Climate Change Adaptation of the Republic of Bulgaria. Appendix 10: Assessment of the Disaster Risk Management sector and Appendix 4 Assessment of the Forestry sector provides an overview of the strategic and legislative framework of the different sectors of the sector shows gaps and recommendations, some of which are:

1/ *Strategy for the development of voluntary pools for protection against disasters, fires and other emergencies in the Republic of Bulgaria for the period 2012-2020*

2/*Program for Risk and Crisis Management in Agriculture (2016)* - The program is not based on climate modeling for the country (and region).

3/*Ordinance on the Terms, Procedures and Bodies for Performing the Analysis, Evaluation and Mapping of Disaster Risks*

4/*According to the Disaster Protection Act, the next steps are the development and adoption of national, regional and municipal programs for disaster risk reduction;*

### About the Forest Sector

**Some of the priorities identified are:**

- ✚ Preparation and implementation of a research program;
- ✚ Encouraging the use of forestry systems that provide high species and structural diversity and natural regeneration;
- ✚ Carrying out a National Forest Inventory;
- ✚ Establishment of a national system for detection and prevention of forest fires and rapid response to this and other natural disturbances;
- ✚ Establishment of a National system for long-term monitoring of natural disturbances;
- ✚ Integration of new and existing information systems into a modern unified Forest Resources Information System.

### At cross-border level:

**An Agreement between the Government of the Republic of Bulgaria and the Government of the Republic of Turkey on Cooperation in the Field of Emergencies** has been concluded (Approved by Council of Ministers Decision No 761 of 14 September 2012. Effective 7 October 2015), Issued by the Ministry of the Interior, Ref. SG. 18 of 8 March 2016

Increasing the level of prevention and readiness for protection against forest fires through transboundary actions are:



## Prevent Fires

- ✓ Sign bilateral agreements with (other) neighboring countries and continue cooperation on regional and international disaster prevention and preparedness projects;
- ✓ Continuation and intensification of cross-border cooperation with neighboring countries in the field of shared risk assessment, such as forest fires, floods, etc.;
- ✓ Building/upgrading effective platforms and networks for cooperation in the field of disaster prevention;
- ✓ Comprehensive collection of data and information on disaster risks and costs and sharing at EU level with a view to conducting comparative studies and identifying the likely transboundary impact of disasters;
- ✓ Cooperation at different levels between local, regional and national authorities and involvement of other actors involved in the disaster risk management;
- ✓ Use the valuable experience gained in this field through projects implemented in the past at the initiative of the INTERREG Community;
- ✓ Co-operation in the field of volunteering;
- ✓ Regular data collection, mapping of risk, drawing up of fire risk management plans, identification of the necessary and available resources in the 27 Member States and coordination at different levels;
- ✓ Research and development in the various Member States, and in particular those exposed to similar risks;
- ✓ Strengthening the early warning systems in the Member States and establishing links as well as deepening the existing links between the different early warning systems;
- ✓ Developing, financing and implementing more effective prevention and conservation policies;
- ✓ Exchange of good practices for the prevention of human-caused disasters between Member States and the provision of disaster management training to regional authorities;
- ✓ Developing a common methodology and minimum requirements for hazard and risk mapping at EU level;
- ✓ Assessing potential prevention gaps and checking that the available instruments cover all types of disasters;
- ✓ Introducing criteria and legislation for disaster prevention in areas at risk of floods and landslides, as well as other geological risks;
- ✓ Improving the integration of disaster prevention into operational planning into national, regional and local programs;
- ✓ Organizing public awareness campaigns on prevention and adoption of best practices, in providing relevant and up-to-date information and training to the general public through means easily accessible to all citizens, on identified risks and the actions to be taken to take action in the event of a natural or man-made disaster;
- ✓ In view of the linkages between drought, forest fires and desertification, submit proposals for a directive similar to the Floods Directive in order to promote the adoption of an EU policy on water scarcity, drought and adaptation to climate change;
- ✓ Legislative proposals and initiatives in the field of forest protection and fire prevention;
- ✓ Construction of joint systems for monitoring floods, forest fires, etc.;
- ✓ Conducting joint seminars, round tables, trainings related to disaster risk management;
- ✓ Preparation of the Joint Risk Management Strategy in the Cross-Border Region, Action Plan for Joint Actions against Flood and Other Natural Disasters, Guidelines for Action to Ensure Joint Emergency Response, Standard Operating Procedures, etc. documents;
- ✓ Simulation of rescue exercises in the event of a disaster; joint field exercises, etc. cross-border scenarios.



### 3.19. Conclusion

This report examines the current European and Bulgarian legislation in terms of disaster risk management and forest fire risk. Conclusions, recommendations and useful ideas and directions for the future development of rapid fire detection systems, methods of monitoring and prevention of forest fires were presented. Possibilities for cross-border cooperation in the exchange of information and good practices were also addressed. Innovative research and solutions for early detection of forest fire were reviewed, using information from 47 scientific publications. The merits of the report are that the development of the legislation, as well as the model of an early fire detection system based on modern technologies, has been shed. This report would be useful to institutions with competence in forest fire risk management.

The trend in recurring tragic fire seasons in Europe reflects the importance of strategies and programs for forest and forest fires management in effectively tackling this phenomenon. Progress has been made at various levels, including the revision of national forest programs, the development of criteria and indicators for sustainable forest management and the implementation of good practices. The increasing number of extreme fires shows that: more efficient science-based management of forest fires and decision-making based on awareness of the risks that take into account the socio-economic, climatic and environmental roots of forest fires are required; shifting the focus from suppression to prevention within the framework of integrated fire management and raising the awareness and preparedness of the population at risk; enhancing European cooperation in the field of forest fire risk management through effective synergies between European and national policy objectives and territorial governance. As a result, more balanced strategies for sustainable forest management that integrate aspects of prevention, climate adaptation, education, preparedness, extinguishing and restoration of forests could be implemented.

It is not possible to achieve sustainable development without significant efforts to reduce the risk of disasters<sup>54</sup>.

Bulgaria is exposed to a number of natural threats. The disasters caused by these phenomena have adverse economic impacts on the country. The risks of disasters facing the country are expected to increase in the face of increasing urbanization, industrial development and climate change. For this reason, disaster risk management plays an important role in the sustainable development of the country and is among the priorities of the Bulgarian government.

#### *Thanks*

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## 3.20. Literature and Sources Used

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<sup>2</sup> **Disaster Protection Act** – Promulgated State Gazette No.102/19.12.2006, amended SG No.41/22.05.2007, amended SG No.113/28.12.2007, amended. SG No.69/5.08.2008, amended SG No.102/28.11.2008, amended SG No.35/12.05.2009, amended SG No.74/15.09.2009, amended SG No.93/24.11.2009, amended SG No.61/6.08.2010, amended SG No.88/9.11.2010, amended SG No.98/14.12.2010, amended SG No.8/25.01.2011, amended SG No.39/20.05.2011, amended SG No.80/14.10.2011, amended SG No.68/2.08.2013, amended and supplemented SG No.53/27.06.2014, amended and supplemented SG No.14/20.02.2015, amended SG No.79/13.10.2015, amended and supplemented SG No.81/20.10.2015, amended and supplemented SG No.51/5.07.2016, supplemented SG No.81/14.10.2016, supplemented SG No.97/6.12.2016, amended SG No.13/7.02.2017, amended and supplemented SG No.97/5.12.2017, amended and supplemented SG No.77/18.09.2018.

<sup>3</sup> The 2005 Hyogo Framework for Action adopted at the World Conference on Disaster Reduction

<sup>4</sup> The Kyoto Protocol is an international instrument adopted in Kyoto, Japan in December 1997 in addition to the United Nations Framework Convention on Climate Change. This document is an international agreement on global warming control that commits signatories to reducing their greenhouse gas emissions.

<sup>5</sup> The Paris Agreement on Climate Change is the first universal, legally binding global climate agreement. It was signed on 22 April 2016 and ratified by the European Union on 5 October 2016.

<sup>6</sup> adopted by Council of Ministers Decision No. 505 of 19.07.2018.

<sup>7</sup> The Sendai Framework for Disaster Risk Reduction 2015-2030, adopted at the Third UN World Conference on Disaster Risk Reduction in Sendai, Japan.

<sup>8</sup> The Covenant of Mayors <http://www.covenantofmayors.eu/> is a European movement involving local and regional authorities, voluntarily committed to working to improve energy efficiency and the use of renewable energy in their territories.

<sup>9</sup> provided for in Article 214 (5) of the Treaty of Lisbon.

<sup>10</sup> Decision No 1313/2013 / EU of the European Parliament and of the Council of 17 December 2013 on the Union Civil Protection Mechanism (OB L 347, 20.12.2013, p. 924).

<sup>11</sup> All EU Member States, as well as Norway, Iceland, Montenegro, Serbia, the former Yugoslav Republic of Macedonia and Turkey. The Commission calls them "participating countries" and this term will be used in the rest of this report.

<sup>12</sup> (European Parliament and EC Decision 1313/2013/EU and Commission Implementing Decision 2014/762/EU)

<sup>13</sup> Common Communication and Emergency Management System - The responsibility of the Commission for the management of CECIS is laid down in Article 8 of the Decision.

<sup>14</sup> The Impact Assessment accompanying the legislative proposal for the Decision establishing the MSG (Commission staff working document on the Impact Assessment 2011 on the regulatory framework for civil protection, accompanying the Decision of the European Parliament and of the Council on Union Civil Protection Mechanism - Financial Instrument 2014-2020, SEC (2011) 1632 final, 20.12.2011) identifies a number of gaps in the EU's disaster response capacity, with which the new legislation is specified to handle.

<sup>15</sup> large-scale integrated projects (eg FIREPARADOX, FUME)

<sup>16</sup> smaller projects and individual scholarships under the Maria Skłodowska-Curie program (eg FIRESCAPE, GRADIENT)

<sup>17</sup> LIFE program (for example, ENERBIOSCRUB, MONTERRAT)

<sup>18</sup> of the Civil Protection Mechanism (e.g., PREDICATE, WUIWATCH)

<sup>19</sup> Forest Fire Technical Report - European Civil Protection Project EVANDE (Enhancing Volunteer Awareness and education against Natural Disasters through E-learning); 2015-2016 r., co-financed by the EU Civil Protection Mechanism (Grant Agreement No ECHO/SUB/2014/693261) and coordinated by the Museum of Natural History of the University of Crete, Greece, [www.evande.eu](http://www.evande.eu);

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<sup>21</sup> Prevention - Regulatory requirements, organizational and physical measures aimed at avoiding or reducing the negative effects of disasters..

<sup>22</sup> Adopted by Council of Ministers Decision No. 621 of 25.10.2019

<sup>23</sup> Responses of the Committee on the Special Report of the European Court of Auditors "Is EU assistance for the prevention and repair of forest fires and natural disasters well managed?"

<sup>24</sup> Method for Sustainable Forest Management and Environmental Protection by Creating a System for Prevention and Early Warning of Fire Protection, Yulia Zarkova, Georgi Milushev.

<sup>25</sup> Fire clearings are lines - strips from which vegetation has been completely removed in order to interrupt its horizontal extension.

<sup>26</sup> Pablo Chamoso, Alfonso González-Briones, Fernando De La Prieta and Juan M. Corchado, Computer vision system for fire detection and report using UAVs. BISITE Digital Innovation Hub, University of Salamanca. Calle Espejo 2, 37007. Salamanca, Spain

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## 4. CONCLUSION

In recent years, there has been an observable increase in the amount and severity of natural disasters with the effect of climate change all over the world. In more human-induced disasters such as forest fires, changes in the forest ecosystem resulting from climate change make it difficult to combat fire. It is a fact that these disasters will increase their impact in the future as sufficient measures are not taken globally.

Within the scope of the research study, the current legal regulations and practices on the basis of European Union and countries regarding the prevention of forest fires, preparedness and protection were examined in the reports prepared by Bulgarian and Turkish experts. Regarding disasters, some gaps between countries' local approaches and EU approaches have been put forward and some suggestions have been made to ensure harmonization with the EU. As a result of the researches conducted, it was mentioned that disaster risk analysis and the preparation of risk maps on the basis of forest fires and other disasters in order to contribute to prevention and preparedness studies are necessary.

In the study of Turkish experts, a survey was conducted with the authorities of some institutions and organizations located in Kırklareli, and information about the work carried out on forest fires and other disasters in the region was collected. By evaluating the information obtained, determinations were made regarding the current situation in the region. At the same time, information was given about forest fire management plans prepared for forest management directorates in Kırklareli province.

The report prepared by Bulgarian experts focused on early warning systems for forest fires. This report provides information on the current early warning systems used for forest fires in Bulgaria, the use of unmanned aerial vehicles (drones) for forest fire detection in some member countries and in the world, and innovations in early warning systems. In addition, a proposal for an early fire detection system model using the latest technology has been developed by the experts.

At the end of both reports, recommendations were made to improve cross-border cooperation between Turkey and Bulgaria regarding disasters.



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