RESILIENT COMMUNITIES THROUGH AWARENESS AND PREPAREDNESS AGAINST THE RISKS OF FIRE, FLOOD, AND LANDSLIDE

CHAPTER 4. FIRE-RELATED DISASTER

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CHAPTER

4

FIRE-RELATED DISASTER

Every day, brave individuals step forward to join the ranks of amateur fire-fighters and dedicated volunteers, driven by a profound sense of duty and the desire to protect their communities from the devastating impact of fires and fire-related disasters. "READY4DISasters: “PREPAREDNESS FOR FIRE-RELATED DISASTER" is your indispensable roadmap on this noble journey, designed to equip you with the knowledge, skills, and confidence needed to confront the challenges of fire-related emergencies.

Within the pages of this guide, you will find a wealth of information and guidance that covers a wide spectrum of topics, from understanding the fundamentals of fire behaviour to developing comprehensive strategies for preparedness, response, and recovery. This guide is intended to be a versatile resource, catering to the needs of both newcomers to the field and experienced volunteers looking to enhance their expertise.

Our journey through the world of fire fighting begins with an exploration of fire-related disasters (Chapter 4) and the pivotal role of steps required for their successful management. This guide consists of Chapters divided to ensure a systematic understanding of the subject matter:

4.1. Preparedness for Fire-related Disasters: This section delves into the critical aspects of preparedness, including developing emergency plans, identifying fire-prone areas and potential hazards, fire extinguishing methods, understanding fire extinguishing agents and their properties, and mastering the usage techniques of fire extinguishers. We will also explore the world of automatic fire detection and extinguishing systems, and the development of effective evacuation plans to ensure the safety of all involved.

4.2. Post-Fire-related Disasters Recovery and Restoration: In the aftermath of a fire-related disaster, knowing how to assess structural damage, control post-fire installations, manage post-fire residues, and collaborate with emergency services and other organizations is paramount. This section will also address the vital aspects of managing volunteers and resources, and the forward-thinking approach to planning for future disasters.

4.3. Case Studies: Throughout the book, you will find case studies that provide real-world examples of the principles and strategies discussed, offering insights into the practical application of fire fighting knowledge.

Within this chapter, we aim not only to impart technical expertise but also to foster an understanding of the values that define the fire fighting community: courage, dedication, and selflessness. As an amateur or volunteer, you become a vital part of this community, dedicated to safeguarding lives, property, and the well-being of those you serve.

This guide is your companion in the quest for proficiency in the world of fire fighting, and we encourage you to absorb its contents, apply its lessons, and always remember that you are part of a noble tradition of individuals who selflessly stand ready to protect their fellow citizens in times of need.

4.1. Preparedness for Fire-related Disasters

In a world where fires are becoming increasingly prevalent and the impact of climate change is undeniable, preparedness for fire-related disasters takes centre stage. As the fire events increase, community involvement takes on a more important role day by day. Volunteerism also plays a crucial role in these efforts, working tirelessly to protect their communities from the ravages of fires. This topic delves into the essential elements of preparedness ranging from proactive measures to reduce fire risks, emergency planning, identifying fire-related areas and potential hazards, automatic fire detection, warning systems to development of the evacuation plans with a special focus on the involvement of dedicated non-professionals (volunteer fire-fighters, community etc.). This discussion highlights the vital role of volunteers in safeguarding lives and property in the face of nature or human based fires.

4.1.1. Developing a fire-related disasters emergency plan

Fires can occur naturally or artificially. Such events may arise from natural causes such as lightning strikes and volcanic eruptions. Fires caused by natural causes constitute a much smaller portion compared to fires caused by human activities. In this sense, generally speaking, fires are caused by human factors. A comprehensive fire-related disasters emergency plan is essential to mitigate the impact of wildfires and ensure the safety of communities and their infrastructure. Such a plan encompasses various critical components that should be carefully considered and integrated for an effective response.

One of the first steps to be taken against possible fires is the development of Emergency Plans. In this manner, after the event occurs, processes are designed to determine roles and tasks. In this context, studies are carried out to shorten the response process and minimize the possible loss of life and property. However, since the safety of the people who intervene will be considered within the plan, it is ensured that they are not harmed by the risks they may encounter.

Emergency Planning is “planning the work and procedures that need to be carried out in order to save people's life, property and other activities from the consequences of extraordinary events with the least loss and damage, before the events occur and during the event" [1].

A fire emergency evacuation plan is a written document that includes what all personnel must do in case of fire and arrangements for calling the fire brigade. While a "General Fire Notification" can be prepared for small-scale facilities, a detailed "Staff Fire Notification" can be prepared for larger-scale facilities.

Beforehand, risk assessment and the location of personnel at risk in case of fire, evacuation plans, instructions and warnings are determined [2]. Emergency plans regarding fire can be prepared at the workplace level, as well as local and national plans at a higher level (plans such as a provincial basis or on a country basis). It is of great importance that individuals and units providing disaster services voluntarily have information about these plans and cooperate with local authorities.

In these plans, the roles and duties to be undertaken by both individuals and institutions (Public, Private, NGO) are clearly stated. Plans may also include worst-case scenarios. These scenarios are mostly seen in plans prepared on a local basis. For example, elements such as what to do in case of a potential volcano eruption, evacuation scenarios, possible impact areas, lava flows and routes are considered in a region with an active volcano.

Scenarios allow us to make realistic predictions. For example, in a region at risk of earthquake, existing building stocks can be examined in the light of the data obtained and information can be obtained about where and how possible demolition will occur. Thanks to this information, protection plans can be prepared before a possible earthquake and predictions can be made about what will happen after the event. This information is of great importance in terms of preparation.

After emergency plans are prepared, they should be updated at certain periodic intervals. These plans should be revised due to many reasons such as new risk information that can be obtained in the light of technological developments, the existence of a newly opened facility that may pose a serious risk, and population growth.

In summary, a fire-related disasters emergency plan is a comprehensive strategy that integrates various elements to effectively respond to fires and minimize their impact on communities. It is a critical means of addressing the challenges posed by fire-related disasters and safeguarding lives, property, and the environment.

4.1.2. Identifying fire-related areas and potential hazards

Identifying possible risky areas for fire and determining the security measures that should be applied to these areas ensures that the damages that may occur is minimized. The point that should not be forgotten is to follow the directives of the Local Fire Department and National Units and formal publications on Disaster Management in carrying out all these processes. It is essential that these directives, regulations and plans are taken as a guide and the work carried out is implemented in accordance with the issues specified here (The fire-related risk analysis and reporting of the buildings, facilities and businesses in which they are located have been carried out by the local Fire Brigade and Disaster authority. It may be enlightening to follow the issues stated here. If such a risk analysis and reporting activity has not been carried out, the local Fire Brigade and Disaster authority should be reported about such an analysis and reporting activity.

The handbooks and guides published by the Fire Brigade regarding the precautions to be taken at home are useful [3]. Thanks to the planning made before a possible fire, the risk of fire can be completely eliminated or the damages that may occur can be reduced. Within the scope of these plans, improvements can be made according to the results obtained by detecting the elements that may start a fire in advance and conducting research on how their safety can be ensured. When evaluated in this way, transactions can proceed in 2 stages.

1. Stage: Risk Hunt

The Risk Hunting phase can be applied anywhere, whether small or large scale. For example, we can give a small-scale example of the house we live in. On a large scale, the building or workplace we are in, can be given as an example. Risks that may occur in homes can be detected in advance with the risk hunting checklists obtained from the local Fire and Disaster units.

Table 4.1. Sample fire risk hunting checklist for office buildings

	Daily	Weekly	Monthly	Quarterly	6 Monthly	Yearly/ Periodic
Emergency Lighting	✓	✓		✓		✓
Fire Alarm	✓	✓		✓		✓
Extinguishers Hose Reels			✓			✓
Fire Exit Doors	✓	✓	✓	✓	✓	✓
Fire Resisting Doors		✓	✓	✓	✓	✓
Furniture Seating etc.		✓	✓	✓	✓	✓
Gas Installations						*
General Wiring						*

[4].

Thanks to the checklists, if there are flammable liquids in the house, they are removed from the house and classified separately, electrical lines and fuel lines (LPG, natural gas, etc.), are controlled, chimney-type structures are cleaned, for the purpose of ensuring the safety of heating elements such as fireplaces and stoves.

2. Stage: Remediation (improvement)

After risk hunting is carried out, possible risk sources are identified. The next process is improvement (remediation). For example, if the source of risk is worn-out electrical installations, they are reinstalled. Nonconformities observed in LPG pipelines are eliminated. Flammable liquids or materials are removed from the house or stored in a safe place, as required by local legislations.

4.1.3. Fire Extinguishing Methods

Fire extinguishing activity can be simple, but it is a process that often involves complex and large-scale intervention. The prerequisite for fire extinguishing is to know the fire very well. Knowing the factors that cause a fire within the cause-effect relationship will positively affect the success of the fire extinguishing process.

Fire is a dynamic event that develops suddenly, changes and grows if it does not encounter any obstacle. It can simply be seen as the result of a chemical reaction called "Combustion".

The combustion reaction is defined as follows: *Exothermic (heat-releasing) reaction of a substance with an oxidizing agent [5]. (TS EN ISO 13943:2008 Article 4.45)*

The oxidizer mentioned in the definition is Oxygen, which is naturally found in the atmosphere and ensures the continuity of life. Fire can be thought of as a phenomenon caused by combustion reactions. Occurrence of certain preconditions may cause a fire to start. Looking at international standards, there are three definitions of fire:

- *Fire (General): The process of combustion characterized by the release of heat and fire waste and often accompanied by smoke, flame, incandescence, or a combination thereof [6]. (ISO 13943:2008 Article 4.96).*

- *Fire (Controlled): A self-supporting process of combustion that is deliberately regulated to provide beneficial effects and whose expansion is limited in time and location [7]. (ISO 13943:2008 Article 4.97).*

  An example of a controlled fire is a flare-up created in an oven for cooking purposes. Cooking here is an example of the beneficial effect mentioned in the definition of controlled fire. The fire continues as long as we leave the oven control button on, that is, as long as the necessary conditions for combustion are met. So the combustion process is self-supporting and controllable.

- *Fire (Uncontrolled): A self-supporting process of combustion that is unrestricted in its expansion in time and location, not deliberately regulated to provide beneficial effects [8]. (ISO 13943:2008 Article 4.98)*

  An example of an uncontrolled fire is a forest fire. It is not deliberately designed to provide beneficial effects. Since there is no control mechanism or structure to limit the fire, its expansion in time and location is unlimited. Additionally, combustion continues as long as it finds the necessary conditions. The elements that make up fire can be generally examined in two ways: natural and artificial. Volcano eruptions and lightning can be given as examples of naturally occurring fires. However, when we look at the causes of fires, we see that they are mostly caused by human factors. The vast majority of human-caused fires occur unintentionally. Lack of control, unforeseen matters or uncontrolled actions can be given as examples. Arson is human-caused fires that are deliberately set to cause harm.

In order to fully understand the phenomenon of fire, it is necessary to mention the three basic components that make up the combustion process - fuel, oxygen, heat energy - these basic components have been known in fire science for more than a hundred years and are represented by the “fire triangle” [9].

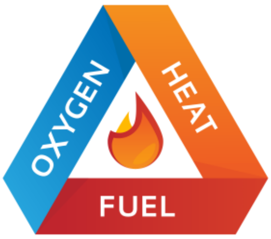

Figure 4.1. Fire triangle.

The "fire triangle" is a simple model used to illustrate the three fundamental components required for a fire to exist and continue burning. These components are heat, fuel, and oxygen. The fire triangle is a fundamental concept in fire science and fire safety. Here's a brief explanation of each component:

1. **Heat:** Heat is the first component of the fire triangle. It represents the initial source of ignition or the energy that raises the temperature of a material to its ignition point. Heat can come from various sources, such as an open flame, a spark, or a hot surface.

2. **Fuel:** Fuel is the second component. It refers to the material that is capable of burning and sustaining combustion. Fuel can be in the form of solids, liquids, or gasses. Common examples of fuel include wood, paper, gasoline, natural gas, and various chemicals.

3. **Oxygen:** Oxygen is the third component. It is essential for combustion because it supports the chemical reactions that occur during the burning process. Fires need a sufficient supply of oxygen to continue burning. When oxygen is present in adequate quantities, it combines with the fuel to release energy in the form of heat and light.

The fire triangle concept illustrates that the absence of any of these three components can prevent or extinguish a fire. In other words, to control or extinguish a fire, you can do one of the following:

- Remove the heat source: By cooling the material below its ignition temperature.
- Remove the fuel source: By eliminating or isolating the material that can burn.
- Remove the oxygen supply: By suffocating the fire to reduce the oxygen concentration.

The fire triangle is a foundational concept in fire safety and serves as a basis for understanding fire prevention, fire fighting, and fire protection measures. It has been extended to the "fire tetrahedron," which adds a fourth component, the chemical chain reaction, to provide a more comprehensive understanding of fire behaviour and control.

4.1.3.1. Fire Classes

Fires are divided into certain classes all over the world in order to determine effective extinguishing methods and strategies. According to TS EN 2 A-1, fires are divided into 6 classes. While class E fires may be accepted in some countries such as Oceania countries (e.g. Australia), they are not accepted as fire class by most countries, especially the European Union, and are categorized separately as electrical fires.

The Fig. 4.2 shows the 6 fire classes. The reason for this is that while some countries accept class 6, this emblem and letter are included in some fire extinguishing devices and systems produced by these countries. It is included in the table for information. However, electrical fires are not separately classified as Class E fires in EU standards [10].

Class of Fire	**Type of fuel**
Class A	Solid
Class B	Liquid
Class C	Gas
Class D	Metal
Electrical fire	Electricity
Class F	Cooking oil or fat

Figure 4.2. Fire classes.

The process of stopping and ending uncontrolled fires is called EXTINGUISHING. It is based on the principle of eliminating the elements that cause of the fire [11]. They are often referred to as the "fire tetrahedron," which is an expansion of the traditional fire triangle. Let's take a closer look at each of these factors:

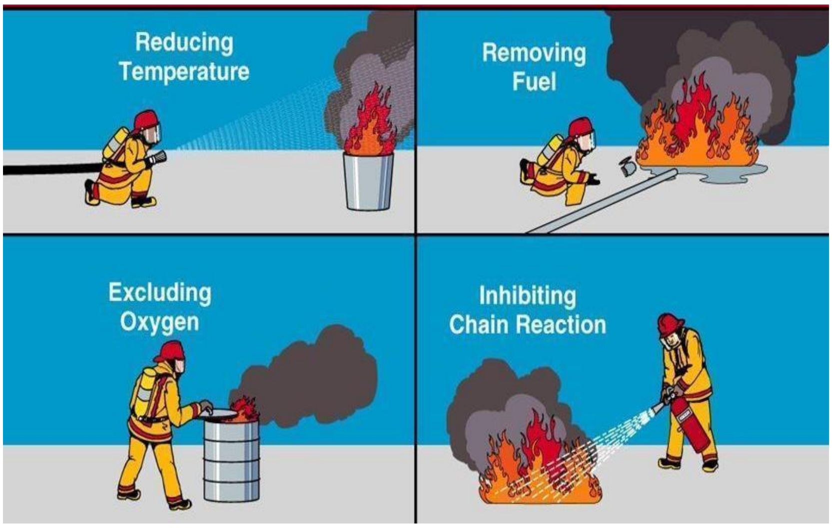

Figure 4.3. Fire extinguishing techniques.

Elimination of Heat (Cooling): Heat is one of the essential components required for fire to exist. By removing heat or reducing the temperature of a fire, you can effectively control or extinguish it. Cooling methods may involve the use of water, foam, or other cooling agents to lower the temperature of the burning material below its ignition point, thus preventing further combustion.

Removal of Oxygen (Suffocation): Fire requires oxygen to sustain combustion. By limiting or cutting off the oxygen supply to a fire, you can extinguish it. This is commonly achieved by smothering the flames with fire-resistant materials or using fire suppression systems that displace or reduce the oxygen concentration in the fire area.

Elimination of Fuel (Removing Fuel): Fire also needs a source of fuel to burn. Removing the fuel source is an effective way to extinguish a fire. This can involve shutting off the flow of flammable liquids or gasses, clearing combustible materials from the fire's path or isolating the fuel source to prevent its contribution to the fire.

Breaking the Chain of Chemical Reaction: The combustion of fuels in a fire involves a complex chain of chemical reactions. By disrupting or breaking this chain reaction, you can extinguish the fire. For example, fire extinguishing agents, such as dry chemical powders, work by interrupting the chemical reactions occurring within the fire. They interfere with the combustion process and prevent the fire from sustaining itself.

4.1.4. Fire Extinguishing Agents and Their Properties

Each extinguishing agent has specific properties and is chosen based on the type of fire and the materials involved. It is crucial to use the appropriate fire extinguishing agent for a given fire class to maximize effectiveness and minimize damage. Fire extinguishers are labelled with symbols and class designations to indicate the types of fires they are suitable for, making it easier for users to select the right extinguishing agent in an emergency. Here you can find fire extinguishing agents and their properties (Fig. 4.4):

Water Extinguisher	A
Powder Extinguisher	A B C
Foam Extinguisher	A B
CO2 Extinguisher	B
Wet Chemical Extinguisher	A F
Fire Blanket	

Figure 4.4 Fire extinguishing agents.

Water: Water is one of the most common and effective fire extinguishing agents. It works by cooling the fuel source below its ignition temperature. Water is widely used for Class A fires (fires involving ordinary combustibles like wood and paper) and in some cases, Class B fires (flammable liquids). However, it should not be used on electrical fires (Class C) as it conducts electricity.

Dry Chemical Powder (KKT): Dry chemical powder is a multi-purpose extinguishing agent. It works by interrupting the chemical reaction in the fire, making it effective for Class A, Class B, and Class C fires. It is widely used in various settings, including homes, offices, and industrial facilities.

D-Powder: D-powder (or sodium chloride-based extinguishing agents) is primarily used for fighting metal fires, such as those involving sodium, magnesium, and titanium. These agents form a crust over the metal, cutting off the oxygen supply and extinguishing the fire.

Foam: Foam is used for Class B fires and is especially effective for flammable liquid fires. It creates a barrier between the fuel and the oxygen, smothering the fire. Foam is often used in industrial settings, including oil refineries and chemical plants.

Carbon Dioxide (CO_2): Carbon dioxide is a versatile and clean fire extinguishing agent. It works by displacing oxygen, thus suffocating the fire. CO_2 is suitable for electrical fires. It leaves no residue and is commonly used in computer server rooms and laboratories.

Wet Chemical: Wet agents are specially designed for Class K fires, which involve cooking oils and fats. They are effective at cooling the fire, emulsifying the hot oils, and preventing re-ignition. Wet agents are commonly used in commercial kitchens.

Fire Blanket: A fire blanket is a safety device designed to extinguish small fires or to provide protection from flames in emergency situations. It is typically made of fire-resistant materials such as fibreglass or specially treated wool. Fire blankets are useful for quickly smothering fires by cutting off the supply of oxygen.

4.1.5. Fire Extinguisher (YSC) and Usage Techniques

Portable Fire Extinguishers are equipment used to suppress and extinguish fires in the initial stage. Fire Extinguisher and Portable Fire Extinguisher are not the same concepts [12].

When we look at the definitions;

-*Fire extinguisher:* Device containing a fire extinguishing agent that can be expelled by the action of internal pressure and directed onto a fire.

-*Portable (mobile) fire extinguisher:* Fire extinguisher designed to be carried and operated by hand, with a weight not exceeding 20 kg during operation [13].

Figure 4.5. Portable fire extinguishers.

Based on fire classifications, effective extinguishing agents that can be used in fire classes are as follows:

Controlling a fire extinguisher involves following specific steps and using proper techniques including before, during and after use:

(*) Just before use,

- External conditions
- Hose and Lance
- Weight
- Manometer

After selecting the size and type of extinguishers required for intervention, the direction of intervention should be determined with the wind at our back.

(*) During Use:

- Pull the pin,
- Aim the hose towards the burning area,
- Press the discharge valve,
- Apply the extinguishing agent (Sweep, Warp, Direct Spray)

(*) After Use:

- After removing the extinguisher pin, it must be checked again, even if the trigger is not pressed.
- The extinguisher used should be left lying on the ground.
- *It should not be hang again.*
- *It must be reported to the authorities and refilled.*

Usage Technique:

Sweeping Motion: Move the extinguisher nozzle in a sweeping motion from side to side. Ensure thorough coverage of the fire area with the extinguishing agent. Ideal for: Fires involving solid combustibles (Class A).

Warp or Direct Spray: Adjust the application technique based on the type of fire. Direct the extinguishing agent precisely to the base of the flames. Ideal for: Fires involving flammable liquids (Class B) or electrical equipment (Class C).

Maintain Safe Distance: Stand at a safe distance from the fire to avoid heat and smoke. Observe wind direction and stand in the upwind position.

Continuous Discharge: For effective control, maintain a continuous discharge of the extinguishing agent.

Target the Base: Direct the spray or stream at the base of the flames, where the fuel source is.

4.1.6. Automatic Fire Detection and Extinguishing Systems

These systems are activated depending on the presence of heat, flame and smoke, which are combustion products, after the first ignition occurs. Detector selection is made according to the type of substance in the volume and its flammability (for example, some substances emit intense smoke after the first ignition) [14].

In the system, a signal is sent to a control panel immediately after the detector detects the fire. Depending on the features of the panel, either the detector that gives the signal and its location or the region where the detector is located appears on the control panel.

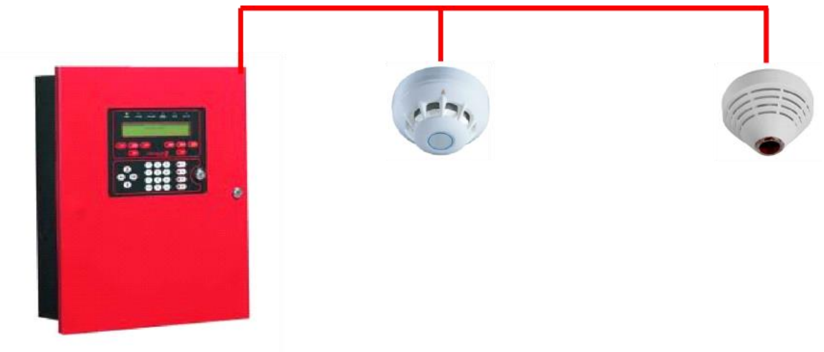

Figure 4.6. Smoke detector and panel.

Following this, they are simultaneously activated by the panel by sending a signal to all audio and visual warning systems (announcement systems, emergency lighting systems, etc.). In this way, the fire detected by the detector is announced throughout the building as an audible and visual alarm. Depending on these systems, manual fire alarm buttons are also installed. Without the need for detection, if a fire incident is detected by a person, the alarm system is activated thanks to this button. It is essential that all these systems be fed from an uninterrupted and structure-independent energy source. In this way, they continue to provide service despite a possible power outage.

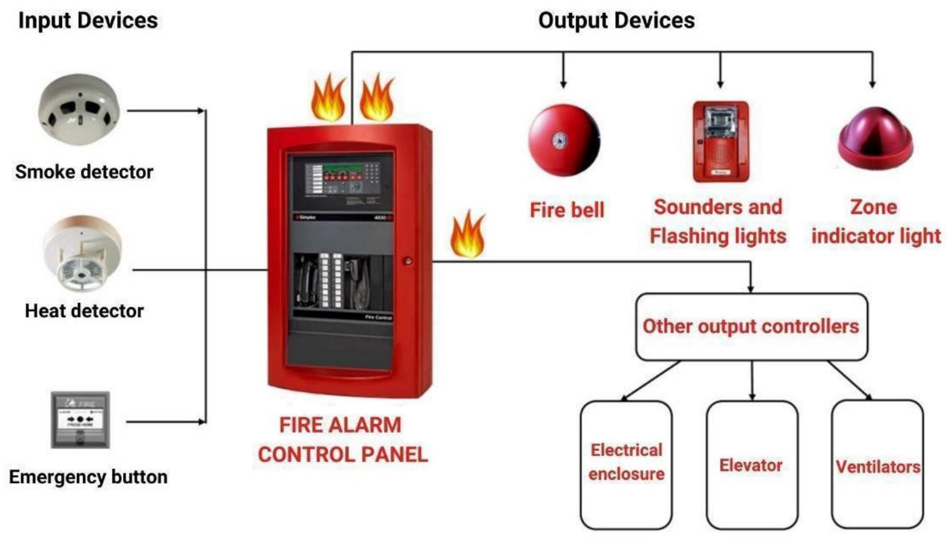

Figure 4.7. Fire alarm control panel.

These systems can be installed with different extinguishing agents such as gaseous, watery, powdery and foamy. The critical factor here is to choose the extinguisher depending on the substance and the type of fire that may occur. In some cases, the nature of the material to be extinguished (valuable documents, important digital archives, etc.) also becomes important. Considering all these, the system containing the most suitable extinguishing agent is designed [15].

The "most well-known" systems among automatic extinguishing systems are " Sprinkler " systems. In this system, water taken from an independent water source (water tank, etc.) is sent to the lines via a pump.

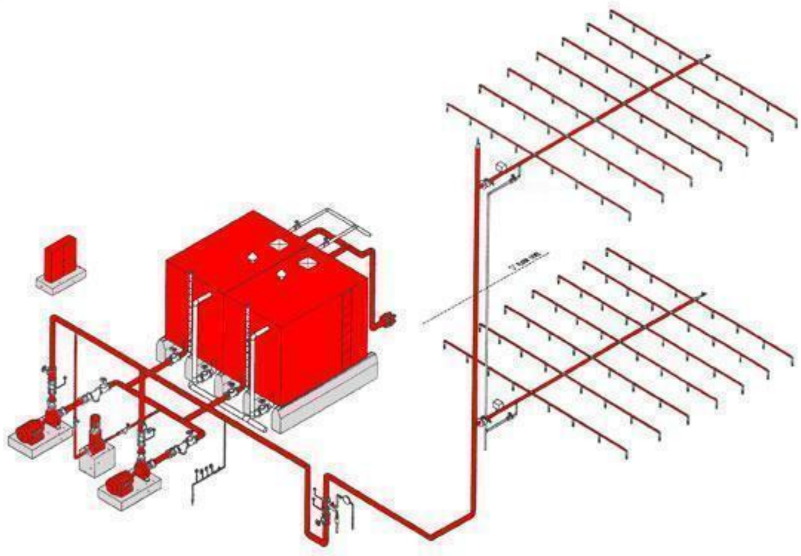

Figure 4.8. Sprinkler system.

The sprinkler fire extinguishing system is a highly effective and widely used fire protection method designed to detect, control, and suppress fires in various environments. Here is some information about sprinkler fire extinguishing systems. Sprinkler systems consist of a network of pipes and sprinkler heads installed in buildings or facilities. These systems are designed to automatically release water when a fire is detected.

Sprinkler heads are individually activated by heat. Each sprinkler head has a heat-sensitive element, typically a glass bulb filled with a heat-sensitive liquid or a fusible link. When the ambient temperature near a sprinkler head reaches a certain threshold, the heat-sensitive element breaks off, allowing water to flow from that specific sprinkler head.

4.1.7. Development of Evacuation Plan

Wherever living things exist, it is vital to quickly reach safe areas against possible disasters. There are guidelines and directives prepared by local fire departments and disaster units for the development and implementation of evacuation plans. It is essential to learn these and put them into practice. In these processes, it is equally important to obtain the approval of such official units and to support them with drills and exercises to be carried out under the supervision of these units [16].

While evacuation plans are being developed, the live load and potential risks of the area/place for which the plan is prepared are taken into consideration. Then desk researches and workshops are held according to the worst-case scenarios to be developed and decisions are taken to see what course of action should be followed in the worst-case scenario.

What all scenarios have in common involves the rapid removal of living things from the adverse environment. In this context, it is necessary to develop the paths and methods to be followed by living creatures, to show them on plans and sketches, and to determine new routes and assembly points, if necessary. The next stage is to establish the necessary route and assembly points. From this point on, answers to the following questions should be sought:

- Do the existing and newly established routes/roads meet the needs?
- Are the number and quality of assembly points appropriate?
- Could the designated routes/roads and assembly points be exposed to secondary risks? Do their locations comply with local regulations? Most importantly, are they safe?
- Are there individuals with disabilities? Can they access it without any help? If these people need help, who are they and are they approachable?
- Can the routes/roads ensure that the evacuation takes place within the stipulated time? Or should improvements be made? What improvements, if any, should be made?

If the answers to all these questions are met, the announcement of these plans can be started after their conformity has been checked / checked according to the provisions of the local legislations. The announcement phase includes informing the individuals in that region about the plan and, if necessary, posting it at certain strategic points. It is also necessary to hold training and seminars.

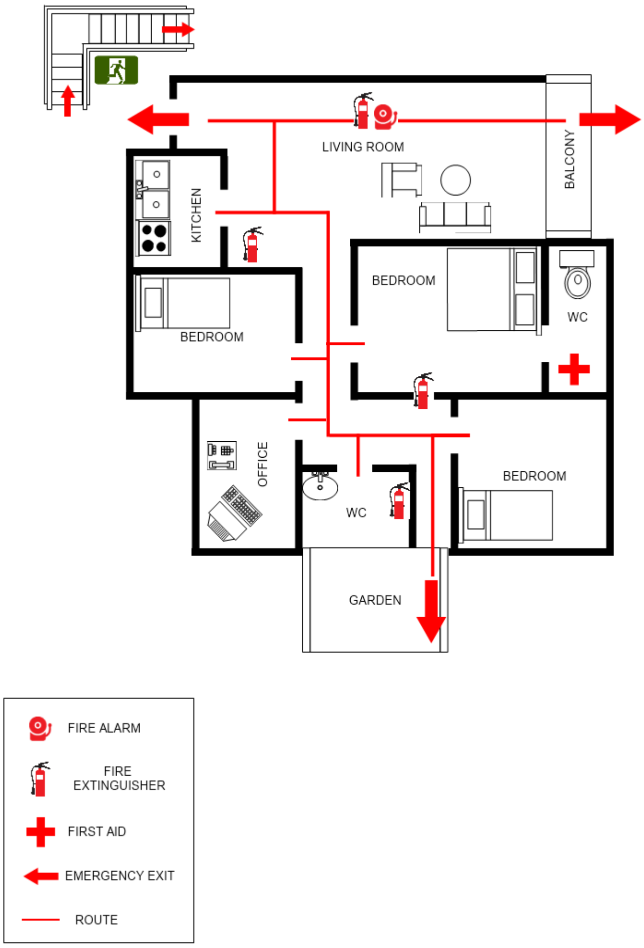

Figure 4.9. Evacuation plan (sample).

No system can be proven effective without testing and measuring it. Therefore, as mentioned before, drills and exercises are essential. By eliminating the problems that may be encountered at this point, it can now be said that there is an effective evacuation plan.

4.2. Post-Fire Related Disasters Recovery and Restoration

Post-Fire Related Disasters Recovery and Restoration refers to the process and activities that take place after a wildfire or fire-related disaster. This phase focuses on the recovery and restoration of affected areas, communities, and ecosystems, aiming to rebuild, rehabilitate and return to a state of normalcy.

Recovering from the aftermath of a fire-related disaster involves a comprehensive and often multi-faceted approach. Whether the disaster is a wildfire, structural fire, or any other type of fire-related incident, the recovery process generally involves addressing immediate concerns, assessing damage, and restoring affected areas.

After a fire, one should never go to the fire scene without carrying out operations such as extinguishing and cooling. Because until processes such as extinguishing and cooling are completed, the structure will not be completely safe, and a fire may break out again. In such a case, material and human losses may be encountered. However, if there is a person trapped in the fire scene, it may be necessary to enter the fire to carry out search and rescue work in a controlled manner after the necessary intervention techniques are applied and the risk is eliminated.

One of many duties of fire-fighters is to rescue injured people. When the first vehicle arrives at the scene, there are not enough resources to both respond to the fire and conduct search and rescue operations. It is quite possible for the fire to grow during search and rescue operations inside the building. As is known from the events, there are many examples where fire-fighters were caught unprepared during search and rescue due to the development of the fire and were negatively affected as a result. Therefore, it is necessary to extinguish the fire first and move forward in line with this strategy.

Fire-fighters provide a preliminary report about the source of the fire and a detailed report afterwards. This report should be examined in detail to avoid problems. In addition, recovery processes will need to be started after the fire. It is very important that these fire brigade reports are taken into consideration during improvements. Restoration is the work done to re-establish structure and function and to preserve and restore many features. Restoration work to be carried out at the scene after a fire must be carried out in accordance with the legislation and all precautions must be taken to reduce the risk of encountering possible fire situations.

4.2.1. Evaluation of Structural Damages

In a fire incident, one of the first conditions before intervention includes the evaluation of structural damage. Heat from combustion products has a negative effect on the main load-bearing elements of the structure. For example, in reinforced concrete products, it causes an effect called "concrete dusting" due to the separation of water in the concrete and reduces its strength. If we want to give another example, the negative effects of heat are also encountered in structures made of steel construction. Under the influence of high heat, steel carrier elements expand and cause serious damage at the connection points of these horizontally and vertically positioned elements. Likewise, in these types of structures, heat can cause steel to lose its carrier properties [17].

The situation is no different in wooden structures. Since the main bearing elements used in these structures and the horizontal elements of the floor and ceiling are made of wood, they are negatively affected by fire and therefore high temperature and lose their bearing properties. It can be said that all the reinforcements present in the structure have now lost their properties.

In such places, entering the structure poses a very high risk. Assuming that the structure may collapse at any time, intervention processes must be shaped accordingly. Depending on the type of structure, some visual and auditory symptoms are observed before collapse. In addition to observable shape changes and deformations, "cracking" in wooden structures and "creaking" of metal elements in steel structures can be given as examples of this. The factor that should not be forgotten is that it should not be assumed that these symptoms will occur in every collapse event. First of all, collapse may occur without any preliminary symptoms. In addition, it is impossible to give a period of time between noticing the preliminary symptom and the collapse event. For example, in the event of a fire, let's say some preliminary symptoms were noticed before the collapse of the structure. Let's assume that the time between the first realization of these symptoms and the occurrence of the event is noted, and these times are noted in each case visited. The average duration value determined based on these durations does not occur in the same way in any event.

There are many parameters that affect the damages caused by fire. Structural features, fire load, intended use, seasonal conditions, atmospheric events are just a few of them.

Up to this point, the possible intervention process has been evaluated and the situations that may be encountered have been summarized. So, in the light of local legislations, what work should be done after damage to a building?

People whose homes and workplaces are damaged due to natural disasters such as earthquakes, floods and fires can request damage assessments from the Ministry of Urbanization and/ or Municipalities. In case of any fire damage; Fire reports, Statements and eyewitness reports kept by the police station, Requests, Accounting records (Invoices, inventory records, trial balances, inventory records), VAT declarations, Title deeds or lease contracts, Prosecutor's Office Indictments and decisions of non-prosecution, Loss photographs etc. are required to be submitted. Considering all these possibilities, it is very important to protect the crime scene correctly, not to make any changes, not to remove evidences, not to disturb the fabric of the crime scene etc.

Post-fire structural safety is defined by local legislations and international standards such as EN 1990 (2002) and EN 1990 1-2 (2002). The fire engineer proposes a four-stage evaluation approach [18].

1. Modelling the fire scenario to determine the heat released from the fire and the resulting atmospheric temperatures within the building.

2. Modelling the heat transfer between the atmosphere and the structure.

3. Evaluation of mechanical loads under fire conditions for fire case design.

4. Determination of the response of the structure at a high temperature.

Following the developments in material science, studies are being carried out on how materials perform under high thermal temperatures. The branch of fire engineering analyzes and reports on the most economical restoration or safe demolition of the structure after a fire.

Figure 4.10. View of the interior of the fire damaged concrete structure.

If appropriate protection measures are not taken for the building material, the building can collapse in a fire [19]. According to the European Union Construction Materials Directive (89/106/EEC), the first of the six basic elements affecting the technical properties of buildings is mechanical strength, and the second is safety in case of fire [20]. This directive is the basic design criteria for protecting the structure from collapsing in case of fire in projects of large buildings. For this reason, it is very important to carry out a correct risk analysis of the scene in order to avoid any negative situations during and before the intervention.

4.2.2. Post-Fire Inspection and Control of Post-fire Installations

After a fire occurs in any building, all installations in that structure encounter negative exposures caused by heat, flame, and smoke. Fire is not the only problem that can damage installations. Extinguishing agents such as water and foam used for extinguishing purposes can also cause serious damage.

Restoring electrical energy and providing gas flows in the area where a fire occurs can cause very serious problems. Damage to such installations will prevent them from carrying out their duties competently and will invite greater negativities to occur.

The best action that can be taken is to prevent these installations from being recommissioned. After the incident is eliminated, it is of great importance to leave the control of the installations, their renewal and commissioning again, if necessary, to professionals, and if the commissioning of the installation must be under the control and supervision of an institution, following these procedures is of great importance for the safety of life and property.

Considering that there may still be active energy in installations such as electrical installations, it should not be forgotten that they should not be approached, and since the water and foam used for extinguishing are good conductors, health problems and secondary fires may occur due to energy exposure.

Reports are prepared within the scope of occupational safety studies. The inspection report prepared is valid for only 1 year. This compliance report must be renewed every year.

Structures located inside buildings are subject to occupancy and operating licenses. They are also known as fire reports or fire permits. However, they are named in regulations as certificates of conformity submitted fire departments. After a fire, they must be inspected, maintained, and checked.

4.2.3. Post-Fire Residues

Any substance that is exposed to fire and burns after a fire has the capacity to cause both physical and chemical damage. These can cause harm in many ways, from creating a cut on the skin to entering the body through inhalation of poisonous gasses [21].

All of these chemical compounds are considered potential human carcinogens; its remains have been found even in the mother herd. Great care must be taken when removing and transporting debris immediately after a fire has been extinguished. It is best to leave this job to fire-fighters who have the necessary protective equipment. However, after large-scale disasters, partial residue removal can be done in cases where the intervention process of professional units will be too long. The point to be considered is the presence of smoke that may still be emitting. Due to its structure, smoke contains some toxic chemicals. Therefore, do not intervene in places where intense smoke is observed, if there is appropriate respiratory protection equipment and there is a trained individual who can use this equipment, their support can be obtained. It should not be forgotten that some chemicals that are/may be released during and after fires can enter the body not only through breathing but also through skin absorption. As mentioned before, even in a completely extinguished fire area where no smoke escape is observed, there may be some risks. Objects held and carried may have become sharp and still hot. Fastening elements such as nails that may be present on them may pose an additional risk. In addition, some materials on the printed floors may have partially or completely lost their bearing properties as a result of heat.

Another danger that may arise from smoke is the presence of carbon particles and structures called "soot". If inhaled, these can reach the lungs and cause health problems due to their carcinogenic effects.

For these reasons, if it is necessary to enter and provide lifesaving services urgently, the following precautions can be taken, at least in places where smoke emissions are not observed and there is no risk of breathing:

- Find out the reliable protocol established by the local authority.
- Learn what type of PPE (Respirator, helmet, boots, gloves, overalls, etc.) should be worn.
- Have all employees fit tested to ensure respirators are working properly.
- Get expert advice to identify possible hazardous chemicals in the environment,
- Provide ambient ventilation,
- If you see any negative health symptoms, contact your healthcare provider.

If possible, the remains to be removed can be kept in a single spot and surrounded by a strip to prevent them from being touched and accessed by other individuals and children. It should not be forgotten that melting plastic materials, burnt rubber and sponge structures can produce materials that may be toxic after a fire or pose a risk when touched.

4.2.4. Working with Emergency Services and Other Agencies

Coordinating with emergency services and other agencies to manage volunteers after a fire is crucial for an effective response and recovery effort. By establishing effective communication channels, proper training, and collaboration with emergency services and other organizations, you can optimize volunteer support after a fire and contribute to a more coordinated and efficient response.

Volunteer units must be well aware of their rights, powers and responsibilities, as well as their areas of duty. Volunteers are more likely to support professional units or take part in situations where professional units may be insufficient in the event of a possible disaster.

At this point, the adequacy of the volunteer unit according to the incident intervened is taken into consideration. For example, when another volunteer team arrives at the scene where a volunteer team intervene, the materials and equipment they have, the number of personnel and their qualifications should be known. Of course, the suitability and number of responders at the scene and their equipment will provide great advantages.

One of the common misconceptions is that the volunteer units' duties end when professional units arrive at the scene of the incident. It should not be forgotten that well-equipped and trained volunteers are the perfect fit to assist professional units. At this point, if volunteer support is requested by professional units, it is the duty of volunteers to provide it without hesitation. For example, in a large forest fire, considering that professional units may be insufficient to intervene, the support of trained and equipped volunteers will be of great importance.

Regarding these issues, it is of great importance for all volunteer units to contact official institutions and obtain information from training and equipment standardization authorities at the scene in accordance with the national and international standards or rules.

4.2.5. Managing Volunteers and Resources

Today, many institutions benefit from volunteer services, especially against large-scale disasters such as earthquakes, floods, forest fires and landslides. Although it is of vital importance in situations where large-scale professional teams are/may remain insufficient for a certain period of time, it is very important for professional units and volunteer units to interact in order to ensure effective coordination.

Volunteers are units that carry out services in line with their individual wishes and their own initiative. It is essential that volunteer units be coordinated and designed in line with the needs and priorities determined on a local and national basis.

Volunteer units are required to provide the relevant official units with details about the number, training and qualification of members along with the equipment they have. At this point, the training and equipment that may be needed by volunteer units providing any needs such as equipment also constitutes great advantages in negative situations that may arise in the future. Theoretical and practical training to volunteer candidates on first aid, personal protective equipment and their use, fire intervention techniques, occupational safety and the tools and materials used in fires is a critical process that should be carried out.

It is essential for institutions to prepare management plans to keep volunteers active. The management plan in question should be made with the participation of all stakeholders (volunteers, professionals, other NGOs and Public Institutions, etc.). The information has been compiled under four headings regarding development stages. Implementing a successful volunteer management program [22]**:**

Stage 1 – Pre-Volunteering: At this stage, what kind of volunteer the organization needs and what kind of expectations / abilities the volunteer has are analyzed. In addition, the organizational culture and the competencies required by the volunteer position should be clearly conveyed. An incorrect match will result in unhappy organizations and volunteers.

Stage 2 – Involving the Volunteer: If the expectations and abilities of the Institution and the Volunteer match, the volunteer is recruited into the institution. The volunteer's deficiencies are analyzed and completed with training activities. After volunteers are recruited to the organization, the volunteer database (personal information, training and competencies, etc.) should be kept up to date.

Stage 3 - Retention: Retaining volunteers is as critical as engaging them. It should not be forgotten that assigning volunteers to institutions only during disasters and leaving them unattended at other times will cause a lack of motivation . For this, reward / success system, promotion mechanism, periodic motivation- enhancing events, recurring training, celebrations, etc. should be repeated at regular intervals. Special attention should be given to volunteers who are absent during this period and efforts should be made to recruit them.

Stage 4 – Review: Finally, why do volunteers continue in their positions? Why are they absent? Whether revisions to job descriptions are necessary? Whether there is a need for revision in the organizational culture? Questions such as these should be answered and plans should be revised with the participation of stakeholders when necessary.

4.2.6. Planning for Future Disasters

Disaster preparedness consists of a set of measures taken in advance by governments, organizations, communities or individuals to better respond to and cope with the immediate aftermath of a disaster, whether caused by human or natural disasters. The aim is to reduce the loss of life and livelihood [23].

Preparation for future disasters is extremely important in terms of being able to better respond to disasters after disasters caused by humans or nature. It consists of a set of measures taken in advance by governments, organizations, communities or individuals in the immediate aftermath of a disaster. The aim is to reduce loss of life and livelihood [24].

Despite the new technological and scientific discoveries and systems that humanity has developed, it is unfortunately ineffective against nature. This situation is not limited to nature. For example, when there comes a time where there are no fires, there will be no need for fire-fighters. If a building that will never collapse for any reason is designed, there will be no need for search and rescue missions to pull alive people from under the rubble. However, it should not be forgotten that we will always need emergency teams, systems and organizations until such a time comes. Not just for these teams; it is a fact that we will need volunteer organizations that are the first to react in their own regions in case of emergency.

Every disaster encountered, every event attended actually serves as an education. Thanks to the lessons learned here, we become at least one step more prepared for the next situation. All of these experiences do not make us perfect. But each time we get one step closer to perfection. So, how can we effectively use a disaster or a situation in which we are working to prepare for the future? This covers processes involving many different disciplines and studies. Emergency planning for future disasters consists of 4 stages [25].

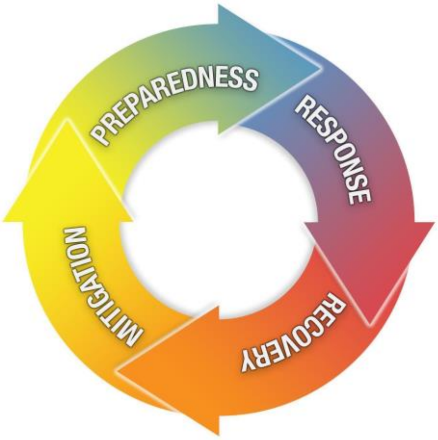

Figure 4.11. Emergency planning.

Mitigation: Activities taken to prevent future emergencies or minimize their effects. It refers to any activity that reduces the probability of emergency situations before they occur or their effects if they occur.

Preparedness: Effective preparedness for future disasters involves developing comprehensive plans, engaging the community, conducting regular drills and exercises, investing in infrastructure resilience, utilizing technology for early warning systems, fostering collaboration among different agencies, and promoting public awareness and education.

Response: Despite Mitigation and Preparedness activities, disasters can sometimes be unavoidable. In this case, preparation plans are put into action. Safely evacuating those affected by the disaster, providing transportation and accommodation, and providing health services are carried out during the response phase.

Recovery: It is the work of improving living things and their living spaces after a disaster. It includes stages such as making living spaces safe and providing psychosocial and financial support to disaster victims.

4.3. Case Studies:

4.3.1. Case Study - 1 Plant Fire

The incident at **Formosa Plastics Corporation** (see references) in Point Comfort, Texas, was a significant event that required a coordinated and effective response from multiple organizations. The incident occurred on October 6, 2005, and involved a fire and series of explosions in an olefins production unit. The incident resulted in the death of three workers and injuries to several others, as well as significant damage to the facility and surrounding community.

The response to the incident was led by the Formosa Plastics Corporation Emergency Response Team (ERT), which included 120 trained and equipped members and two fire trucks. On the day of the incident, two off-shift crews were on site for training, resulting in 90 trained emergency responders being immediately available.

Figure 4.12. Formosa Plastics Corporation.

Fire-fighters from surrounding communities also supplemented the Formosa ERT by providing and staffing a fire-fighter health monitoring station. The Formosa ERT's emergency response strategy was to prevent the fire from spreading to other units and to isolate fuel sources where possible. The ERT also allowed small fires to burn the uncontained hydrocarbons and used about seven million gallons of water to cool vessels and contain the fire. The fire burned for five days before it was finally extinguished.

The incident resulted in a site-wide evacuation of Formosa Plastics Corporation, and a shelter-in-place order was issued for the Point Comfort community. The local elementary school was also evacuated. Fourteen workers sustained minor injuries, including scrapes and smoke inhalation. The extensive damage shut down the Olefins II unit for five months.

The response to the incident was not without its challenges. The collapse of the elevated structure crimped emergency vent lines to the flare header, leading to multiple ruptures of piping and equipment and the loss of integrity of the flare header. Crimped pipes and steel, softened from fire exposure, also posed a significant risk to emergency responders.

Despite these challenges, the Formosa ERT was able to effectively manage the incident and prevent it from spreading to other units. The ERT's use of remotely actuated valves to isolate fuel sources and the use of small fires to burn uncontained hydrocarbons were effective strategies that helped contain the incident. In addition to the Formosa ERT, other organizations also played a critical role in the response to the incident. The local fire department and other emergency responders provided valuable support and resources to the Formosa ERT.

4.3.2. Case study -2 Daily Wildfire Hazard Prediction Map in Greece

The "Ημερήσιος Χάρτης Πρόβλεψης Κινδύνου Πυρκαγιάς," translated as the "Daily Wildfire Hazard Prediction Map" is a crucial tool in the realm of fire management and civil protection in Greece. This comprehensive map offers a detailed representation of the potential risks and dangers associated with wildfires on a day-to-day basis. Its importance lies in its ability to provide essential insights and inform decisions that contribute to fire prevention, preparedness, and response strategies. Let's explore this map in-depth:

Overview: The Daily Wildfire Hazard Prediction Map amalgamates a variety of data sources and predictive models to evaluate the likelihood and severity of wildfires occurring within a specific region on a given day. This visualization aids fire management agencies, emergency responders, and policy makers in making informed choices related to resource allocation, public safety, and effective disaster response.

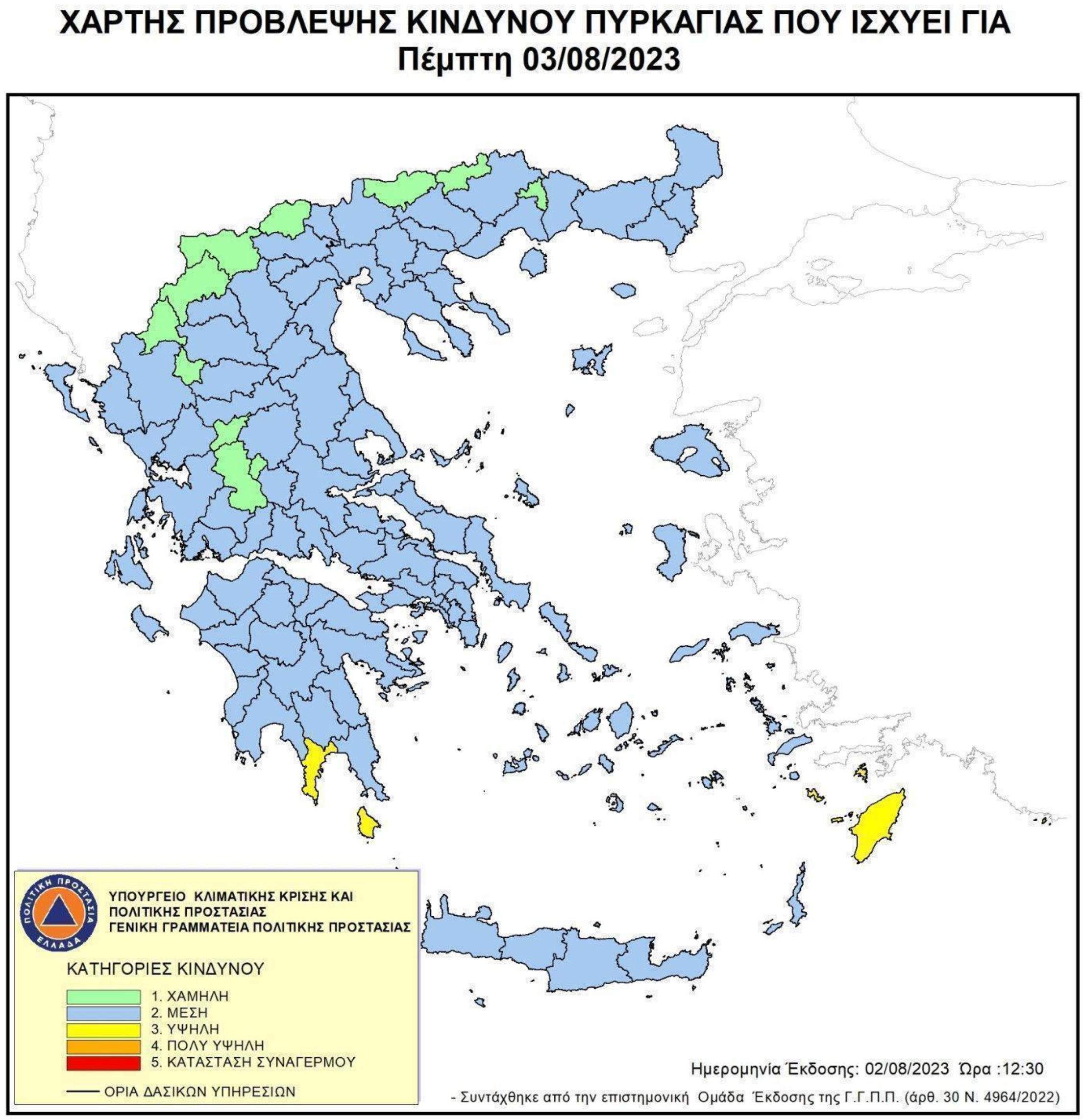

Figure 4.13. Daily wildfire hazard forecast map for Thursday, 03/08/2023. A safe day in the middle of the summer of 2023.

Components and Data Sources:

- **Weather Data:** Meteorological information such as temperature, humidity, wind speed, and direction is gathered from ground stations and satellites. These factors significantly influence the speed and intensity at which fires can spread.
- **Fuel Type and Moisture Content:** The type of vegetation and its moisture content are crucial factors determining the ease with which a fire can ignite and propagate. Dry vegetation is more susceptible to ignition than green, moist vegetation.
- **Topography:** Landscape features like slope and elevation impact fire spread patterns. Steep slopes and canyons can accelerate the movement of flames.

- **Historical Fire Data:** Past fire incidents provide valuable insights into fire-prone regions and the potential for recurrence.
- **Satellite Imagery:** Real-time satellite images aid in detecting and monitoring active fires, smoke plumes, and burnt areas, refining the accuracy of predictions.

Predictive Models: Complex computer models process collected data to generate predictions about wildfire behaviour. These models simulate fire spread under different scenarios, accounting for various factors. By analyzing historical data and current conditions, these models estimate ignition likelihood, fire direction, and propagation speed.

Mapping and Visualization: Predictive model results are translated into geospatial maps using Geographic Information Systems (GIS) technology. The map employs different colours to represent varying levels of fire danger. Areas in state of emergency are marked in red, very high-risk areas in orange, high risk is depicted with yellow while medium and low-risk zones appear in blue and green.

Application in Fire Management: The Daily Wildfire Hazard Prediction Map serves several essential purposes:

- **Mitigation Strategies:** The map informs long-term fire management strategies. Identifying high-risk areas helps prioritize fuel reduction treatments, anti-fire zones, and vegetation management, to reduce fire intensity and prevent large, catastrophic fires.
- **Resource Allocation:** Limited fire fighting resources require strategic deployment. The map guides where to allocate resources based on the predicted fire intensity, helping achieve an efficient and effective response.
- **Policy Development:** The insights from the map support policymakers in developing regulations and policies that minimize the fire risk. This might involve zoning laws, building codes, or public education campaigns.
- **Post-Fire Assessment:** After a fire is contained, the map aids in assessing its impact. Analyzing how well the predictions matched the actual fire behaviour provides valuable feedback for improving future models.

Integration of Technology: Cutting-edge technology significantly enhances the Daily Wildfire Hazard Prediction Map's accuracy and utility:

- **Remote Sensing:** Satellite sensors offer real-time data on temperature, humidity, vegetation health, and fire activity. This data refines predictive models and contributes to accuracy.
- **High-Resolution Imaging:** High-resolution aerial imagery enable accurate mapping of the landscape's features, such as vegetation density and terrain, which greatly influence fire behaviour.
- **Supercomputing and Modelling:** Powerful computing resources enable complex fire spread simulations. These models take into account interactions between weather, topography, and vegetation.
- **Data Fusion:** Advanced algorithms combine data from multiple sources to create a more comprehensive and accurate picture of fire risk. This data fusion improves the reliability of predictions.

Dynamic Nature of the Map: The Daily Wildfire Hazard Prediction Map is not a static product; it's updated regularly to reflect changing conditions. As weather patterns shift, vegetation dries out, or fire incidents occur, the map's predictions are adjusted accordingly. This real-time updating ensures that responders and the public receive the most up-to-date and relevant information.

Collaboration: The map is updated regularly to reflect changing conditions. Collaboration and communication among stakeholders enhance its effectiveness:

- **Interagency Cooperation:** Different agencies responsible for fire management, meteorology, forestry, and emergency response collaborate to provide accurate data and insights.
- **Public Outreach:** The map's findings are shared with the public through official channels, websites, and media outlets. This empowers individuals to take proactive steps to reduce fire risk around their homes and communities.

Challenges and Future Development: Several challenges exist, including uncertainty due to complex fire dynamics, climate change's influence, and data quality:

- **Uncertainty:** Fire behaviour's complexity introduces unpredictability despite technological advancements.
- **Urban-Wildland Interface:** As human settlements encroach on natural landscapes, the urban-wildland interface becomes a significant concern. Predicting how fires behave in these complex environments requires specialized modelling.

- **Climate Change:** Altered climate patterns create new challenges, necessitating adaptive predictive models.
- **Data Quality:** Incomplete or outdated data can affect prediction reliability.

Scientific advancements continue to refine wildfire prediction:

- **Improved Modelling:** Fire behaviour models incorporate more variables, enhancing accuracy.
- **Data Integration:** Seamless real-time fusion of diverse data improves predictions.
- **Early Warning Systems:** Integration of weather forecasts, fire behaviour models, and historical data yields early warnings.
- **Climate Model Coupling:** Integrating wildfire prediction with climate change projections enhances long-term risk assessment.

In conclusion, the Daily Wildfire Hazard Prediction Map is a sophisticated fusion of technology, interdisciplinary data, and predictive models. It is a critical asset in fire management, informing decisions, enhancing public safety, and shaping policies. Ongoing scientific progress promises to bolster its accuracy and role in mitigating the devastating impacts of wildfires.

4.3.3. Case study -3 House Fire

The incident took place within the borders of Kocaeli province and was selected from among the incidents intervened by fire brigade personnel, analyzed and converted into a case form.

At around 3:15 in the night, smoke was seen coming from the first floor of a 5-storey building. The incident, which was noticed by the police on night security patrols and reported the situation to the 112 emergency call centre, was ended with the intervention of the fire brigade. The teams arrived at the scene within 3 minutes and, after assessing the risks in the building, started their intervention by cutting off gas and electricity. People on the upper floors of the building were awakened and evacuated using the fire escape ladder. The door was opened by using forced entry (with a hydraulic door opening set). The fire-fighters' extinguishing team, seeing that there was heavy smoke inside, advanced with a thermal camera and entered the kitchen area on the right side of the entrance door, finding the source of the fire. The fire brigade search team conducted an evaluation to see whether there were people trapped inside. After entering the apartment, there was a straight corridor, the kitchen on the right, the living room opposite the entrance door and the bedroom on the left. The fire was seen to have started from a pot forgotten in the kitchen and was extinguished by the intervention of the extinguishing team. The search team first started checking in these areas because it was night and people were likely to be in their bedrooms. When they went into the bedroom, it was discovered that a 3-year-old child and his mother were in bed and were rescued. Necessary precautions were taken by evacuating the smoke from the building and the incident was terminated.

Important elements that started the fire:

The father was in the hospital for a surgery. The mother and child had not slept for a long time (for almost two days). Fatigue caused distraction and forgetfulness. After the mother put the chicken on the stove to cook, she took the child to his bedroom to put him to sleep, and while she was putting him to sleep, she also fell asleep. The water that had been boiling for hours evaporated, the chicken started to burn and produced intense smokes.

Elements that prevent fire from spreading:

According to the information given by the mother, he fell asleep at 1:00 AM. Considering the time the fire-fighters arrived at the scene of the incident, it was seen that it was 3:21 AM. The fire should have spread faster during this time. The reason why this did not happen was that there were no flammable or easily flammable elements near the fire pot on the stove. It was seen that the kitchen had metal cabinets, not wood, outside the traditional kitchen structure. Items such as easily flammable cloths and oil bottles were far away from the stove area. In addition, thanks to the upper and lower ventilation on the kitchen door, the smoke was evacuated and the smoke was delayed in heating the environment.

Reasons why people are not affected by smoke

The kitchen area is located on the far right of the building; the room where the child and the mother slept was on the far left, which caused the smoke to reach this area later. In addition, smoke and heated air first rose and then slowly began to fill towards the ground. When the fire-fighters reached the people, the smoke coming down from above had not yet reached half of the room. It was observed that it accumulated on the ceiling. The mother and child, who were lying on the bed, were not affected. Another reason is that the kitchen door and bedroom doors where the fire broke out were closed, making it difficult for the smoke to pass to other areas.

Presence of fire detection systems

Kitchen areas are risky areas where activities such as cooking with open fire are carried out and there are many flammable substances such as gas and oil. Care should be taken during operations in these areas and fire detection systems should be kept active. There is no detection system in the apartment where the fire broke out.

Smoke, Heat and Gas Detector: In the fire safety process, the aim is primarily to prevent the fire from starting. (Do not forget the pot on the stove). In the second process, the fire must be detected early, prevented from spreading, and must be extinguished by intervention. Detection in fires is determined by the products produced. The products of fire can be counted as heat, smoke and light. These products help us make detection. Smoke detectors that detect the smoke generated in a fire as soon as it comes out or temperature detectors that detect the temperature are used. Although it may seem more accurate to detect smoke since smoke forms early here, it would be correct to have a temperature detector as it can detect food vapours. The existence of these detection detectors would wake the mother up with the loud sound she made and events could be prevented before they escalated.

According to the information given by the mother; a smoke detector had previously been installed in the kitchen. However, she declared that she cancelled it because it was constantly beeping because of the food steam. As can be understood from the statement, it is not enough for the detector to be just installed and active. In addition, the most suitable detector for that area should be selected. Smoke detectors found in kitchens may give alarms due to the presence of intense food vapours. That's why temperature detectors are more suitable.

After the incident

The incident started with the checks of the ambulance teams, one of the emergency response teams at the scene, after the mother and child were rescued, they were transferred to the hospital and discharged after the necessary checks were carried out. In addition, the family's shelter, food and transportation needs were met by the municipality teams and they were placed in their accommodation.

Conclusion:

When the fire process was examined, it was seen that the cause of the fire was human origin. People's daily sadness and fatigue lead to such forgetfulness. Working with fire is a situation that requires attention wherever it occurs. If you are mentally and physically bad, it would be more beneficial not to do such flaming exercises. We must also make our apartment safe by activating our fire prevention and extinguishing systems. We should create an emergency plan at home and notify our family. We must do our part individually.

From an institutional perspective; the harmony and success of the teams during the intervention phase is very important. The incident was resolved with the joint and harmonious work of the police patrol who noticed the fire, the fire-fighters who extinguished it and carried out rescue activities, and the ambulance teams providing emergency treatment services. Finally, needs such as shelter and food were met by municipal teams. This process can be called the lifesaving chain. A break in one link of the chain will negatively affect the process.

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