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Regional Fire Monitoring Center - RFMC

LANDSCAPE FIRE MANAGEMENT REPORT ON THE LEVEL OF THE FEDERATION OF BOSNIA AND HERZEGOVINA, BOSNIA AND HERZEGOVINA

2025

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List of Acronyms

BAM	Bosnia and Herzegovina convertible mark
BiH	Bosnia and Herzegovina
CORINE	Coordination of Information on the Environment Land Cover
DRR	Disaster Risk Reduction
Eco-DRR	Ecosystem based Disaster Risk Reduction
FBiH	Federation of Bosnia and Herzegovina
FEA	Forestry Environmental Action
FHI	Federal Hydrometeorological Institute
FMAWF	Federal Ministry of Agriculture, Water Management and Forestry
FMP	Forest Management Plans
FWI	Fire Weather Index
GHG	Greenhouse Gas
GIS	Geographic Information System
ha	Hectare
IFS	Institute for Statistics of Federation of Bosnia and Herzegovina
JCC	Joint Coordinating Committee
JICA	Japan International Cooperation Agency
LFM	Landscape Fire Management
MODIS	Moderate Resolution Imaging Spectroradiometer
MOFTER	Ministry of Foreign Trade and Economic Relations of Bosnia and Herzegovina
NDVI	Normalized Difference Vegetation Index
NEAP	National Environmental Action Plan
NFFIS	National Forest Fire Information System
TCG	Technical
TCG	Technical Coordination Group
UNDP	United Nations Development Programme
UNFCCC	United Nation Framework Convention on Climate Change

Introduction

The countries of the Western Balkan (WB) region have gone through a period of societal, economic, and social transformation in the last three decades. It is a significant period as almost all the countries and some of the processes of change and transformation are still being developed. In this period, population migration within the countries is particularly pronounced, but emigration outside of the region is also resolutely ongoing. In addition to these processes, unfortunately, the WB region has not been spared from the impacts of climate change either, causing numerous disasters and catastrophes, such as floods, landslides, periods of extremely high temperatures, etc. All this has had a negative impact on forest fire and landscape fire occurrence in the region resulting in large-scale forest fires, material damage, and, unfortunately, also cases of injuries and loss of human life in some instances.

Insufficiently defined forest fire protection systems (prevention, preparedness, suppression, and post-fire management) and inadequate coordination between the stakeholders on the landscape level within that system persist in all WB countries. This was influenced by the ever more frequent occurrence of fires that are not limited to forests but also burn on arable and agricultural areas, pastures, abandoned agricultural areas, and peri-urban landscapes. These types of fires (landscape-level fires) require both an appropriate approach and a concept for protection against them.

This was recognized by the **Swiss Agency for Development and Cooperation (SDC)** which supported the **Landscape Fire Management in Western Balkan (LFMWB) Programme**, coordinated by Farmahem – Skopje, North Macedonia, and Helvetas Swiss Intercooperation as a backstopper. This Programme, through its activities, aims *to increase the resilience of Western Balkans forests and landscapes against uncontrolled landscape fires to the benefit of the people who depend on these landscapes for their livelihoods and socioeconomic development*.

Following a landscape and participative approach, the LFMWB Programme contributes to establishing of the Landscape Fire Management (LFM) Network in FBiH, Bosnia and Herzegovina as a science-practice-policy mechanism where different stakeholders have the opportunity to discuss the current situation and propose future guidelines regarding landscape fires. Acting as FBiH, Bosnia and Herzegovina's sounding board, the LFM Network members were actively involved in a dynamic feedback process of preparation of the first Landscape Fire Management Report for FBiH, Bosnia and Herzegovina representing a comprehensive, authentic, and well-rounded document that elaborates the current situation in the country regarding fires on a landscape level. The process for preparation of this report was coordinated by the Ministry of Agriculture, Water Management and Forestry of the Federation of Bosnia and Herzegovina with the support of the Regional Fire Monitoring Centre (RFMC) for the Southeast Europe/Caucasus Region as partners of the LFMWB Programme.

In 2024, the LFM Network members in FBiH, Bosnia and Herzegovina succeeded in developing a common understanding covering different areas of landscape fires through several workshops. All data elaborated in the report are provided and confirmed by official institutions of FBiH, Bosnia and Herzegovina, giving more legitimacy to the conclusions derived from the result analysis. This report gives an overview of land use, demography and migration, climate characteristics, climate change and nationally determined contribution, analysis of the existing fire system on landscape level, recording fires, landscape fire risk assessment, and existing initiatives. Additionally, this report includes findings of the LFM Network members in FBiH, Bosnia and Herzegovina who worked on developing a SWOT analysis elaborating the strengths, weaknesses, opportunities, and threats related to the LFM.

The last chapter of this report defines the LFM Guidelines developed by the LFM Network members, which will serve as a fundamental framework to steer future actions and strategies into landscape fire management governance in FBiH, Bosnia and Herzegovina. These Guidelines offer essential recommen-

dations, laying a solid foundation for implementing the landscape fire management approach in all of its phases, especially through stressing prevention and preparedness measures, all in one cohesive fire protection system.

The validation process of the Landscape Fire Management Report was ensured through continuous communication among the LFMWB Country Project Staff in Sarajevo seconded by FMAWF as a drafting person of the report as well as the LFM Network members of FBiH, Bosnia and Herzegovina with expert support provided by the RFMC. Through ensuring an inclusive and participatory approach, this report has become a valuable resource for promoting and advancing LFM guidelines and principles in making FBiH, Bosnia and Herzegovina's forests and landscapes fire resilient.

This report will serve as a fundamental document for planning measures and activities that will lead to the establishment of a more efficient landscape fire management system that will be able to successfully respond to the challenges resulting from socioeconomic, demographic, natural, and climate change.

Land Use

Land use is a fundamental aspect of environmental planning and management that influences both natural ecosystems and human societies. It encompasses the various ways in which land is utilized for diverse purposes, including agriculture, forestry, urban development, recreation and conservation. Understanding and managing land use is essential for several reasons. Primarily, effective land use planning promotes sustainability, ensuring that natural resources are utilized in a manner that meets current needs without compromising the ability of future generations to meet theirs. It plays a critical role in mitigating environmental issues such as deforestation, soil erosion, and loss of biodiversity, thereby promoting ecological balance. Secondly, land use has profound implications for economic development. Thoughtful land use planning can enhance productivity in agricultural sectors, create infrastructure for urban growth, and optimize resource allocation for industries. It can also improve the quality of life for communities by providing access to green spaces, recreational areas, and essential services.

Bosnia and Herzegovina is a country located in southeastern Europe, on the Balkan Peninsula. The administrative division of Bosnia and Herzegovina includes entities. Bosnia and Herzegovina consist of two entities (Federation of Bosnia and Herzegovina and Republic of Srpska) and the Brčko District of Bosnia and Herzegovina. The Federation of Bosnia and Herzegovina is further divided into 10 cantons, each with its own government and legislative authority. The Republic of Srpska is administratively divided into municipalities. The Brčko District of Bosnia and Herzegovina is a neutral self-governing administrative unit established as a special district under state-level jurisdiction. The territory of the Federation of Bosnia and Herzegovina is located in the central, western and southern parts of Bosnia and Herzegovina, covering an area of 26.087,53 km^2. The territory of the Federation entity is characterized by diverse natural landscapes including mountainous regions, forests, valleys, rivers and lakes. Land use in Federation of Bosnia and Herzegovina is influenced by its diverse natural landscapes and historical developments.

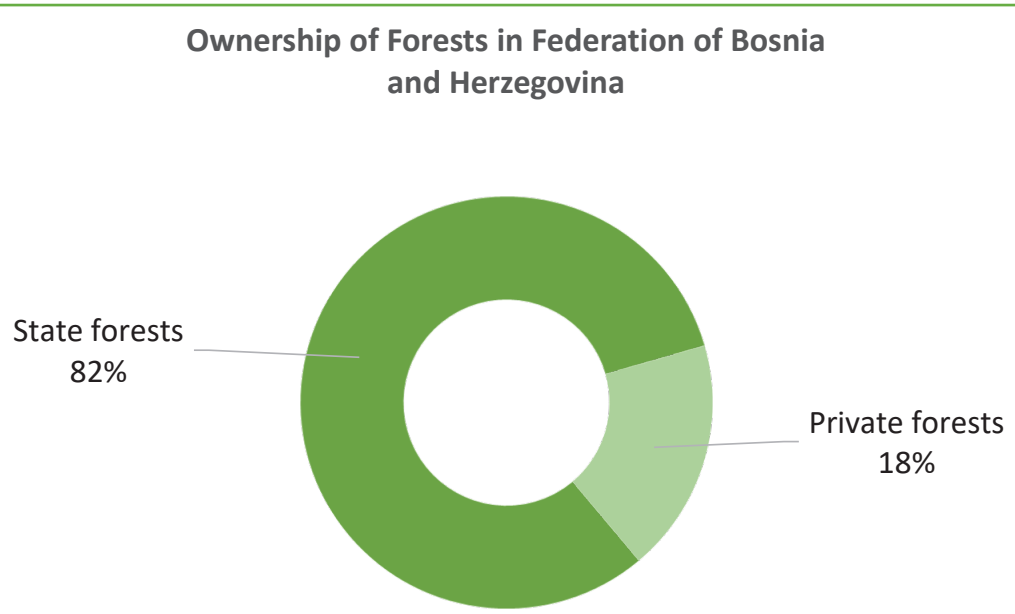
By prioritizing sustainable land use practices, FBiH, Bosnia and Herzegovina can enhance agricultural productivity, preserve natural habitats and mitigate the impacts of landscape fires. Collaborative and strategic approaches to land use will foster resilience and improve landscape fire management and, consequently, quality of life in FBiH.

As the population continues to grow and urbanize, the need for strategic land use becomes even more pressing. With competing demands for land resources, effective land use management can help minimize conflicts, maximize efficiency, and foster resilience against climate change. In conclusion, land use is not merely a planning tool but a critical element in shaping the future of our environment, economy, and society. Understanding of land use in FBiH, Bosnia and Herzegovina is crucial for developing integrated strategies that promote sustainable living and foster harmonious coexistence between humans and nature. Additionally, proper land use can lead to better landscape fire management. A proactive approach to land use not only enhances landscape fire resilience but also promotes a healthier environment for future generations.

I.1. Forests and Forest Land

Indicators in the subchapter provide a detailed breakdown of agricultural land types and their respective areas according to their usage. It provides information on the land used for agricultural production, Forestry plays a crucial role in the economy of Bosnia and Herzegovina since approximately 63 % of the territory is covered with forests and forest land (MOFTER, 2018). These forests provide not only critical habitats for diverse flora and fauna but also contribute to the overall health of the ecosystem, serve as reservoirs of carbon, and play an important role in soil and water conservation. The forestry sector in FBiH, Bosnia and Herzegovina is characterized by its unique blend of natural and managed forests, which support various economic activities, including timber production, non-timber forest products, recreation, and tourism. This multifunctionality of forests underlines their importance for local communities, where traditional practices and sustainable management approaches are recognized as essential for balancing economic development with environmental sustainability.

Forests and forest land in FBiH, Bosnia and Herzegovina cover an area of approximately 1,533,572 ha, of which 1,256,442 ha or 82 %, are in state ownership, and approximately 277,130 ha or 18 %, are in private ownership and ownership of other legal entities (FMAWF, 2022).



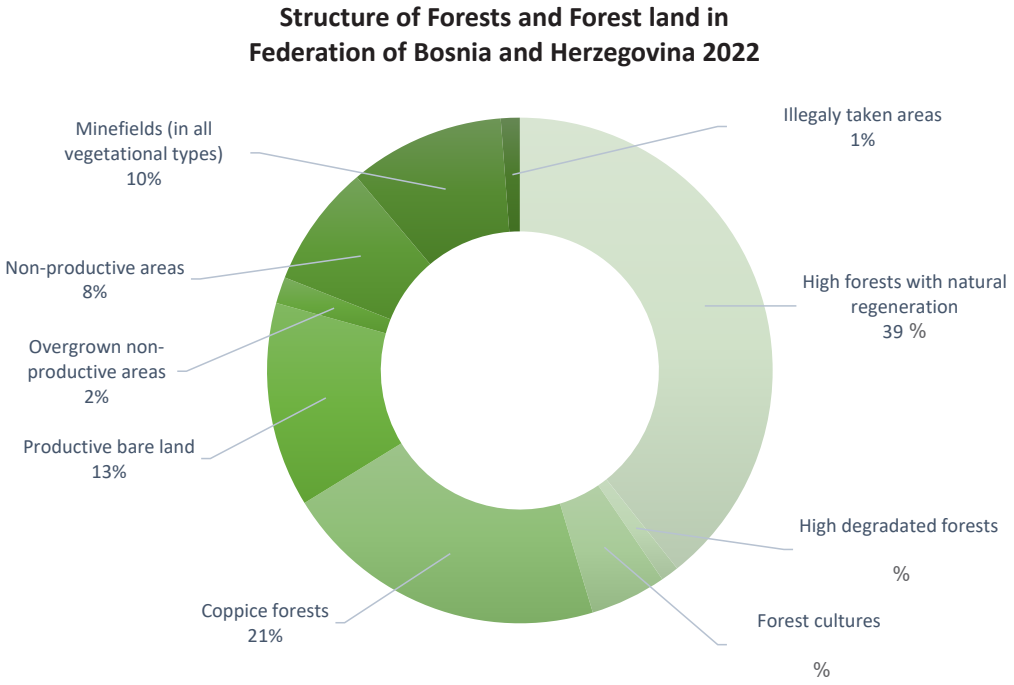
Graph 1. *Ownership of forests in FBiH, Bosnia and Herzegovina (**source of data**: FMAWF,2022)*

In addition to ownership structure, forests are also classified according to their intended use. According to this classification, there are: economic forests, protective forests and special-purpose forests. The fundamental principles of forestry in FBiH, Bosnia and Herzegovina are sustainable forest management, preservation of natural forest structure and diversity, as well as continuous improvement of stability both in economic terms and in all general-purpose functions of forests. Forests in FBiH are managed based on forest management plans that are adopted for a ten-year period. The preparation of forest management plans for state forests is the responsibility of forest users (in this case, forest management companies), and for private forests, it is the responsibility of cantonal ministries of forestry and cantonal forestry directorates. According to the data from the Federal Forestry Directorate published in the "Information on Forest Management in the FBiH, Bosnia and Herzegovina in 2021 and Forest Management Plans for 2022", the total area of forests and forest land owned by the Federation is 1,241,336.1 ha.

Table 1. *Structure of forest by quality and forest land in FBiH (**source of data**: FMAWF,2022)*

VEGETATION TYPE	AREA (ha)	%
High forests with natural regeneration	492,642.2	39.7
High degraded forests	14,550.5	1.2
Forest cultures	60,360.8	4.8
High forests – total	**567,553.5**	**45.7**
Coppice forests	261,690.1	21.1
Overgrown non-productive areas	22,047.4	1.8
Overgrown forest land – total	**851,291**	**68.6**
Productive bare land	166,598.6	13.4
Total for management	**1,017,889.6**	**82**
Non-productive areas	98,471.4	7.9
Minefields (in all vegetation types)	124,975.1	10.1
TOTAL	1,241,336.1	**100**

From the structure of forests and forest land, it is visible that there are 49,054.2 ha or about 39 % of high forests with natural regeneration. There are 14,55.8 ha or 1 % of high degraded forests. These forests require special measures in management because natural regeneration is not possible and their use results in low-quality wood assortments. Most of these forests have been formed due to poor habitats, anthropogenic influence such as illegal activities, as well as negative effects of biotic and abiotic factors. A significant share of the total forest area is also made up of artificially planted culture stands, covering 5 % of the area, or 60,360.8 ha. The share of coppice forests in the total forest area is 21 % or 261,690.1 hectares. This represents a significant area considering the state and nature of these forests, where the wood stock is rather small, and the technical structure and wood quality are quite poor. Regular silvicultural measures should be implemented in these forests to transform them into stable stands of more valuable vegetation form.

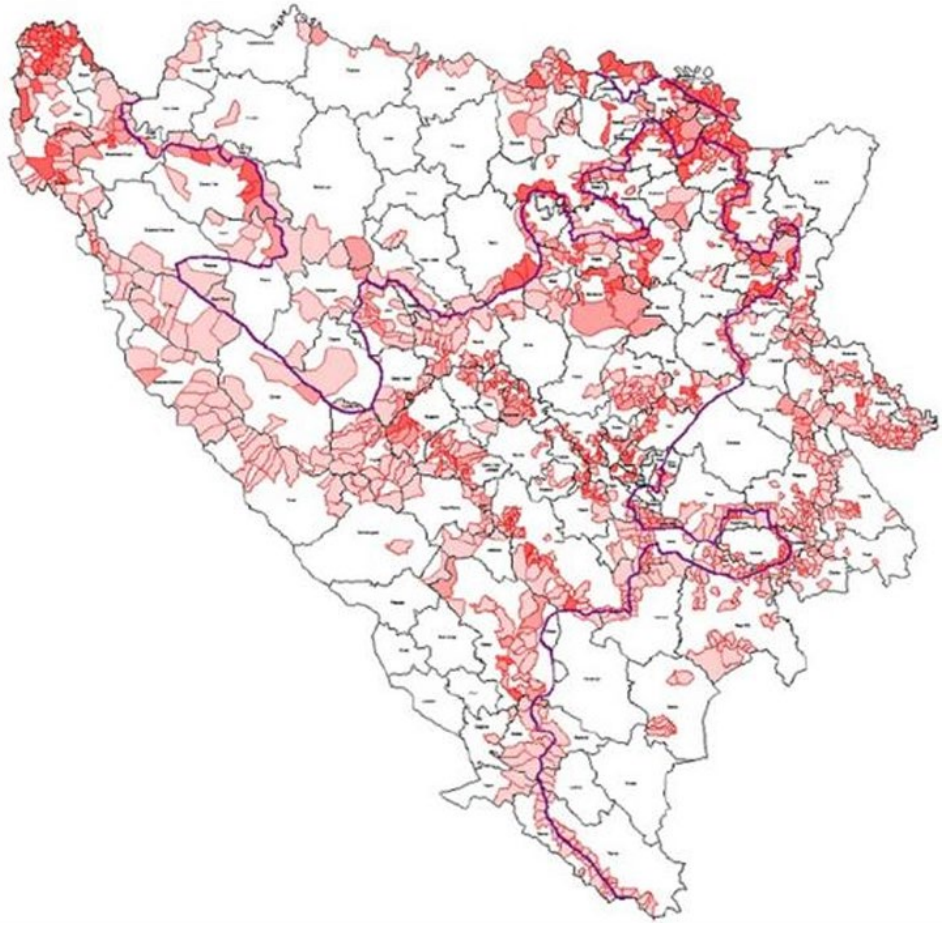


Graph 2. *Forest structure in Federation of Bosnia and Herzegovina (**source of data**: FMAWF, 2022)*

Overgrown unproductive areas cover 22,047.4 ha or 2 % of the total forest area. These include forests in river canyons and on steep slopes and cliffs that are mostly unsuitable for management. They vary in categories from tall forests to non-native stands to shrublands. There are approximately 166,598.6 ha of productive bare land suitable for afforestation, representing 13 % of the total forest area, where planting appropriate tree species in accordance with natural and ecological conditions can increase the forested area. Most of these areas have very poor and low productive habitat potentials.

A significant problem for the forestry of the FBiH, Bosnia and Herzegovina derives from the fact that approximately 124,975.1 ha, or 10 % of all categories of forests and forest lands are known or assumed to be contaminated with mines. The actual minefields is probably smaller as buffer zones are left around known mine-affected areas for safety reasons. Among these forests, a significant portion consists of highly economically valuable forests inaccessible for management for an extended period time, which are often damaged, and thus posing as potential hotspot for the development of plant diseases and many harmful insects. These areas present a security and ecological problem, leading to economic loss as their use is impeded for an extended period. Demining activities in forests and forest lands are a crucial task in the upcoming period, requiring significant financial resources (FMAWF, 2022).

Situations frequently arise when forest fires occur in minefields, complicating the firefighting process. In such cases, the primary option is to prevent the fire from spreading to nearby areas, which can pose serious risks to both human safety and the environment. If ground access is too dangerous, aerial firefighting becomes necessary. This method, while effective, requires careful planning and coordination to ensure the safety of both the firefighters and the surrounding communities.



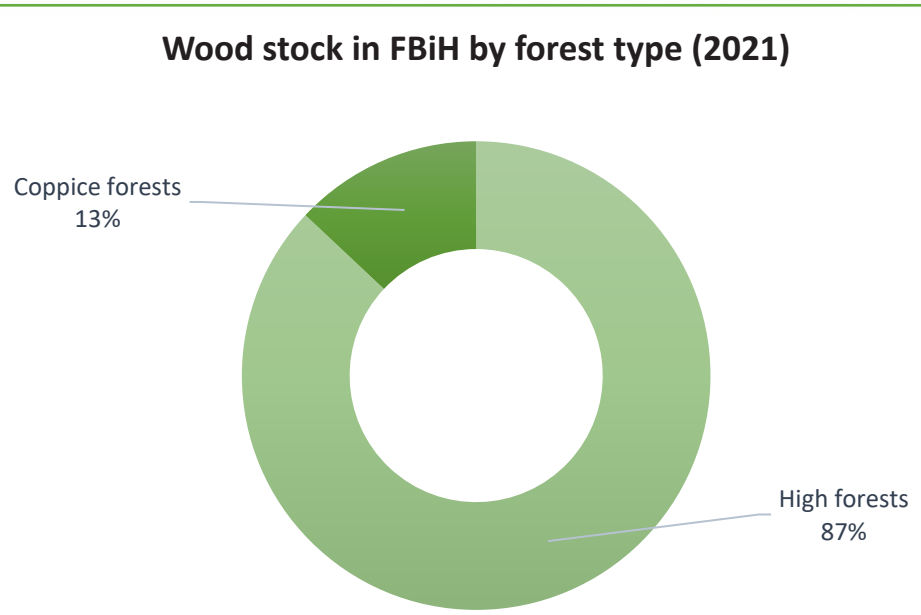
Map 1: *General assessment of the mine situation in Bosnia and Herzegovina (**source of data**: Centar za uklanjanje mina, 2012)*

The timber stock of forests together with forest areas is one of the essential elements in assessing the state of forests.

Table 2. *Wood stock in FBiH (**source of data**: FMAWF, 2022)*

VEGETATION TYPE	CONIFEROUS m^3	BROADLEAF m^3	TOTAL m^3	m^3/ha	%
All high forests	77,161,810	82,007,869	159,169,679	280.4	86.9
Coppice forests	0	23,835,788	23,835,788	91.1	13.1
TOTAL	**77,161,810**	**105,843,657**	**183,005,467**	**215.0**	**100**

From the data shown in the table, the total wood stock of all state-owned forests in the FBiH, Bosnia and Herzegovina is 183,005,467 m^3. The wood stock of conifers amounts to 77,161,810 m^3, or 42 %, while for broadleaves, it is 105,843,657 m^3, or 58 % of the total stock. The stock of broadleaves is slightly higher than conifers, which is a realistic indicator relative to the areas where they are located. The average wood stock of all high forests combined is 280.4 m^3/ha, and for coppice forests, it is 91.1 m^3/ha. The average stock for all forests combined is 215.0 m^3/ha. In the overall stock structure, high forests represent 86.9 %, while coppice forests represent 13.1 %. This composition is influenced by the habitat conditions and the way they are utilized (Graph 3).



Graph 3. *Wood stock in FBiH, Bosnia and Herzegovina by forest type in 2021 (**source of data**: FMAWF, 2022)*

Having in mind all the above-mentioned information, we can conclude that the forests and forest land in FBiH, Bosnia and Herzegovina are invaluable assets that contribute to the country's ecological balance and economic stability. These areas not only support biodiversity and natural habitats but also provide essential resources for local communities and industries. Preventive actions for landscape fires in FBiH, Bosnia and Herzegovina are essential for safeguarding the forests and forest lands' rich natural resources, services and biodiversity. These actions, such as public awareness campaigns, proper land management, and the establishment of fuel/firebreaks and other LFM measures, reduce the likelihood of landscape fires. Proactive measures help protect local communities, infrastructure, and wildlife from the negative impacts of landscape fires. Investing in prevention and preparedness measures, especially forestry companies in FBiH, Bosnia and Herzegovina can enhance the landscape's resilience against climate change and preserve its forests from landscape fires. Forestry sector in FBiH, Bosnia and Herzegovina also provides significant employment opportunities, supporting the livelihoods of many rural communities that rely on forestry-related activities. Many local communities in FBiH, Bosnia and Herzegovina depend on the forestry sector, and therefore, it is important to implement landscape fire management practices in order to better prevent landscape fires in these areas.

I.2. Agricultural Land

Agriculture plays a crucial role in the economy of FBiH, Bosnia and Herzegovina, contributing to employment and food security. It provides livelihoods for many rural communities and helps sustain local food production. Agriculture in FBiH, Bosnia and Herzegovina also supports the preservation of traditional farming practices and biodiversity, making it an essential sector for the region's sustainable development. The abandonment of agricultural lands in FBiH, Bosnia and Herzegovina poses a major challenge, leading to land degradation and loss of traditional farming knowledge. This trend also results in decreased food self-sufficiency and increased reliance on imported goods. Addressing the issue of abandoned agricultural lands is essential to revitalize rural areas, preserve the landscape, and ensure sustainable agricultural practices in FBiH, Bosnia and Herzegovina.

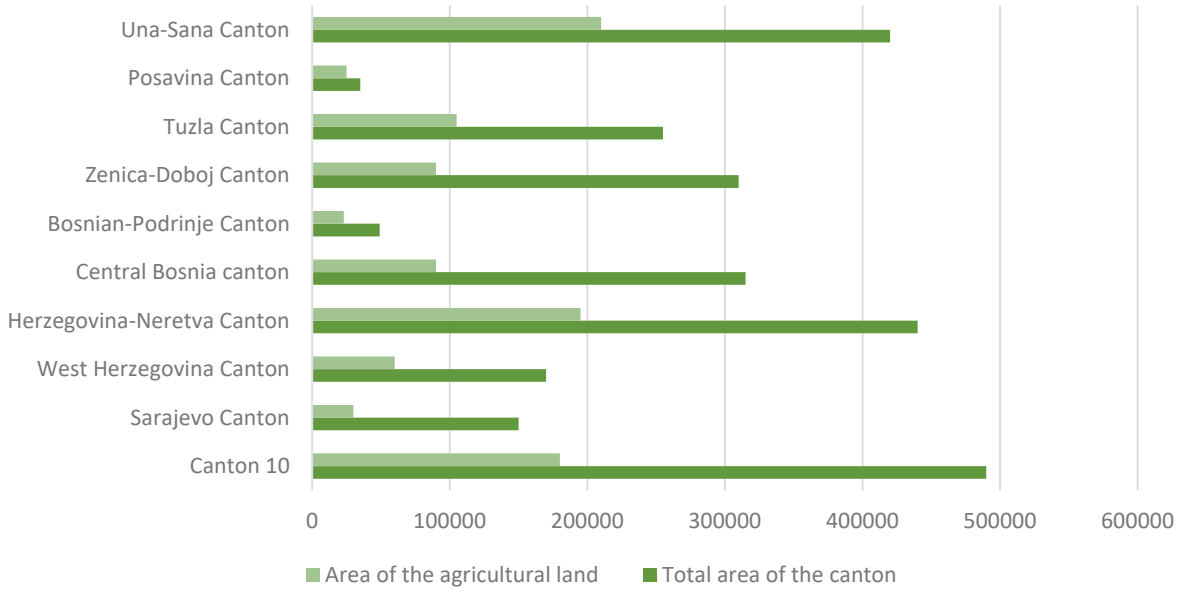
Bosnia and Herzegovina is predominantly a hilly-mountainous country, with this region covering around 66 % of its territory. Only 5 % belong to the flat region, and 29 % to the karstic-Herzegovina area. The flat

areas are mainly located in the northern part; karst areas are mostly in the northwest and southeast, and hilly-mountainous regions in the central part of Bosnia and Herzegovina are mostly covered with forests. In the territory of the FBiH, Bosnia and Herzegovina, there are hardly any flat areas. Specifically, it is estimated that 89.1 % of the Federation of Bosnia and Herzegovina's territory is located in the hilly-mountainous region, limiting the agricultural production possibilities and emphasizing the importance of rational land use (Strategy for the management of agricultural land, 2011).

Table 3. *Structure of agricultural land in Bosnia and Herzegovina (**source of data**: NEAP, 2002)*

STRUCTURE (ha)	BOSNIA AND HERZEGOVINA	FBiH	RS
Agricultural land	2,557,415	1,258,796	1,298,590
Arable land and gardens	1,179,661	508,062	671,599
Crops	657,908	41,360	616,548
Orchards	95,753	41,395	54,358
Vineyards	6,000	5,307	693
Meadows	485.213	248,291	236,922
Pastures	861,177	502,443	358,734

According to the data from "Strategy for the management of agricultural land, 2011," below graph shows the relationship of agricultural land area to the total area of the canton.



Graph 4. *Area of the agricultural land and total area of the cantons (**source of data**: Strategy for the management of agricultural land, 2011)*

From the above graph, it is evident that the largest share of agricultural land in the total area of the canton is in Posavina (75.68 %), followed by Una-Sana (52.26 %), West Herzegovina (47.91 %), Herzegovina-Neretva (45,68 %), Bosnian-Podrinje (44.37 %), Tuzla (42.91 %), West Bosnia (37.61 %), Zenica-Doboj (37.14 %), Central Bosnia (27.01 %), and Sarajevo Canton (18.84 %).

The largest share of arable land in the total agricultural land is in Posavina (97.22 %), Tuzla (90.27 %), and Zenica-Doboj Canton (82.62 %) while the smallest is in the territory of Herzegovina-Neretva (30.6 %), Canton 10 (39.29 %), and West Herzegovina Canton (53.24 %). In the structure of agricultural land, the largest share is occupied by arable land and gardens in Posavina, Tuzla, Una-Sana, Zenica-Doboj, and Central Bosnia Canton, while in West Bosnia, Herzegovina-Neretva, West Herzegovina, and Sarajevo Canton, pastures dominate the structure of agricultural land. In Bosnian-Podrinje Canton, meadows have the most significant participation in the total agricultural land.

Table 4. *Agricultural land by type of cultivation over last 5 years (**source**: IFS)*

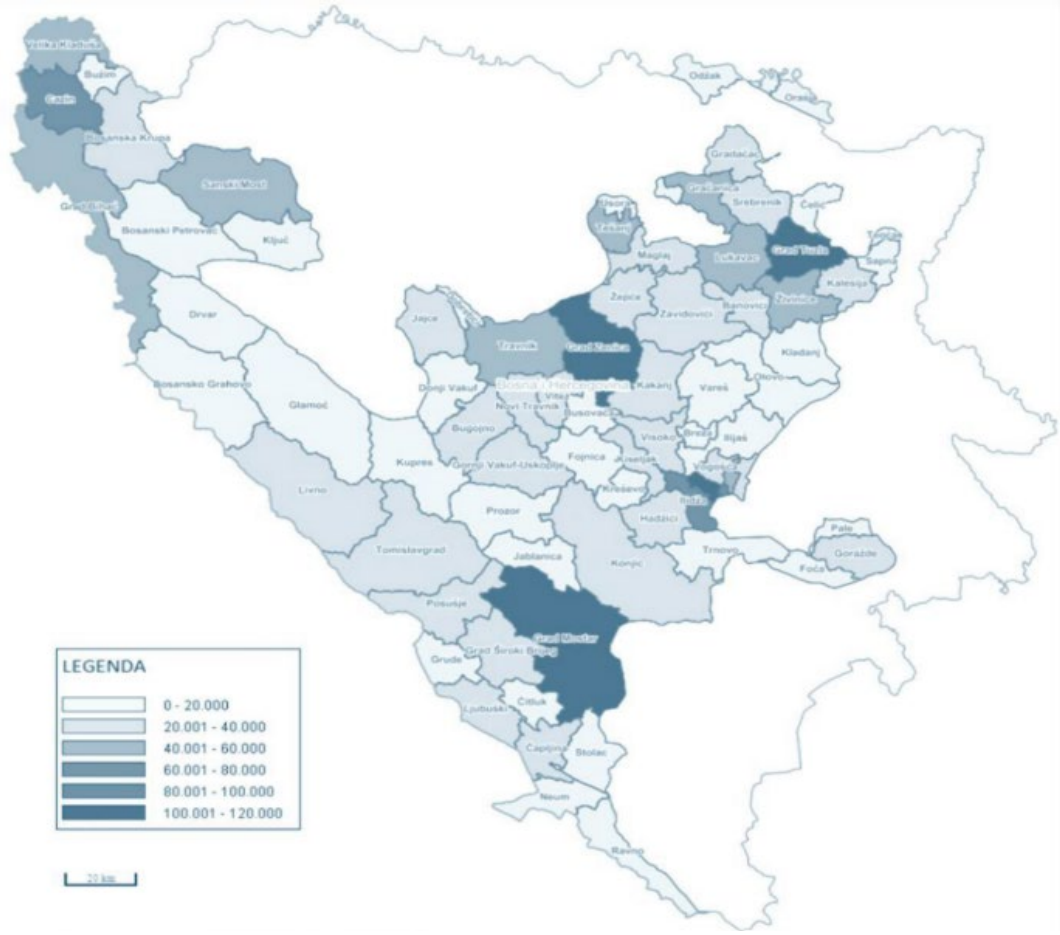
YEAR	TOTAL	CULTIVABLE LAND - TOTAL	ARABLE LAND AND GARDENS	ORCHARDS	VINEYARDS	MEADOWS	PASTURES	SWAMP AND POND
2018	1,179,000	719,000	395,000	45,000	4,000	274,000	458,000	2,000
2019	1,183,000	731,000	405,000	45,000	4,000	277,000	450,000	2,000
2020	1,175,000	721,000	400,000	45,000	4,000	272,000	452,000	2,000
2021	1,166,000	720,000	399,000	45,000	4,000	272,000	444,000	2,000
2022	1,168,000	717,000	399,000	45,000	4,000	269,000	449,000	2,000

Land use changes and losses of agricultural land are resulting from sudden urbanization, industrialization and changes to commercial developments involving the introduction of new technologies (NEAP, 2002).

The data on the use of agricultural land in the last 5 years (Table 4.) shows a decrease in agricultural areas, primarily due to migrations, both to other countries and migrations from rural to urban areas. Abandonment of agricultural areas increases the risk of landscape fires because the areas that were previously cultivated are now overgrown with vegetation. Agricultural areas that are still being cultivated are continuously at risk from the activities of local people related to the burning of ground vegetation during the spring and summer, which leads to uncontrolled fires that, in many cases, spread to the nearby forests. To ensure the resilience of the landscape in the upcoming period, education of local population about the dangers of landscape fires will be necessary, as well as alternatives they can use for better management of agricultural land. As mentioned in the "Strategy for the management of agricultural land, 2011", agricultural land in FBiH, Bosnia and Herzegovina is a fundamental strategic issue for the survival of the people in the FBiH, Bosnia and Herzegovina and should be strictly protected from urbanization and irresponsible land management. That also means that implementing landscape fire management practices can help enhance the resilience of agricultural land against landscape fires. The importance of agriculture and agricultural land in landscape fire protection extends to its synergy with the forestry sector overseen by the Federal Ministry of Agriculture, Water Management and Forestry. The Ministry's efforts to develop integral forest protection programmes and fire management plans highlight the interconnection of these domains. Agricultural activities, when aligned with sustainable resource management, enhance soil moisture retention and support strategic placement of cultivated zones that can interrupt fire pathways. This is particularly crucial in regions where rising temperatures and prolonged droughts have heightened landscape fire risks, especially in mountainous areas rich with different types of forests. In conclusion, agriculture in FBiH, Bosnia and Herzegovina transcends its traditional role as a source of sustenance and income, emerging as a linchpin in the region's defence against landscape fires. By integrating sustainable farming practices with broader environmental strategies, including strategy for adaptive landscape fire management, agriculture fortifies FBiH, Bosnia and Herzegovina's capacity to withstand the growing threat of landscape fires, protecting the well-being of its people. As climate change continues to reshape the region's ecological and economic realities, the strategic importance of agriculture in landscape fire protection will only deepen, making it an indispensable ally in building a resilient and sustainable future for FBiH, Bosnia and Herzegovina.

II Demographics

This chapter provides a comprehensive analysis of how the population has changed during the last decade. Understanding these demographic changes is crucial for developing effective landscape fire management strategies and policies. By examining factors such as population density, natality and mortality rate, and socio-economic status, this chapter seeks to highlight the vulnerabilities and resilience of different communities in the face of landscape fire threats. After the aggression in Bosnia and Herzegovina, only one census of the population has been conducted. The last census in Bosnia and Herzegovina was conducted in 2013. According to that census, there is a total of 3,531,159 inhabitants in Bosnia and Herzegovina, compared to 4,377,033 inhabitants as per the 1991 census. Over the past 15 years, there has been an increasing trend of young people migrating to the European Union countries, which significantly contributes to changing the demographic picture in Bosnia and Herzegovina. Bosnia and Herzegovina is facing a worrying trend of working-age and educated people leaving the country in search of better jobs and living conditions, which in the long run can have negative consequences for the country's development potential, especially the rural development.

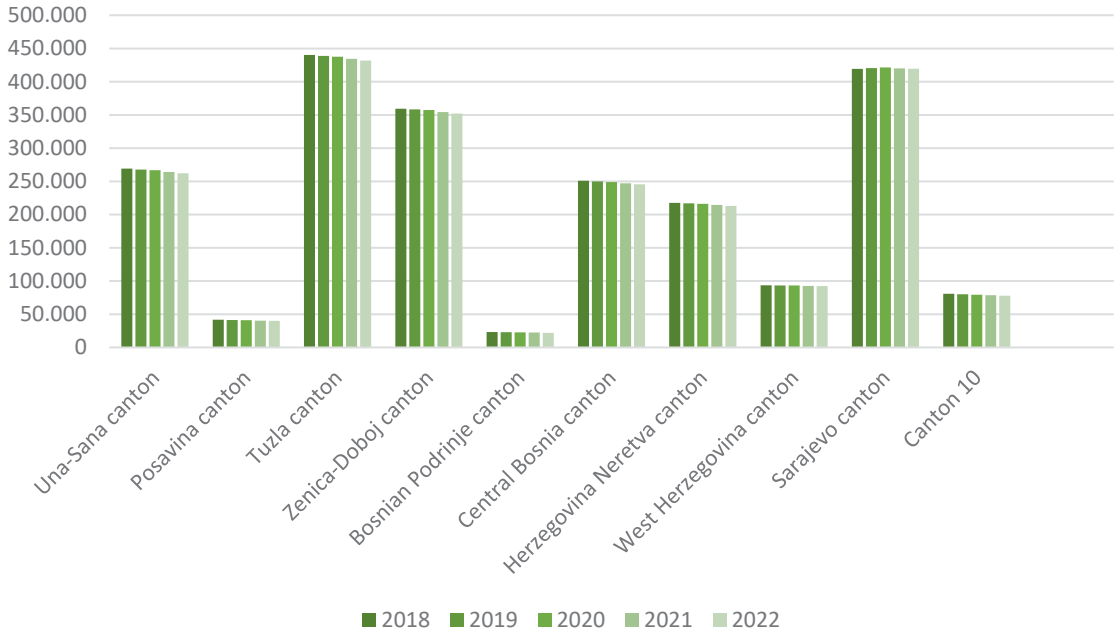


Map 2: *Total number of population in FBiH, Bosnia and Herzegovina by municipalities (**source of data**: Census of population, 2013)*

Statistical bulletin data for the period 2018-2022 shows a decrease in the population in the area of the FBiH, Bosnia and Herzegovina, indicating a concerning demographic trend that may have implications for various aspects of socio-economic development in the region. This population decline can impact labour force availability, economic growth, and public service provision.

Table 5. *Population estimated by sex, 2018-2022 (**source of data**: IFS – Statistical bulletin,2023)*

FBIH, BOSNIA AND HERZEGOVINA	2018	2019	2020	2021	2022
Total	2,196,233	2,190,098	2,184,680	2,168,602	2,156,846
Males	1,077,981	1,075,981	1,072,549	1,063,923	1,058,241
Females	1,118,252	1,115,081	1,112,131	1,104,679	1,098,605



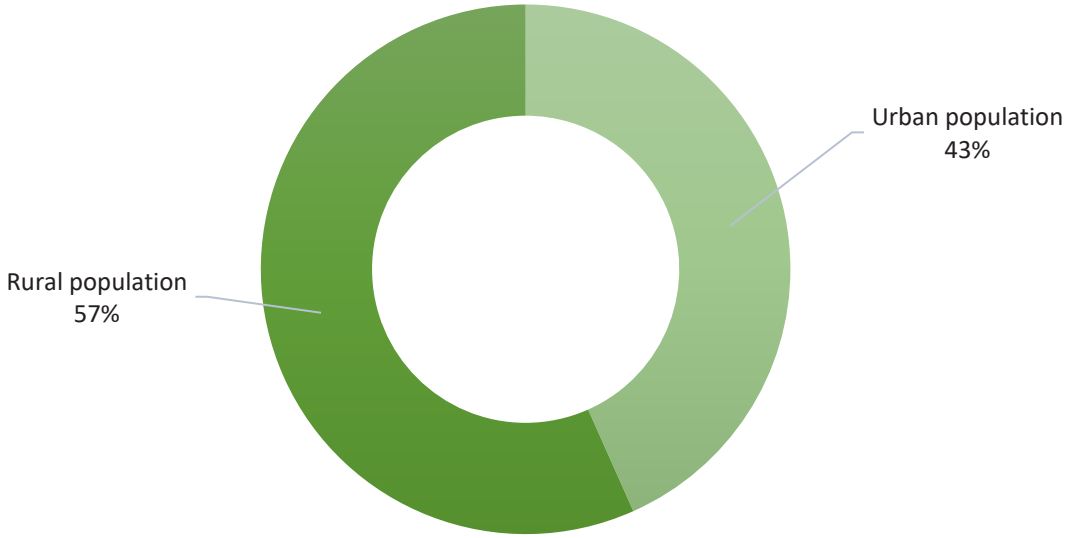
Graph 5. *Estimated population by cantons, 2018-2022 (**source of data**: IFS)*

The table below shows that there has been a decrease in the birth rate and an increase in the mortality rate from 2018 to 2022. In 2023, a negative natural population growth was recorded in eight out of ten cantons in the FBiH, Bosnia and Herzegovina. In June 2023, 1,233 babies were born in the FBiH, Bosnia and Herzegovina, while 1,506 people passed away. This means that the natural population growth is -273, with a vital index of 82. An exception to these data is the Sarajevo Canton and West Herzegovina Canton, which have a positive natural population growth.

Table 6. *Natality and mortality rate, 2018-2022 (**source of data**: IFS – Statistical bulletin, 2023)*

YEAR	NATALITY RATE	MORTALITY RATE
2018	8.6	9.8
2019	8.2	10.1
2020	7.9	11.9
2021	7.8	13.4
2022	7.7	10.8

According to the Census of population 2013, 961,617 people were living in urban areas and 1,257,603 in rural areas of the FBiH, Bosnia and Herzegovina. These data indicate a decrease in both rural and urban populations compared to the Census of population conducted in 1991 when there were 1,152,442 inhabitants in urban areas and 1,558,849 in rural areas. Out of the total 3,337 settlements in the FBiH, an increase in the number of inhabitants was recorded in 541 settlements while the remaining 2,700 settlements experienced a decrease in population. The population density of urban inhabitants is 1,024.9 individuals per square kilometre while the population density of rural inhabitants is 50.0 individuals per square kilometre in the FBiH, Bosnia and Herzegovina.



Graph 6. *Urban and rural population in FBiH, Bosnia and Herzegovina (**source of data**: Census of population 2013)*

Although official data show that the majority of people (57 %) live in rural areas (Graph 6.), the situation in practice is different, mainly due to population migration, both migration to other countries and migration from rural to urban areas, as well as migration from smaller towns to larger centres like Sarajevo, Banja Luka, Tuzla, and Zenica. These migrations significantly influence the increase in landscape fires. The rural population exodus in the FBiH, Bosnia and Herzegovina presents a complex interplay of expectations, risks and cascading effects, particularly in the context of landscape fire management. As the rural population migrates toward urban centres or abroad, driven by economic opportunities different challenges emerge. On one hand, this demographic shift holds the potential to alleviate pressure on rural landscapes, possibly allowing natural rewilding and ecological recovery in abandoned areas. On the other hand, it introduces risks, including land neglect and vegetation overgrowth, which threaten both the environment

and the remaining local population. In the FBiH, Bosnia and Herzegovina, where a significant portion of the terrain is hilly or mountainous and already susceptible to climate-driven drought, the departure of the rural population exacerbates the accumulation of fuel loads, amplifying the risk of uncontrolled landscape fires. The risks tied to this trend are multifaceted. Beyond the immediate threat of landscape fires, the exodus of people contributes to a loss of local knowledge and community resilience, critical for effective landscape fire prevention. In conclusion, a comprehensive landscape fire management strategy could play a crucial role in enhancing the resilience of rural areas and improving landscape fire management. By implementing practices such as controlled burns, vegetation management, and education of local people, rural communities can reduce the risk of uncontrolled landscape fires, which pose threats to both human lives and natural ecosystems. Moreover, these mitigation efforts foster local engagement and awareness, empowering residents to take an active role in safeguarding their environment. Ultimately, a proactive approach to fire management not only protects agricultural lands and forests but also contributes to the overall sustainability and vitality of landscapes, ensuring their ecological and economic health for future generations.

III. Climate Characteristics, Climate Change Scenarios and Nationally Determined Contributions (NDCs)

The climate on Earth has always changed and will continue to change in the future. However, while it was previously subject only to natural influences, in the last 100 years, the climate has been changing significantly faster than before, primarily due to the impact of anthropogenic factors. The climate changes that are frequently discussed today primarily refer to the negative consequences of humanity's influence on the components of the climate system. Climate change refers to alterations in the variability of climatic parameters that last for decades or longer. The atmosphere is at greatest risk from climate change, as its composition is being changed due to the uncontrolled burning of fossil fuels. Climate change is very significant in terms of the occurrence of landscape fires, as with the temperature rise, we are witnessing longer summer periods with higher temperatures each year, which have an important impact on the occurrence of landscape fires.

III.1. Climate Characteristics of Bosnia and Herzegovina (FBiH entity)

There are three dominant climate types in Bosnia and Herzegovina, conditioned by geographical position, geological substrate, relief, terrain cover by plant, and the closeness to the Adriatic Sea:

- Continental and moderate continental
- Mountain and mountain valley, and
- Mediterranean and modified Mediterranean

The continental and moderate continental climate is predominant in the northern part of Bosnia and in the valleys of the middle flows of the rivers Una, Sana, Vrbas, Bosna, and Drina. This area is bordered to the north by the river Sava, and to the south by a line that runs from Bihać, south to Sanski Most and Banja Luka, through the valleys of Usora and Spreča to Zvornik. In the annual cycle of air temperatures, there is an obvious rapid increase in temperature from January to July, followed by a gradual decrease towards December. The coldest month is January while the warmest is July. The average January temperatures are negative and range between -0.9 °C and 0.0 °C, except in the area around Bihać, where the temperature is positive (0.3 °C) due to its location and orography.

The hottest month is July, with average temperatures between 20 °C and 22 °C. Due to the large differences between the hottest and coldest months, the annual temperature fluctuations are significant (from 20 °C to 23 °C) and greater than those in mountainous areas, which is a characteristic of the continental climate. The average annual air temperatures are relatively high, ranging from 9.6 °C to 11.4 °C, with dis-

tinct seasonal variations. There are obvious temperature fluctuations in spring and autumn, so late spring and early autumn frosts can have negative consequences. The duration of the frost-free period varies significantly in this area, ranging from 174 to 206 days, which means that frost can appear during six months of the year. The only months without frost are May to September. In the northern regions, the snow cover lasts between 40 and 60 days, and in the border belt with mountainous areas, it can last up to 90 days. Its average height is between 30 and 40 cm. The average duration of sunshine is quite large and ranges from 1730 to 1920 hours. In the annual cycle, the maximum duration of sunshine is in July, averaging 8.4 hours per day for this region, and the minimum duration is in December, when the average daily duration of sunshine is 1.7 hours.

The mountain and mountain valley climate is characterized by hilly-mountainous area extends from the border of the northern region. In the south, the boundary stretches from Posušje and the southern slopes of Čabulja, Velež, and Bjelašnica to Bileća. This area is influenced by the Central European continental climate from the north and the Mediterranean climate from the south. The interplay of these climatic influences, along with the diversity of the terrain, give this area the characteristics of a moderately mountainous climate. The spatial distribution of air temperature shows significant differences from place to place, with variations of up to 11 °C over relatively small distances. The coldest month throughout the year is January, with average temperatures ranging between -0.3 °C and -6.5 °C, while the warmest is July or August, with temperatures ranging from 9.5 °C to 21.2 °C. Autumn is warmer than spring, a result of the greater thermal influence of the Adriatic Sea. Mean annual air temperatures range from 1.2 °C to 11.6 °C. Due to the mitigating thermal influence of the terrain in this area, the annual temperature fluctuations are smaller and less pronounced than in northern regions, averaging around 20 °C. The smallest differences in spatial temperature distribution occur in January, and the largest in July and August. This can be explained by the varying influence of modifiers throughout the year. The Adriatic Sea, which accumulates heat during the summer and releases it during the winter, moderates low winter temperatures, while in summer, when the sea is cooler than the land, it helps reduce high summer temperatures.

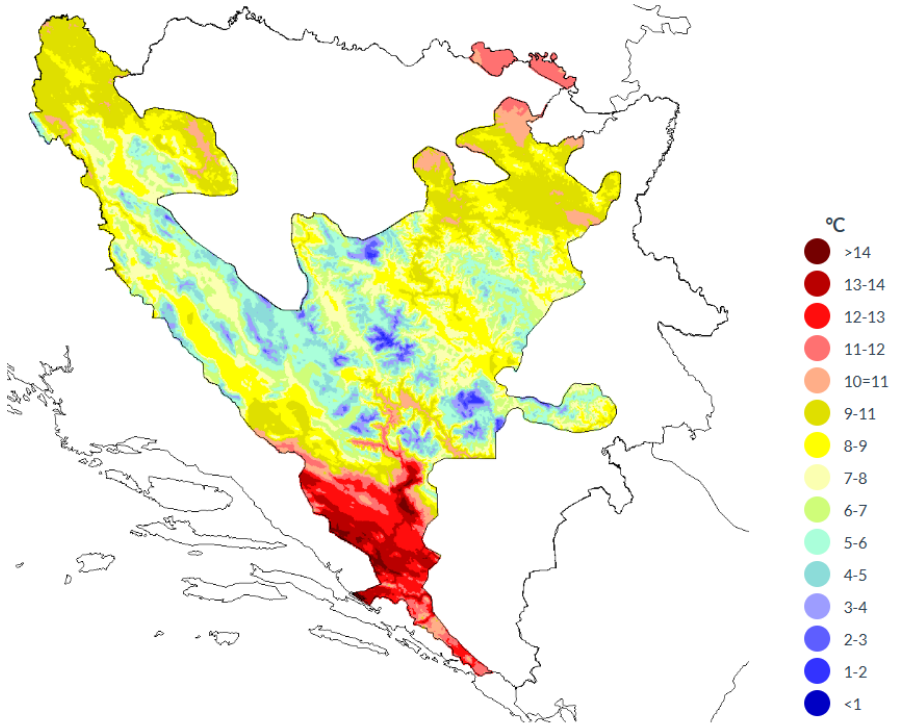
The complex terrain results in smaller changes in temperature with altitude in winter. In valleys, due to air stagnation, "pools" of cold air form, leading to the phenomenon of inversion, i.e., a rise in temperature with altitude, so places at lower altitudes often have lower temperature values. The highest average maximum temperatures occur in most of the area during August, with exceptions in some parts where they occur in July, ranging from 12.3 °C to 29 °C. The delayed extreme temperatures occurring in August are due to maritime influence. Negative average monthly temperatures are characteristic of this area for almost three months (December, January, and February).

The spatial distribution of annual precipitation is uneven due to the complex terrain. Windward sides of high mountains receive high annual precipitation amounts, ranging between 1500 and 2300 mm, while sheltered river valleys and basins receive significantly less, between 700 and 800 mm. In addition to higher rainfall amounts, high mountains also experience more days with precipitation compared to surrounding valleys and basins. The highest number of days with precipitation exceeding 1.0 mm in this area is recorded at Mount Bjelašnica with 163 days while the lowest is in Čajniče with 93 days. The region also experiences the highest intensities of daily and hourly precipitation. In the monthly distribution of precipitation, significant differences are observed. The highest amounts of rainfall are in October, November, and December while the lowest occur in the summer months of July and August, and in some areas of eastern Bosnia, in February or March.

Snowfall plays a significant role in the annual precipitation total and is a regular occurrence during the winter months in this area, contributing to 40-50 % of the total annual precipitation. The number of snow days and snow cover height increase with higher altitudes. The first snow cover typically appears in November, with the last remains melting in April. However, on high mountains, snow cover forms much earlier and lasts longer.

Mediterranean and modified-mediterranean climate. The Mediterranean (Adriatic, subtropical) climate is found in the southwest of the country, specifically in the region of Herzegovina. This area encompasses the space between the southern boundary of the hilly mountainous area and the southern boundary of

the country. Due to the immediate closeness to the Adriatic Sea and its direct influence on the climatological elements, this area has characteristics of a maritime climate. The pronounced relief, especially the arrangement and direction of relatively high mountain massifs, limit maritime influences to a narrow area and result in a very abrupt transition from maritime to continental conditions. Only in the valleys of the Neretva and Trebišnjica rivers are these influences felt deeper inland. Average annual air temperatures have relatively high values, ranging from 12.8 °C in Široki Brijeg to 15.2 °C in Neum. In the annual cycle of this climatological element, January stands out as the coldest month, and July as the warmest one. The average January air temperature is positive throughout the entire area, ranging from 3.4 °C in Široki Brijeg to 6.6 °C in Neum. The average July temperatures range from 22.6 °C to 24.7 °C. Autumn is always warmer than spring, which is a result of the strong maritime influence. The spring increase and autumn decrease in air temperatures are much slower compared to the interior of the country where they are more abrupt. The annual variation in this area is the smallest, ranging from 19.3°C to 21.4 °C. Lower temperature values and higher fluctuations are influenced by both altitude and local factors. The distribution of average maximum air temperatures shows the highest values in August, ranging from 29 °C to 31 °C. These high values result from the less moderating influence of the Adriatic Sea during the summer. The average minimum air temperatures range from -1.7 °C to 3.4 °C. Negative values occur only in areas with higher altitudes and complex relief. It is worth noting that frost is a regular occurrence in this area, but mainly in the winter period, occasionally in late autumn and early spring. The first frost occurs in the second half of November or early December, and the last frost in March (FHI, 2024).



Map 3: *Average air temperature in FBiH, Bosnia and Herzegovina (**source of data**: FHI, 2024)*

III.2. Climate Change Scenarios

Earth's climate has always changed and will continue to change in the future. However, while it was only subject to natural influences in the past, the climate has been changing in the last 100 years much faster than before, primarily due to anthropogenic factors. Climate changes largely discussed today primarily signify the negative consequences of human influence on the climate system components. By climate change, we mean changes in the variability of climate variables that last for decades or longer. The atmosphere is most vulnerable to climate change, as its composition is changing due to uncontrolled burning of fossil fuels. The increase in temperature causes the melting of the ice cap and leads to a rise in sea levels, while on land, there are shifts in temperature and rainfall patterns. There are indications that the continuation of current uncontrolled anthropogenic influences in the 21st century will have dramatic impacts on the global economy, society, and the environment.

Significant changes in climate conditions can be expected in the territory of Bosnia and Herzegovina in the future, especially in case of climate scenarios that do not involve implementation of appropriate mitigation measures for climate change. By the end of this century, according to IPCC scenarios, a possible change in the average annual temperature compared to the period 1961-1990 ranges from 2.4 to 4 °C, depending on the chosen scenario and the region. Changes in the average annual precipitation accumulation range from 0 to -30 % compared to the same reference period, with most of the territory characterized by a negative anomaly (Cupać et al., 2013). The conclusion that arises is that if global greenhouse gas emissions continue the observed trend from recent decades, the climate of Bosnia and Herzegovina could become warmer and more arid on average compared to the climatic conditions of the mid-20th century.

The 4th national report[1] presents the results of future climate projections for Bosnia and Herzegovina based on various scenarios of future greenhouse gas concentrations. The considered scenarios of future concentrations are the RCP2.6, RCP4.5, RCP6.0, and RCP8.6 scenarios defined in the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). The basis for analysing possible future climate changes consists of estimates of changes in key climate variables: average daily temperatures, minimum daily temperatures, maximum daily temperatures, and daily precipitation accumulations on an annual and seasonal level, for four seasons - December-January-February (DJF), March-April-May (MAM), June-July-August (JJA), and September-October-November (SON).

According to regional climate models, for the RCP8.5 scenario, the change in mean daily temperature for the first period, near future (2016-2035), ranges from 0.5 to 1.5 °C. For the second analysed period, mid-century (2046-2065), changes range from 1.5 to 3 °C. Finally, for the last period (2081-2100), temperature increase ranges from 2.5 to 5 °C, with a particular emphasis on the rise in maximum daily temperatures for the June-July-August (JJA) season, when the temperature increase in most parts of the country is over 5 °C. Temperature changes are more pronounced in mountainous areas, which is clearly visible in the case of changes for the last analysed period, 2081-2100. The season with the least deviation is the March-April-May (MAM) season.

[1] Četvrti nacionalni izvještaj Bosne i Hercegovine u skladu sa Okvirnom konvencijom Ujedinjenih nacija o klimatskim promjenama (Fourth National Communication of Bosnia and Herzegovina under the United Nations Framework Convention on Climate Change)

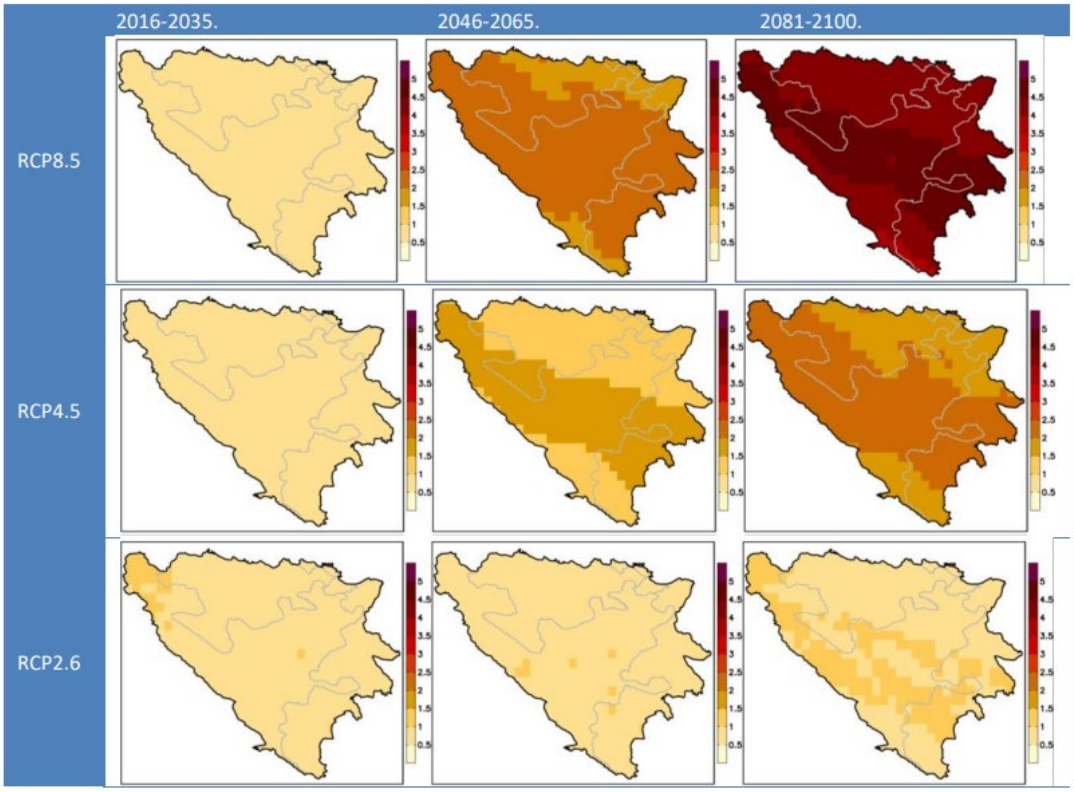


Figure 1: *Change in mean daily temperature (in °C) relative to the reference period 1986-2005 for scenarios RCP8.5, RCP4.5, and RCP2.6, annually, for three selected future periods: 2016-2035, 2046-2065, and 2081-2100*

For the RCP4.5 scenario, the change in mean daily temperature for the first period, near future, ranges from 0.5 to 1.0 °C (as well as the change in minimum and maximum daily temperatures). For the second analysed period, mid-century, 2046-2065, changes range from 1 to 2 °C while for the last period, 2081-2100, the temperature increase ranges from 1.5 to 2.5 °C. For the RCP2.6 scenario, the change in mean daily temperature ranges from 0.5 to 1.5 °C (as well as the change in minimum and maximum daily temperatures). At the annual level for the last period, 2081-2100, the end of the 21st century, the change in minimum and mean daily temperatures over most of the territory is up to 1 °C while in the case of maximum temperature, this change is up to 1.5 °C over most of the territory.

For the RCP2.6 scenario, the change in daily accumulated precipitation at the annual level ranges from -5 % to 5 % for the first two periods. For the last period, end of the century, the change is mostly positive across the territory, with an increase greater than 5 % in the southeastern regions.

In the case of scenarios RCP4.5 and RCP8.5, the precipitation change for the last analysed period 2081-2100 is negative. In the RCP8.5 scenario, the decrease is smaller and even below -10 % in some parts of the country. Also characteristic of scenarios RCP4.5 and RCP8.5 is that JJA is the season with the greatest loss of precipitation, especially pronounced in the RCP8.5 scenario, where a reduction of less than -30 % in summer precipitation is possible in the southern part of the country during the last period. This deficit in summer precipitation is clearly the main contributor to the negative change in total precipitation at the annual level. In the case of scenario RCP2.6, this negative change in JJA precipitation is not evident, although, during the last analysed period, a larger part of the territory shows a negative change.

A common characteristic of all three scenarios is that for all three analysed periods, the DJF season shows a positive change in precipitation, mainly across Bosnia and Herzegovina, with the most pronounced change observed in the last analysed period and the RCP8.5 scenario. For the remaining two seasons, the precipitation change varies and is mostly within the range of -10 to 10 %, depending on the season and region. Another consistent characteristic for the MAM season across all scenarios and periods is that

southern parts of the country tend to have negative changes, while northern parts have positive changes, indicating a higher probability of precipitation deficit in the southern regions during this season.

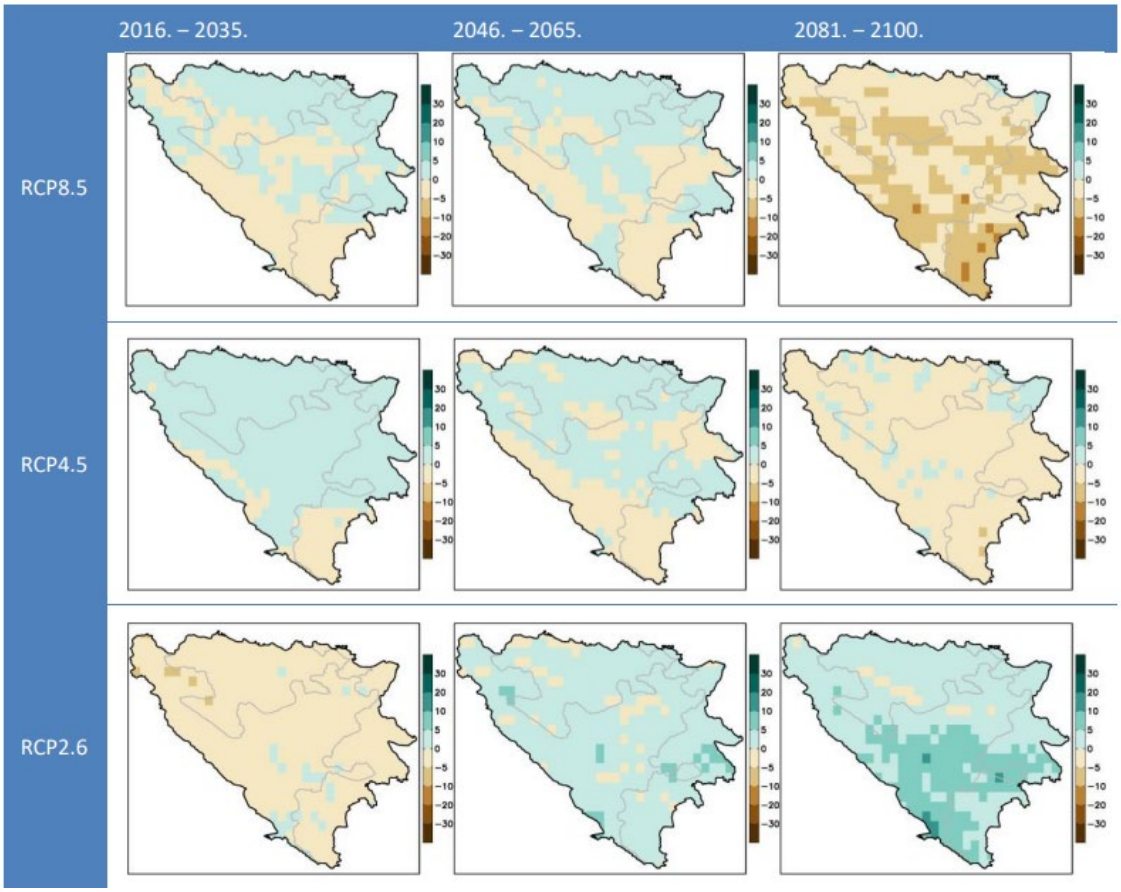


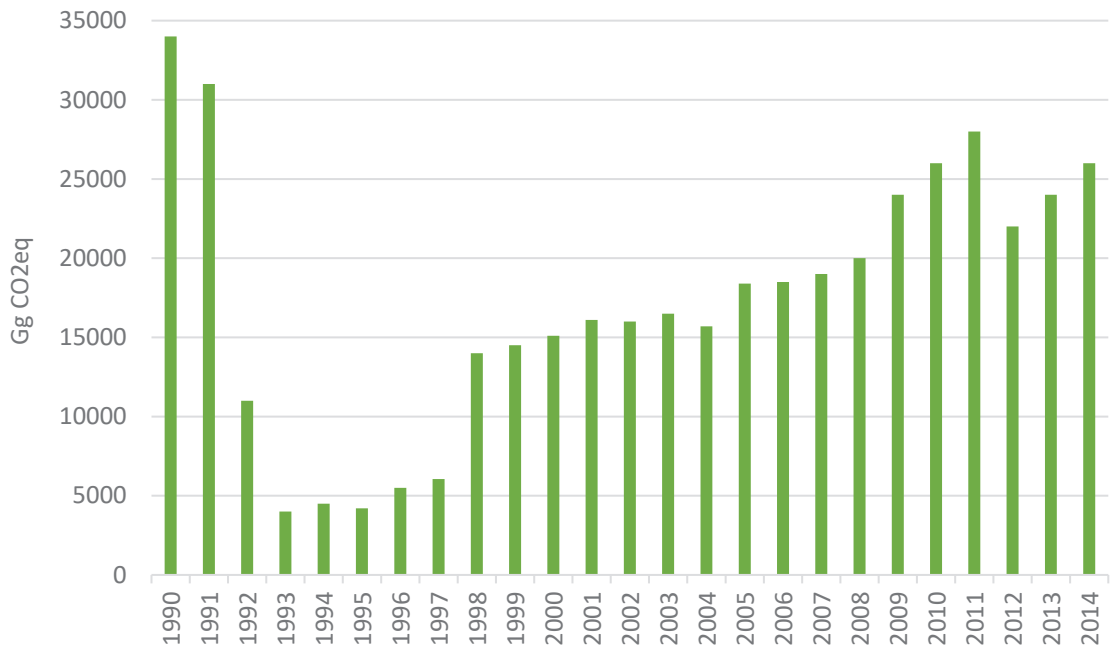
Figure 2: *Change in average daily precipitation (%) relative to the reference period 1986 – 2005 for scenarios RCP8.5, RCP4.5, and RCP2.6, on an annual basis, for three selected future periods 2016 – 2035, 2046 – 2065, and 2081 – 2100*

III.3. Nationally Determined Contributions (NDCs)

Bosnia and Herzegovina became a member of the UNFCCC on 6 December 2000. After ratifying the UNFCCC, Bosnia and Herzegovina embarked on the process of establishing appropriate political, institutional, and legal frameworks to fulfil its obligations under the Convention. The Paris Agreement on climate change entered into force on 4 November 2016, following the 21st Conference of Parties (held in 2015). By ratifying the Paris Agreement, countries confirm their activities in mitigating climate change. In October 2015, Bosnia and Herzegovina submitted its first Intended Nationally Determined Contribution (INDC) and ratified the Paris Agreement through a Decision on the Ratification of the Paris Agreement in accordance with the UNFCCC. In accordance with the provisions of the Paris Agreement, countries have the obligation to submit updated and more ambitious documents on activities to mitigate climate change every five years.

In 2021, the document "Bosnia and Herzegovina's Determined Contribution (NDC) for the period 2020-2030" was adopted, which refers to the commitment to fulfilling the Paris Climate Agreement from 2015. MOFTER is the institution responsible for coordination of climate change adaptation and mitigation in Bosnia and Herzegovina. As a member of the UNFCCC, Bosnia and Herzegovina is obligated to report on

greenhouse gas emissions. The graph below shows the trend of greenhouse gas emissions from 1990 to 2014.



Graph 7. *Annual emissions of GHG in Bosnia and Herzegovina*

The highest emissions were noted in 1990, totalling 34,040 Gg CO2eq. Emissions decreased significantly during the war period, from 1992-1995, and then began to rise again. In 2001, they amounted to 12,030 Gg CO2eq, just over a third compared to the base year. Subsequently, primarily due to emission growth in the energy sector, total emissions exceeded 20,000 Gg CO2eq (in 2008). Emissions from other sectors were more than halved in the period 1990-2001 due to a reduction of over 80 % in industrial emissions and 50 % in the agricultural sector. The highest post-war emissions were in 2011, totalling 28,107 Gg CO2eq, which is approximately 83 % of the 1990 emissions. In 2012, there was a significant decrease in emissions, attributed to a lower share of thermal power plants in electricity production. Emissions in 2014, the latest year for which an inventory has been completed, amounted to 25,740 Gg CO2eq, about 25 % less compared to 1990. Analysing emissions per capita, emissions in 2010 almost reached the levels of emissions per capita in 1990 (5.18 tons CO2eq per capita annually in 2008), but still among the lowest values in Europe. In 2014, emissions per capita were around 7.25 tons CO2eq per capita, about 17 % lower than the EU average. However, if we compare emissions relative to wealth, emissions in Bosnia and Herzegovina are nearly four times higher than in the EU. Greenhouse gas emissions per unit of GDP in Bosnia and Herzegovina amounted to 1.85 kg CO2eq per euro in 2014 while the EU average was 0.39 kg CO2eq per euro. These statistical data illustrate the economic and social situation of Bosnia and Herzegovina: caught in the poverty trap, with relatively low values of GHG emissions, but even lower gross domestic product per capita, indicating irrational resource use, primarily energy.

In Bosnia and Herzegovina, climate change leads to an increase in extreme events such as forest fires. Hot and dry summers, along with strong winds, increase the risk of landscape fires that can spread rapidly and cover large areas. In the forestry sector, in addition to the evident increase in the frequency and intensity of forest fires, there is an increased risk to rare and endangered forest communities; damages have increased due to calamities of diseases and pests; ecosystems are weakened due to drought; there is an increased risk of forest ecosystem transformation resulting in large-scale tree mortality; boundaries of certain forest types are shifting in terms of geographic latitude and altitude; it is more challenging to preserve biological and genetic diversity; and the risk of extinction of endangered and rare species is increased.

IV. Existing Landscape Fire Management System

The landscape fire management system represents the organization of all relevant institutions and governmental and non-governmental organizations that, through a joint approach, can influence the reduction of the risk of landscape fires. Due to the complexity of the administrative structure of Bosnia and Herzegovina, the system is based at the state level, delegating its responsibilities to the level of entities, cantons, and municipalities. At the state level, there is only coordination of activities, while the operational teams are on lower administrative levels: entities, cantons and municipalities. Below are shown the major stakeholders involved in the landscape fire management system. Their role is in prevention, preparedness, suppression and post-fire management. Only through the joint actions of the stakeholders listed below, it is possible to ensure the smooth operation of the LFM system. Collaboration among different stakeholders, including public agencies, NGOs, and community groups, is essential for effective fire prevention and suppression efforts.

IV.1. Major Stakeholders within the Existing System

Identified stakeholders within the landscape fire management system in the FBiH, Bosnia and Herzegovina are:

1. Ministry of Security of Bosnia and Herzegovina
2. Ministry of Defence of Bosnia and Herzegovina
3. Federal Ministry of Environment and Tourism
4. Ministry of Construction, Spatial Planning and Environmental Protection Una-Sana Canton
5. Ministry of Agriculture, Water Management and Forestry - Una-Sana Canton
6. Ministry of Economy and Spatial Planning - Posavina Canton
7. Ministry of Spatial Planning and Environmental Protection - Tuzla Canton
8. Ministry of Agriculture, Water Management and Forestry - Tuzla Canton
9. Ministry of Spatial Planning, Communications and Environmental Protection Ze-Do Canton
10. Ministry of Agriculture, Forestry and Water Management Ze-Do Canton
11. Ministry for Urbanism, Spatial Planning and Environmental Protection Bosnia Podrinje Canton
12. Ministry of Economy (Department for Agriculture and Forestry) Bosnia Podrinje Canton
13. Ministry of Spatial Planning, Construction, Environmental Protection Central Bosnia Canton
14. Ministry of Agriculture, Water Management and Forestry Central Bosnia Canton
15. Ministry of Construction, Spatial Planning Herzegovina Neretva
16. Ministry of Agriculture, Water Management and Forestry Herzegovina Neretva
17. Ministry of Spatial Planning, Construction and Environmental Protection West Herzegovina Canton
18. Ministry of Economy (Department for Agriculture, Forestry and Veterinary) West Herzegovina Canton
19. Ministry of Communal Economy, Infrastructure, Spatial Planning, Construction and Environmental Protection Sarajevo Canton

20. Ministry of Economy (Department for Agriculture, Water Management, Veterinary and Forestry Sarajevo Canton
21. Ministry of Construction, Reconstruction, Spatial Planning and Environmental Protection Canton 10
22. Ministry of Agriculture, Water Management and Forestry Canton 10
23. Federal Ministry of Agriculture, Water Management and Forestry - Federal Forestry Directorate
24. Federal Directorate for Civil Protection
25. Federal Directorate for Inspection Affairs
26. Federal Hydrometeorological Institute
27. Institute for Statistics of the Federation of Bosnia and Herzegovina
28. Federal Administration for Geodetic and Property Affairs
29. Faculty of Agriculture University of Sarajevo
30. Faculty of Forestry University of Sarajevo
31. Cantonal Forestry Directorate Una-Sana Canton
32. Cantonal Forestry Directorate Posavina Canton
33. Cantonal Forestry Directorate Tuzla Canton
34. Cantonal Forestry Directorate Zenica Doboj Canton
35. Cantonal Forestry Directorate Bosnia Podrinje Canton
36. Cantonal Forestry Directorate Central Bosnia Canton
37. Cantonal Forestry Directorate Herzegovina Neretva Canton
38. Cantonal Forestry Directorate West Herzegovina Canton
39. Cantonal Forestry Directorate Sarajevo Canton
40. Cantonal Forestry Directorate Canton 10
41. Cantonal Directorate for Civil Protection Una-Sana Canton
42. Cantonal Directorate for Civil Protection Tuzla Canton
43. Cantonal Directorate for Civil Protection Zenica Doboj Canton
44. Cantonal Directorate for Civil Protection Bosnia Podrinje Canton
45. Cantonal Directorate for Civil Protection Central Bosnia Canton
46. Cantonal Directorate for Civil Protection and firefighting Herzegovina Neretva Canton
47. Cantonal Directorate for Civil Protection West Herzegovina Canton
48. Cantonal Directorate for Civil Protection Sarajevo Canton
49. Cantonal Directorate for Civil Protection Canton 10
50. Forestry Company "Unsko-sanske šume" d.o.o. Bosanska Krupa
51. Forestry Company "TK šume"
52. Forestry Company "ŠPD-ZDK" d.o.o. Zavidovići
53. Forestry Company "Bosanskopodrinjske šume" d.o.o. Goražde
54. Forestry Company "Srednjobosanske šume" d.o.o. Donji Vakuf
55. Forestry Company "šume Hercegovačko-neretvanske"
56. Forestry Company "Zapadnohercegovačkog kantona"
57. Forestry Company "Sarajevo šume" d.o.o. Sarajevo
58. Forestry Company "Hercegbosanske šume" d.o.o. Kupres
59. National Park Una
60. Nature Park Hutovo Blato
61. Nature Park Blidinje
62. Protected Landscape Konjuh

63. Public Institution for Protected Areas in Sarajevo Canton
64. Forestry Association of FB&H
65. Forestry Environmental Action

The Ministry of Security of Bosnia and Herzegovina is a state-level ministry. Within this ministry, there is a sector for protection and rescue. The ministry is responsible for: implementing international obligations and cooperation in the implementation of civil protection, coordinating the actions of entity civil protection services in Bosnia and Herzegovina and harmonizing their plans in case of natural or other disasters affecting the territory of Bosnia and Herzegovina, and developing protection and rescue programmes and plans.

The Federal Ministry of Environment and Tourism is a ministry on entity level responsible for nature protection, sustainable development and tourism. Its main objectives include implementing policies and strategies for environmental protection, monitoring and managing natural resources, promoting sustainable tourism practices, and raising awareness about environmental issues.

Cantonal Ministries of Agriculture, Water Management and Forestry are ministries within the cantons responsible for the sectors of agriculture, forestry, and veterinary.

Cantonal Ministries of Environmental Protection are ministries within the cantons responsible for nature protection and sustainable development.

The Federal Forestry Directorate is part of the Federal Ministry of Agriculture, Water Management, and Forestry and its responsible for overseeing the forestry sector in the FBiH, Bosnia and Herzegovina. Its main tasks include forest management, protection, promoting sustainable forest management, and implementing forestry policies on the FBiH, Bosnia and Herzegovina level.

The Federal Directorate for Civil Protection performs the duties established in the provision of Article 22 of the Law on Federal Ministries and Other Bodies of the Federal Administration ("Official Gazette of the Federation of BiH", no. 58/02, 19/03, 38/05, 2/06, 8/06, 61/06, 52/09, and 48/11). In the area of protection and rescue, the Directorate carries out tasks outlined in the provision of Article 26 of the Law on the Protection and Rescue of People and Material Goods from Natural and Other Disasters ("Official Gazette of the Federation of BiH", no. 39/03, 22/06, and 43/10). In the field of fire protection and firefighting, the Administration performs duties established in the provision of Article 13 of the Law on Fire Protection and Firefighting ("Official Gazette of the Federation of BiH", no. 64/09). In the area of demining and disposal of explosive materials, the Administration performs tasks outlined in the Law on Demining in Bosnia and Herzegovina ("Official Gazette of BiH", no. 5/02), as well as in the Law on Protection and Rescue.

Cantonal Forestry Directorates in the FBiH, Bosnia and Herzegovina are responsible for managing and overseeing forestry activities within cantons.

The Federal Hydrometeorological Institute is a government body monitoring and providing weather forecasts, hydrological data, air quality, seismology and astronomy. Its main tasks include collecting and analysing meteorological data, issuing warnings for weather-related risks, and conducting research on meteorological and climatological trends. The Institute plays a crucial role in providing information to the public, stakeholders, and decision-makers to help in disaster preparedness.

The Federal Statistics Agency is a federal authority for statistical affairs in the FBiH, Bosnia and Herzegovina. The Federal Statistic Agency organizes and conducts statistical research of interest to the FBiH, Bosnia and Herzegovina in accordance with the Law on Statistics in FBiH, Bosnia and Herzegovina.

The Federal Administration for Geodetic and Property Affairs in the FBiH, Bosnia and Herzegovina is responsible for overseeing geodetic and cadastral activities at the federal level. It plays a crucial role in maintaining land records, property rights, and spatial data to ensure efficient land management and property registration processes.

Cantonal Forestry Companies are companies that manage state-owned forests in the territory of the FBiH, Bosnia and Herzegovina. The right to manage is granted based on a transfer of rights agreement

signed with the cantonal governments. Their main task is to manage forests in accordance with the Forest Management Plans (FMP), which include plans for fire protection.

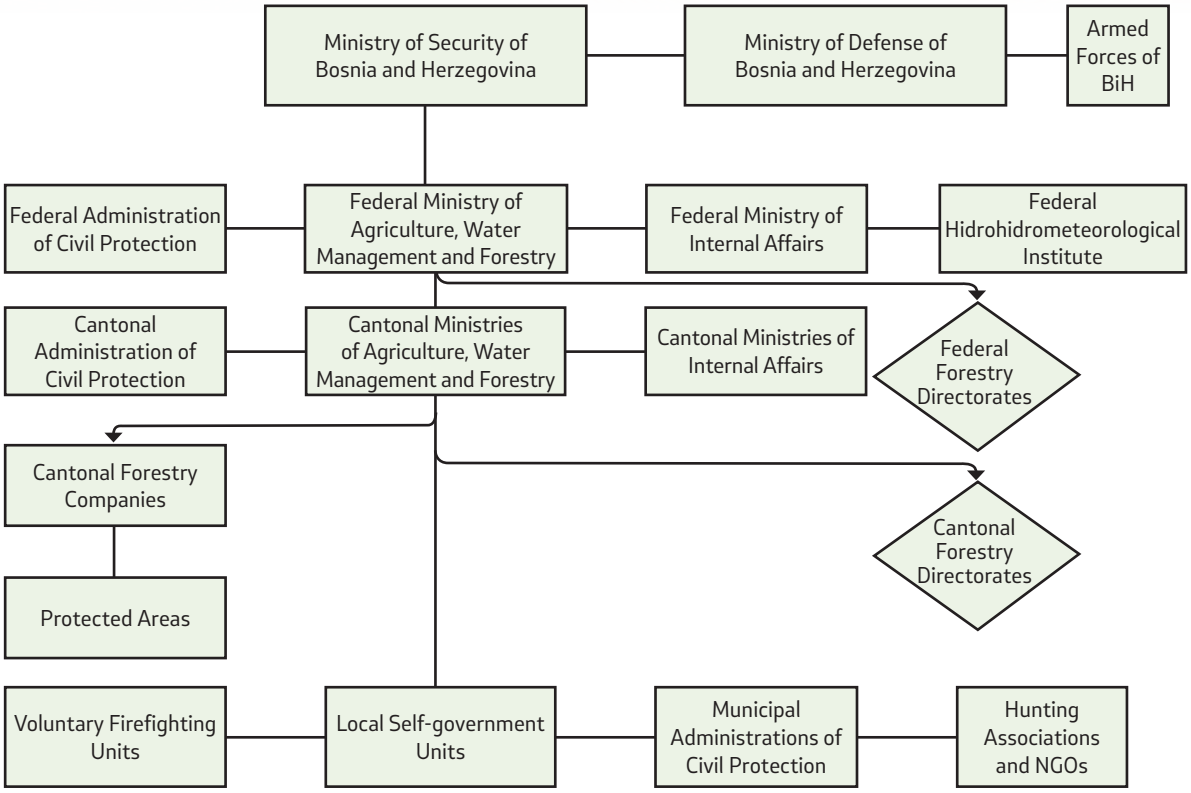
IV.2. Organizational Setup of the System

As mentioned before, the organizational setup of fire protection in Bosnia and Herzegovina involves a multi-tiered approach that includes different levels of government, from state to local level. Coordination of activities is provided by the state ministry, ensuring a unified strategy for landscape fire management. Operational responsibilities are delegated to entities, cantons, and municipalities. The organization of fire protection in the FBiH, Bosnia and Herzegovina is divided into two parts: fire protection in forests and in other open areas. The organization of fire protection in the forestry sector of the FBiH, Bosnia and Herzegovina is carried out through the cantonal forestry directorates, forest management companies, and civil protection administrations at all levels (local, cantonal and federal). Fire protection is implemented through annual Forest Fire Protection Plans which are prepared and adopted by companies that manage and oversee forests, landscapes, and protected areas, containing the following contents:

- Basic data on the forest complex,
- Assessment of forest fire vulnerability,
- Preventive measures for forest fire protection,
- Organization of forest fire protection and establishment of an operational headquarters for fire-fighting,
- Observation and information dissemination,
- Use of personnel and firefighting units, and their cooperation,
- Technical equipment and firefighting resources,
- Access roads,
- Method and location of water supply, and
- Supervision of fire protection measures. (FMAWF,2022)

If support from the air or ground is needed to extinguish a large scale landscape fire, the Federal Administration of Civil Protection will, in accordance with the Law on the Protection and Rescue of People and Material Goods from Natural and Other Disasters ("Official Gazette of the Federation of BiH", no. 39/03, 22/06, and 43/10), as well as based on the Regulation on Providing Military Assistance to Civil Authorities in Responding to Natural and Other Disasters ("Official Herald of BiH", no. 34/18), the Agreement on Cooperation between the Ministry of Defence of Bosnia and Herzegovina and the Ministry of Security of Bosnia and Herzegovina in the area of responding to natural or other disasters, number: 06-50-704-5/09 dated 29.06.2009, and the Standard Operating Procedures for Engaging the Armed Forces of Bosnia and Herzegovina in Providing Assistance to Civil Authorities in Responding to Natural or Other Disasters, number: 06-04-3-3229/10 dated 09.07.2010, request the participation of the Armed Forces of BiH in providing assistance in the protection and rescue of people and material goods from natural and other disasters in FBiH, Bosnia and Herzegovina, in accordance with the Law on Defence of Bosnia and Herzegovina. Within the Ministry of Security there is a sector for protection and rescue. The sector for protection and rescue is responsible for implementing international obligations and cooperation in the implementation of civil protection, as well as coordinating the actions of the civil protection services in Bosnia and Herzegovina and harmonizing their plans in the event of a natural or other disaster. In cooperation with the Ministry of Defence of BiH and the Armed Forces of BiH, and with the special approval of all three members of the presidency of Bosnia and Herzegovina, it is possible to use helicopters to extinguish large fires.

Below is an organizational scheme developed by stakeholders in the FBiH, Bosnia and Herzegovina which shows all parties involved in the organization of fire protection from the local to the state level.



Scheme 1. *Organizational scheme of the fire management in the FBiH, Bosnia and Herzegovina*

In practice, delays in responding to fire events happen often due to administrative complexity and the large number of decision-makers within the system. The fact that the use of helicopters to extinguish fires requires the approval of all three members of the Presidency of BiH further obstructs the quick response that is often necessary to control and extinguish fires. In the future, better cooperation among all administrative levels in Bosnia and Herzegovina will be necessary for more effective landscape fire management.

IV.3. Legislation Regulating This Field

This chapter provides an overview of the legislation related to landscape fire management in Bosnia and Herzegovina. Effective legal frameworks are essential for establishing clear guidelines and responsibilities for fire prevention, suppression, and recovery efforts. This legislation encompasses different aspects, including forestry, environmental protection and disaster response coordination. The aim of examining existing laws and regulations is to highlight their significance in fostering a proactive approach to landscape fire management, ensuring the safety of communities, and preserving the natural ecosystems of the region. Furthermore, this chapter discusses the challenges and opportunities presented by the current legal framework, clearing the way for potential improvements in landscape fire management practices.

The main legal regulations related to landscape fire management are:

The Law on Protection and Rescue of People and Material Goods from Natural or Other Disasters ("Official Gazette of the Federation of Bosnia and Herzegovina", 39/03, 22/06 and 43/10) provides a legal framework for effectively responding to emergencies and disasters. This law outlines the responsibilities of government bodies, emergency services, and other relevant stakeholders in preparing for, responding to, and recovering from disasters. It aims to ensure the safety and well-being of people and the protection of property during emergency situations such as natural disasters, accidents, or other crises.

The law sets out mechanisms for coordination, communication, resource mobilization, and cooperation among different entities to enhance the overall response and resilience to disasters in FBiH, Bosnia and Herzegovina.

The Law on Fire Protection and Firefighting ("Official Gazette of the Federation of Bosnia and Herzegovina", no. 64/09) regulates the organization and functioning of fire protection and firefighting, planning and implementation of fire protection measures, organization and functioning of firefighting and fire extinguishing (firefighting interventions), professional training and development of employees and firefighters, financing, and other important issues for the organization and functioning of fire protection and firefighting in the FBiH, Bosnia and Herzegovina.

The Law on Forests in the FBiH, Bosnia and Herzegovina was adopted in 2002 with an effective date of 30 June 2002. Following the initiative of the municipality of Konjic and by the Decision of the Constitutional Court of the FBiH, on 14 April 2009, the Law on Forests was found to have violated the municipalities right to local self-government, upon which, the Law on Forests ceased to be valid on 27 November 2009. As a transitional solution, the Government of the FBiH adopted the Regulation on Forests on 23 December 2009. By adoption of a new decision by the Constitutional Court of FBiH, the Regulation on Forests was in force until 6 December 2011, so currently, there is no law regulating the forestry sector at the level of the FBiH. Regulation on the Content of Fire Protection Plans for Forests ("Official Gazette of the Federation of Bosnia and Herzegovina", 21/04) was repealed because it was based on the 2002 Law on Forests, which prescribes technical, preventive-silvicultural, and other measures for the protection of forests from fires that must be implemented by forest management companies in the FBiH, Bosnia and Herzegovina. The aim is to reduce the danger of forest fires and early detection and reporting of forest fires as well as timely action in localizing and extinguishing forest fires. These regulations establish the obligations of forestry companies managing forests in state ownership and forest owners to take and implement measures to protect forests from fires. Special importance is given to the implementation of preventive fire protection measures concerning forest protection. In all other cantons, except for the Herzegovina-Neretva Canton, laws on forests have been adopted, as well as specific regulations based on them, which, among other things, address forest fire protection. The adoption of cantonal laws on forests limits the competencies prescribed by the Constitution of the Federation of Bosnia and Herzegovina, as various methods have been established for the management and utilization of forests, ownership issues, as well as the allocation of financial resources for the use, protection, and improvement of forests, which is not in line with constitutional provisions. Therefore, the area of forestry in the Federation of Bosnia and Herzegovina, Bosnia and Herzegovina, is regulated by the Law on Forests and the Law on Seed and Plant Material of Forest and Horticultural Tree and Shrub Species ("Official Gazette of the Federation of BiH", no. 71/05 and 8/10)."

The Law on Nature Protection ("Official Gazette of the Federation of Bosnia and Herzegovina" 66/13) regulates the conditions and methods for the restoration, protection, conservation, and sustainable development of landscapes, natural areas, plants, animals and their habitats, minerals and fossils, and other natural components within the territory of FBiH, Bosnia and Herzegovina.

The Law on Environmental Protection ("Official Gazette of the Federation of Bosnia and Herzegovina" 15/21) establishes legal frameworks and regulations for environmental protection at the federal level. It covers a wide range of areas such as air quality, water resources management, waste management, nature conservation, and environmental impact assessments. The law aims to prevent pollution, protect natural resources, promote sustainable development, and ensure compliance with international environmental standards. It also outlines the roles and responsibilities of government bodies, industry sectors, and individuals in safeguarding the environment for current and future generations.

The Law on Agricultural Land ("Official Gazette of the Federation of Bosnia and Herzegovina" 52/09) regulates various aspects related to agricultural land, including definitions, management principles, protection measures, land use, organization, records, supervision, criminal provisions, transitional arrangements as well as other important issues related to agricultural land in the territory of the FBiH, Bosnia and Herzegovina.

The Law on Seed and Plant Material of Forest and Horticultural Tree and Shrub Species ("Official Gazette of the Federation of BiH", no. 71/05) regulates the following: registration and the manner of maintaining registers, production and control of forest and horticultural seed and planting material, control of the import of reproductive material, compensation for costs, administrative supervision over the implementation of this Law, penal provisions, and other issues of significance for the implementation of a unified system for the management of seed production and nursery cultivation of forest and horticultural tree and shrub species in the Federation of Bosnia and Herzegovina, Bosnia and Herzegovina.

Cantonal Laws on Forests:

- Law on Forests of the Una-Sana Canton ("Official Gazette of the Una-Sana Canton", no. 22/12, 16/16, 12/17 and 25/17)
- Law on Forests of the Tuzla Canton ("Official Gazette of the Tuzla Canton", no. 7/17)
- Law on Forests of the Posavina Canton ("Official Gazette of the Posavina Canton", no. 9/13)
- Law on Forests of the Bosnia Podrinje Canton ("Official Gazette of the Bosnia Podrinje Canton, no. 04/13, 5/13, 13/19, 14/19)
- Law on Forests of the Sarajevo Canton ("Official Gazette of the Sarajevo Canton" no. 05/13)
- Law on Forests of the West Herzegovina Canton ("Official Gazette of the West Herzegovina Canton no. 8/13 and 11/17)
- Law on Forests of the Central Bosnia Canton ("Official Gazette of the Central Bosnia Canton" no. 5/14, 12/15, 8/16, 7/18 and 14/20)
- Law on Forest of the Zenica Doboj Canton ("Official Gazette of the Zenica Doboj Canton" no. 8/13, 01/15)
- Law on Forests of the Canton 10 ("Official Gazette of the Canton 10" no. 04/14)

Cantonal Laws on Forests are responsible for forestry planning, forest management, trade of timber and non-wood forest products, protection of forests and forests land and protection of endangered species as well as improvements in sustainable forest management, including professional and financial assistance to forest owners and users.

In addition to the federal Law on Fire Protection and Firefighting, there are also cantonal laws in certain cantons regulating the field of fire protection and firefighting:

- Law on Fire Protection and Firefighting of the Una-Sana Canton ("Official Gazette of the Una-Sana Canton" no.04/13)
- The Law on Fire Protection and Firefighting of the Posavina Canton ("Official Gazette of the Posavina Canton", no. 12/19)
- Law on Fire Protection and Firefighting of the Zenica-Doboj Canton ("Official Gazette of the Zenica-Doboj Canton" no. 05/11 and 24/19)
- Law on Fire Protection and Firefighting in the Central Bosnia Canton ("Official Gazette of the Central Bosnia Canton" no. 15/12)
- Law on Fire Protection and Firefighting in the Tuzla Canton ("Official Gazette of the Tuzla Canton" no. 01/12 and 03/16)
- Law on the Competencies of the Authorities of the Sarajevo Canton in the Field of Fire Protection and Firefighting ("Official Gazette of the Sarajevo Canton" no. 23/11)
- The Law on Fire Protection and Firefighting in the Herzegovina-Neretva Canton ("Official Gazette of HNK", no. 3/23
- The Law on Fire Protection and Firefighting in the Bosansko-Podrinje Canton Goražde ("Official Gazette of the Bosansko-Podrinje Canton Goražde", no. 12/21)
- The Law on Fire Protection ("Official Gazette of the HBŽ", no. 7/02 and 5/10), which is not harmonized with the federal Law on Fire Protection and Firefighting, while the area of firefighting has not yet been legally regulated in the canton.

In conclusion, the legislation regulating landscape fire management in Bosnia and Herzegovina plays an important role in establishing a framework for effective fire prevention and response strategies. While existing laws provide a foundation for managing landscape fires, there remains a significant gap since there is no Law on forests on the level of the FBiH, Bosnia and Herzegovina. The absence of a comprehensive legal framework in the forestry sector limits the ability to implement proactive measures that could mitigate fire risks in these areas. Addressing this deficiency is essential for enhancing the overall effectiveness of landscape fire management efforts as healthier forests are integral to reducing fire susceptibility and preserving biodiversity. Moving forward, the development of targeted legislation focused on forest management will be vital in creating a more robust and comprehensive approach to landscape fire management, ultimately contributing to the safety and resilience of communities and ecosystems in the FBiH, Bosnia and Herzegovina.

V. History of Landscape Fires in the FBiH, Bosnia and Herzegovina for 2000-2022

Forest fires in the FBiH, Bosnia and Herzegovina are a common phenomenon and bring huge damages despite the fact that this area is not categorized as highly risky in European terms. Forest fires have been particularly frequent and catastrophic during 1999, 2000, 2003, 2007, 2012, 2017, and 2020. Direct damages include the loss of timber stock, ground vegetation, and other forest products as well as firefighting and rehabilitation costs, or the restoration of fire sites. Indirect damage represents the effects of habitat changes and the loss of all multipurpose forest functions, which are much greater than direct damages but are not yet fully accounted for. The extent of damage depends on the age and size of the forest, tree species or vegetation type, and the type and intensity of the fire. The vulnerability of certain areas to forest fires varies. Fires cause the greatest damage in newly planted crops and young stands, which can be completely destroyed in a short time. Addressing fires requires coordinated action from all institutions and the whole community. It is essential to allocate significant financial resources to establish a quality fire protection system that combines prevention, control, and rehabilitation of burned areas. From an economic standpoint, fires cause significant losses to forestry enterprises by destroying wood and timber assortments, exposing them to additional costs for site rehabilitation and replanting. (FMAWF, 2022).

Fires are a widespread phenomenon, and when they occur in the forest, not only do they have economic but also have ecological effects. While the hazardous economic impact is, indeed, a problem, the directly manifested problems are caused by the far more harmful ecological effects, and forest fires inflict the greatest damage to our forests, which are mainly caused by humans (USČUPLIĆ,2001). Up to 90 % of forest fires are caused by human activities, primarily through the uncontrolled use of fire during the cleaning of forests and forest lands for agriculture and industrial development (NIKOLOV, 2006).

From the table below we can see that statistically, the highest number of fires occurred in 2003, 2007, and 2012. Out of the total number of open fires, approximately 80 % are forest fires while 20 % are fires in other open areas. For example, in 2012, which was the year with the highest number of fires in the last twenty years, out of 1538 fires in total, 1362 were forest fires, and 176 were fires in other open areas.

Table 7. *Number of landscape fires for the period from 2000 to 2022 (**source of data**: IFS)*

NUMBER OF FIRES					
Year	Total	High forests	Coppice forests	Other forests	Other areas
2000	940	598	208	102	32
2001	246	71	87	23	65
2002	602	249	263	41	49
2003	1283	533	326	157	267
2004	206	85	46	44	31
2005	254	65	91	57	41
2006	234	79	90	47	18
2007	1104	353	395	138	223
2008	543	141	172	122	108
2009	336	105	123	40	68
2010	207	57	72	26	52
2011	765	285	210	94	176
2012	1538	528	649	185	176
2013	344	153	100	52	39
2014	206	64	59	32	51
2015	413	165	98	53	97
2016	335	96	135	32	72
2017	594	189	262	52	91
2018	105	31	28	18	28
2019	531	113	157	146	115
2020	977	200	348	206	223
2021	488	138	144	47	159
2022	486	124	187	48	127

The fire season of 2017, was extreme in terms of damages caused in the forests, considering the number of fires, the burned area, and the estimated damages, especially in the area of the municipality of Konjic in Herzegovina. The estimated damages in the FBiH, Bosnia and Herzegovina amount to 17,307,510.00 BAM.

Table 8. *Forest fires data in FBiH, Bosnia and Herzegovina for the period 2017-2021 (**source of data**: FMAWF,2022)*

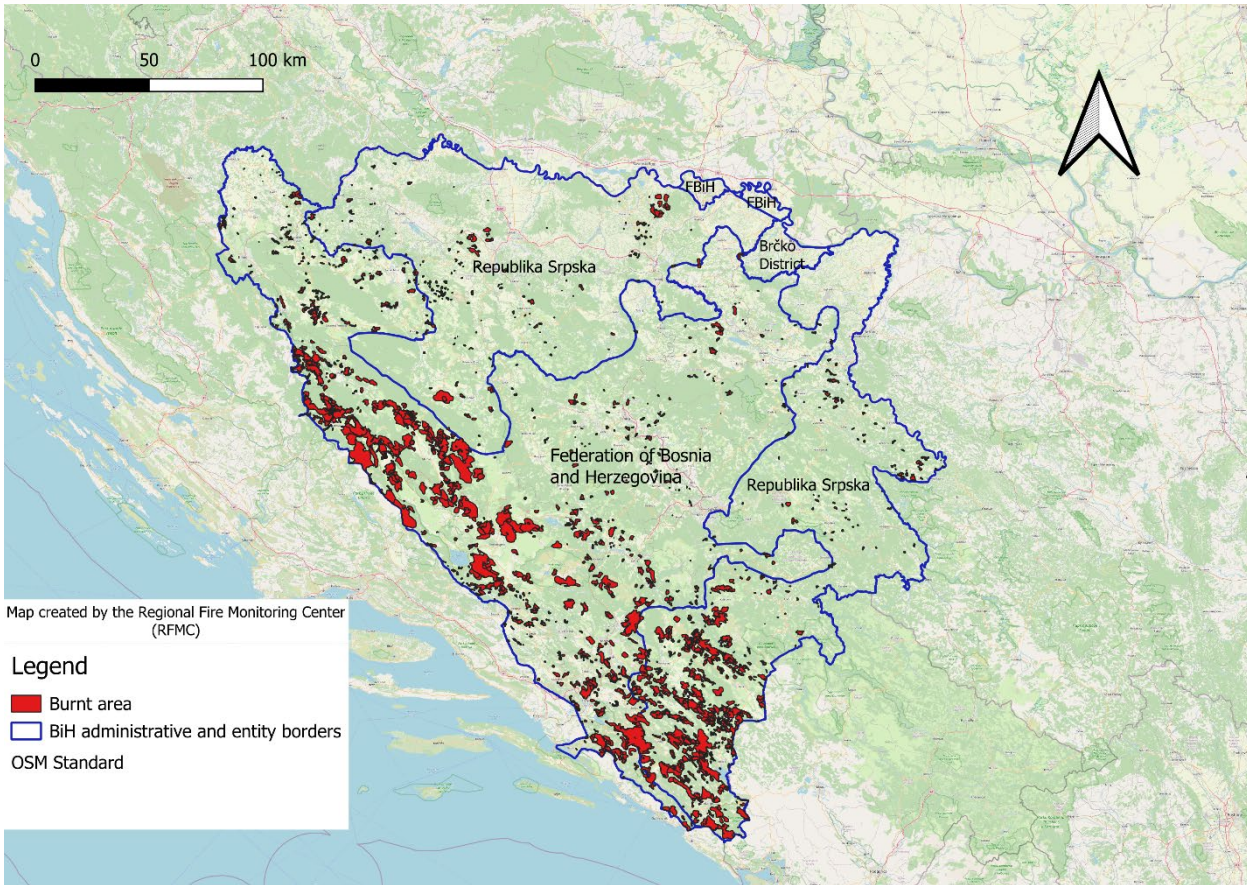
FOREST FIRES	2017.	2018.	2019.	2020.	2021.	Total
Number of fires	564	146	401	675	483	2,269
Burnt area (ha)	26,858	1,467	4,099	21,732	18,062	72,218
Burnt wood mass (m^3)	51,658	87	775	16,966	20,764	90,250
Burnt saplings (piece)	153,621	90,100	96,287	2,162,520	200,280	2,702,808
Estimated damage (BAM)	17,307,510	3,667,570	2,900,297	15,434,534	7,659,799	46,969,710

Graph 8. *Overview of estimated damages caused by fire for the period 2017-2021 (**source of data**: FMAWF,2022)*

In addition, the risk assessment of forest fire plan for the protection of forests against fire should include: preventive measures to protect forests from fire, equipment for firefighting, roads, water sources and catchment, detection and fire alarm systems, operational and tactical firefighting plan, a way of engaging firefighting units and intervention group of forest workers, or professional or volunteer fire brigade and other forces in the event of large-scale forest fire.

Indirect damages caused by fires are drastically higher and, by global standards, reach values 10 to 17 times higher than direct damages. By establishing cantonal forestry companies and cantonal forestry directorates, and through their good cooperation and coordination, with quality annual forest fire protection plans, they can influence the reduction in the number of fires. Equipping with firefighting equipment, training personnel, fostering good cooperation with fire departments, deploying fire spotters, and other activities can lead to better protection of forest ecosystems. Most fires are caused by human activities, but timely actions by forestry company employees and cantonal forestry directorates (emergency response teams) as well as prompt intervention by professional and voluntary fire brigades, can help prevent major damages. (FMAWF, 2022)

The 2017-2020 period as per FMAWF's "Information on Forest Management in FBiH in 2021" reveals a pattern of escalating fire risk in the FBiH, Bosnia and Herzegovina, with the number of fires fluctuating between 105 in 2018 to 977 in 2020. These numbers reflect not only climatic variability but also the challenges of managing a fire-prone landscapes amid socio-political fragmentation. The peak in 2020, with its unprecedented scale, serves as a stark warning to the potential for future fire seasons under worsening climate conditions. Human factors, such as uncontrolled agricultural burning and inadequate forest management, compounded natural triggers, while the legacy of landmines in some areas continues to limit ground-based suppression efforts.



Map 4: *Burnt area from Landscape Fires in the Federation of Bosnia and Herzegovina (2008 to 2023)*

This map was created based on data provided by the European Forest Fire Information System – EFFIS (https://effis.jrc.ec.europa.eu) of the EC JRC and prepared by the Regional Fire Monitoring Centre (RFMC) in Skopje. In addition to the image representation of the map above, for the period of 2008 to 2023, the digital/interactive map offers the following information (and more):

- Date and geo-referenced location
- Timeframe: beginning and end of fire
- Comparison of fires in the same location but different time periods
- Total burnt area (per fire or overall) expressed in hectares (ha)
- Structure of the burnt area: land use and vegetation type, expressed in percentage (%) of the total burnt area

In conclusion, the history of landscape fires in the FBiH, Bosnia and Herzegovina highlights the pressing need for urgent and effective prevention measures to safeguard both ecosystems and local communities. Over the last two decades, recurring landscape fires have devastated large areas causing huge environmental damage and impacting local livelihoods. These events underscore the urgency of implementing comprehensive landscape fire management strategies that prioritize prevention measures in the fight against landscape fires. Also, the history of landscape fires in the FBiH, Bosnia and Herzegovina is a narrative of adaptation and resilience punctuated by periods of crisis. The 2017-2020 period encapsulates this crisis, with fire events reflecting on intersection of environmental change and human influence. As the FBiH, Bosnia and Herzegovina looks to the future, addressing root causes of landscape fire risk, through improved legislation, community engagement, and climate adaptation, will be essential to protecting its rich landscapes and the local communities that depend on them.

VI. Landscape Fire Risk Assessment

Risk assessment of natural and other disasters in the Federation, as determined by Article 26, paragraph 2, item 2) of the Law on Protection and Rescue of People and Material Goods from Natural and Other Disasters ("Official Gazette of FBiH", no. 39/03, 22/06 and 43/10), represents the legal framework for protection and rescue in the Federation of Bosnia and Herzegovina, Bosnia and Herzegovina. It is a comprehensive document prepared by the Federal Administration of Civil Protection. The estimated level of risk of the FBiH, Bosnia and Herzegovina consists of all natural and other disasters that can threaten the territory of the FBiH, Bosnia and Herzegovina, which is a significant step towards the establishment of readiness of the community to prevent the formation and mitigation of natural and other disasters in the FBiH, Bosnia and Herzegovina. This document also contains a risk assessment for large fires occurring on the territory of the FBiH, Bosnia and Herzegovina.

The tables below give an overview of cantons that have adopted cantonal laws on fire prevention and firefighting as well as the cantons and municipalities/cities that have developed planning documents – fire risk assessment and fire protection plan, following the adoption of the Law on Fire Protection and by-laws regulating this issue.

Table 9. *Overview of cantons which have adopted cantonal laws on fire protection and firefighting as well as cantons that have created risk assessment and fire protection plans (**source of data**: Risk Assessment on Natural and Other Disasters of the Federation of Bosnia and Herzegovina, 2014)*

NO.	CANTON	CANTONAL LAW ON PROTECTION FROM FIRE AND FIREFIGHTING		FIRE RISK ASSESSMENT		CANTONAL FIRE PROTECTION PLAN	
		adopted	not adopted	adopted	not adopted	adopted	not adopted
1.	Una-Sana	x		x		x	
2.	Posavina	x		x			x
3.	Tuzla	X		x		x	
4.	Zenica-Doboj	X		x		x	
5.	Bosnia-Podrinje	x		x			x
6.	Central Bosnia	X		x		x	
7.	Herzegovina Neretva	x		x		x	
8.	West Herzegovina	x		x		x	
9.	Canton Sarajevo	x		x			x
10.	Canton 10		X				x
	TOTAL	**9**	**1**	**9**	**1**	**6**	**4**

Table 10. *Overview of the municipalities/cities that adopted fire risk assessment and fire protection plan (**source of data**: Risk assessment on Natural and Other Disasters of the Federation of Bosnia and Herzegovina, 2014)*

No.	Canton	Municipalities with adopted fire risk assessment and fire protection plan	
		Fire risk assessment	Fire protection plan
1.	Una-Sana	Bihać, Bosanska Krupa, Bosanski Petrovac, Bužim, Cazin, Ključ, Sanski Most, Velika Kladuša	Bihać, Bosanska Krupa, Bosanski Petrovac, Bužim, Cazin, Ključ, Sanski Most, Velika Kladuša
2.	Posavina	Domaljevac-Šamac, Odžak, Orašje	
3.	Tuzla	Čelić, Gračanica, Tuzla, Gradačac, Kalesija, Banovići, Doboj Istok, Kladanj, Lukavac, Sapna, Teočak, Srebrenik, Živinice	Čelić, Gračanica, Tuzla, Gradačac, Kalesija, Banovići, Doboj Istok, Kladanj, Lukavac, Sapna, Teočak, Srebrenik, Živinice,
4.	Zenica-Doboj	Maglaj, Visoko, Breza, Doboj Jug, Kakanj, Vareš, Zenica, Tešanj, Zavidovići, Maglaj, Kakanj	Maglaj, Visoko, Breza, Doboj Jug, Kakanj, Vareš, Zenica, Tešanj, Zavidovići, Maglaj
5.	Bosnia-Podrinje	Goražde	Goražde
6.	Central Bosnia	Jajce, Novi Travnik, Travnik	Jajce, Novi Travnik, Travnik, Vitez
7.	Herzegovina Neretva	Mostar, Čapljina, Jablanica, Konjic, Prozor-Rama, Čitluk, Stolac, Neum, Ravno	Mostar, Čapljina, Jablanica, Konjic, Prozor-Rama, Čitluk, Stolac, Neum, Ravno
8.	West Herzegovina	Posušje, Grude, Široki Brijeg, Ljubuški	Posušje, Grude, Široki Brijeg, Ljubuški
9.	Canton Sarajevo	Centar Sarajevo, Hadžići, Stari Grad Sarajevo, Novo Sarajevo, Ilidža, Vogošća	Centar Sarajevo, Hadžići, Stari Grad Sarajevo, Ilidža, Vogošća
10.	Canton 10	Drvar, Glamoč, Livno	Drvar, Glamoč, Livno
	TOTAL	**56**	**50**

In the field of forestry, the main instrument for implementation of preventive protection of forests against fire is a plan to protect forests from fire, which is prepared and adopted by cantonal forestry companies and cantonal forestry directorates for private forest.

The plan for fire protection, among all else, establishes preventive fire protection measures (technical, preventive-silvicultural and other measures), which must be implemented by cantonal forest company for the specific forest area under their management.

Technical, preventive-silvicultural and other measures to protect forests from fire include:

1. Determining the vulnerability to forest fire (I, II, III and IV level) and making transparent map on which forest areas classified as I, II, III or IV level of threat are marked (Table 11.)
2. Establishment of an observation-reporting service, their training and equipping
3. Formation, training and equipping their own fire protection services or entrusting the care to a specialized legal entity
4. Formation, training and equipping of emergency group of forest workers, their training and equipment for felling trees and making fire-average or entrusting these tasks to a specialized legal entity
5. Preventive silviculture (cutting and removal of dry branches, development and maintenance of firebreaks)
6. Maintenance of external hydrant network
7. Educational measures for the population, tourists, school children, which is achieved by exploring the possible causes of forest fire, misdemeanour penalties for perpetrators causing forest fires
8. Other measures

The cantonal ministries responsible for forestry, through cantonal forestry directorates and cantonal forestry companies, are required to determine the level of threat to forests from fires and to create overview maps at a scale of 1:25.000 or larger, on which forest areas will be marked with the appropriate colour based on the degrees of fire threat.

It is expected that after assessing the fire threat to forests by cantons or determining the level of threat to forests from fires for the areas of the cantons, the Federal Forestry Directorate will prepare, consolidate, and publish an overview map of fire threat to forests for the entire area of the FBiH, Bosnia and Herzegovina based on the overview maps created for the areas of the cantons.

The creation of an overview map for the entire area of the FBiH, Bosnia and Herzegovina based on the overview maps that will be prepared by the cantonal forestry companies for all cantons is very important from the perspective of planning, organizing, and implementing preventive measures for the protection of forests from fires, especially for those forest areas classified as I and II level of threats.

Table 11. *Level of threat to forests from fire (**source of data**: Risk assessment on Natural and Other Disasters of the Federation of Bosnia and Herzegovina, 2014.)*

THE DEGREE OF RISK OF FOREST FIRE		NUMBER OF POINTS
I LEVEL	VERY HIGH	480
II LEVEL	HIGH	381-480
III LEVEL	MEDIUM	281-380
IV LEVEL	LOW	< 280

VI.1. Fire-Prone Areas in Bosnia and Herzegovina

Fire-prone areas are regions that have a higher susceptibility to landscape fires due to a combination of environmental, climatic, and human factors. Characteristics of fire-prone areas including several factors such as: climate, vegetation type, topography, human activity, and proximity to urban areas. Five fire-prone zones have been identified in Bosnia and Herzegovina: Low Herzegovina, High Herzegovina, Centre, West, and North.

Fire-Prone Area Low Herzegovina Region

This zone consists of the area of Low Herzegovina and the coastal part of the seaside. The total area of this zone is approximately 4,200 km^2, with Low Herzegovina accounting for 95 % and coinciding with areas geographically defined as the Mostar Region, Bekija Region, Humine, and Popovo Polje, extending from Posušje in the west to Trebinje in the east, and a narrow coastal strip 13 km long from Klek to Neum. In this area, the influence of the Mediterranean and the modified Mediterranean climate is felt, which is a result of the deep intrusion of Low Herzegovina into the continent while strong influences of the Mediterranean climate penetrate through the Neretva Valley. The average January temperature in Mostar (59 m above sea level) is 5.4 °C, while the average July temperature in Neum is 27.0 °C.

Fire-Prone Area High Herzegovina Region

High Herzegovina stretches from Čapljina in the south to Konjic in the north, and from Livno in the west all the way to Bileća in the east. This area is characterized by karst fields, large mountains, and the canyons of the Neretva and Rama rivers. The karst fields are located at altitudes of up to 1,000 meters and have a specific climate while the fields at higher altitude exhibit typical features of a mountain climate.

Air temperature decreases with increasing altitude and distance from the sea. For every 10 km of distance from the sea, the temperature drops by 0.6 °C to 0.8 °C. The highest summer temperatures can rise up to 40 °C. Just like in Low Herzegovina, autumn is warmer than spring, but the temperature fluctuations are more pronounced. On an annual basis, precipitation can reach up to 1,800 mm.

Fire-Prone Area North Region

Thanks to its geographical position and the surrounding mountains to the west and south, the northern part of Bosnia and Herzegovina, which includes Semberija, Posavina, and the areas around the cities of Modriča, Derventa, Prijedor, Gradiška, and Kozarska Dubica, has a moderate continental climate. Stronger continental influences are thus significantly mitigated, resulting in July temperatures ranging from 20 °C to 22 °C. Winters are moderate and cold, with January temperatures reaching only -2 °C. The average annual temperature is 10 °C. Fall and spring have approximately the same temperatures. Precipitation is evenly distributed throughout the year, totalling around 800 mm, with the most rain occurring in May and June.

Fire-Prone Area Centre Region

This area consists of a group of high mountain massifs, including Jahorina, Vranica, Bjelašnica, Treskavica, Zvijezda, Vitorog, and Romanija, all of which are above 1,500 meters. To the north, the terrain gently descends and transitions into hilly landscapes. The average air temperature in the hottest month, July, ranges between 20 °C and 22 °C, while winters are mostly moderately cold. In the mountains, a distinctly mountain climate is present, characterized by fresh and short summers, and cold, snowy winters.

Fire-Prone Area West Region

In this zone, there is a high plateau in the south, with altitudes over 1,000 meters, which includes Livanjsko, Kupreško, and Glamočko fields. As it moves towards the northwest, the terrain descends towards Bihać. The orographic structure of this zone is simpler than that of the fire zone of High and Low Herzegovina. This is reflected in the forms of relief, where the dominant fields are in karst terrain, combined with areas that gently descend from the watershed between the Adriatic and Black Sea basins (Kupreško Field) to the southeast towards the border with the fire zone of High Herzegovina, and to the northeast, the terrain descends through limestone outcrops into the valleys of the Una River, transitioning into the peri Pannonian fringe (Krajina). The climate of this area, from the perspective of the fire season, is influenced primarily by a mountain climate, its modified forms (the climate of karst fields), and a moderate continental climate. (Study – Extinguishing Forest Fires in BiH, 2014).

Map 5: *Fire-prone areas: Niska Hercegovina (Low Herzegovina), Visoka Hercegovina (High Herzegovina), Centar (Centre), Zapad (West) and Sjever (North), (**Source of data**: Study – Extinguishing Forest Fires in BiH, 2014)*

In conclusion, a significant gap remains evident: the last comprehensive risk assessment on natural and other disasters of the FBiH, Bosnia and Herzegovina was conducted in 2014, rendering it increasingly outdated in the face of evolving climate conditions, land use and socio-economic changes. Over the past decade, these shifting dynamics have altered landscape fire risk of the region, necessitating an urgent update to ensure that strategies and policies are based on current situation rather than historical snapshots. Central to this effort is the pressing need for a detailed landscape fire risk map for the FBiH, Bosnia and Herzegovina. Such a map would provide an invaluable resource for policymakers at all levels, enabling them to visualize high risk zones and implement prevention measures. The absence of an updated assessment and risk map not only hampers effective decision-making but also leaves the FBiH, Bosna and Herzegovina exposed to devastating consequences to amplify the frequency and intensity of landscape fires. Moving forward, it is important that decision makers invest in the development of these critical tools to bridge existing gaps. By doing so, the FBiH, Bosnia and Herzegovina can strengthen its capacity to safeguard its natural landscapes, protect biodiversity and ensure safety of local communities in fire prone areas.

VII. Existing Projects

This chapter presents existing projects dealing with the topic of landscape fires. Most of the projects in recent years have been implemented by UNDP, along with projects implemented by local non-governmental organizations. These projects include collaborative efforts between governmental agencies, NGOs, and local communities, all aimed at minimizing the impact of landscape fires on the environment and public safety. By examining these existing projects, we gain insights into effective practices, innovative technologies, and lessons learned that can guide future actions in landscape fire management. This overview not only highlights successful interventions but also identifies areas for improvement and potential for further development in the landscape fire management. Only ongoing projects related to landscape fire management are mentioned below.

1. **Joint action to reduce the increased risk of forest fires to nature and people in the context of climate change in Bosnia and Herzegovina**

Donor: Ministry of Foreign Affairs of the Kingdom of Norway

Implementor: Forestry Environmental Action - FEA

Duration of the project: 2023-2024

This project is implemented by FEA, funded by the Ministry of Foreign Affairs of the Kingdom of Norway in the frame of the SMART Balkan programme. The project aims to enhance capacities and empower relevant stakeholders in Bosnia and Herzegovina in the fight against forest fires. Through various activities, the project focuses on educating citizens about preventive measures, as well as improving the monitoring, detection, and response systems to forest fires. The main outcome of this project will be an interactive GIS map of fire susceptibility and a policy document - a roadmap for reducing the risk of forest fires.

2. **Building capacities to reduce the risk of natural disasters through National Forest Fires Information System (NFFIS) and Ecosystem-based disaster risk reduction (Eco-DRR)**

Donor: Japanese International Cooperation Agency (JICA)

Beneficiary: Ministry of Security of BiH, Civil Protection of RS, Civil Protection of the FBiH, Public Safety Department of Brčko District, BiH

Duration of the project: 2024-2029

In June 2024, JICA started their project named "Building Capacities for risk reduction of natural disaster through NFFIS and Eco-DRR. This project plans the development, test, and operationalize the NFFIS as well as develop a sustainable operational system with the functions of MKFFIS based on national circumstances, including technological innovations. Through this project, Joint Coordinating Committee (JCC) and Technical Coordination Group (TCG) will be established from relevant institutions. JCC will have at least one meeting annually where progress will be presented as well as operational plan for following year. The project will also include awareness raising campaign about the importance of NFFIS for DRR.

In conclusion, key projects have been spearheaded by various organizations, including UNDP and EU-led initiatives, focusing on enhancing preparedness, response, and recovery mechanisms in the face of growing environmental challenges. These projects have emphasized the importance of community involve-

ment, training local response teams, and developing strategic management plans that integrate both disaster readiness and ecological restoration.

The focus on landscape fire management within the broader framework of disaster risk reduction (DRR) highlights a comprehensive approach to tackling not just the immediate impacts of such fires, but also the underlying vulnerabilities within rural landscapes. By combining efforts to prevent and manage fires with strategies for ecological recovery, these projects create a synergetic effect that promotes sustainable land use and enhances biodiversity. Ongoing commitment to DRR projects in the region reflects a proactive stance toward safeguarding lives, property, and the natural environment, ensuring that communities are better equipped to face future challenges posed by both climate change and anthropogenic factors. The lessons learned and the resilience developed through these initiatives will be crucial as the FBiH, Bosnia and Herzegovina continues to navigate the complexities of disaster risk management including landscape fire management in the years to come.

VIII. LFM System SWOT Analysis

This chapter presents the LFM System SWOT analysis. Strengths, weaknesses, opportunities, and threats identified by stakeholders at all levels in FBiH, Bosnia and Herzegovina during the 2nd workshop on the level of the FBiH, Bosnia and Herzegovina in Sarajevo are presented. The SWOT analysis will facilitate a thorough evaluation of the effectiveness of the landscape fire management system while identifying the key challenges. By identifying internal strengths, weaknesses, opportunities and threats, this analysis provides a strategic framework to enhance landscape fire management practices. The insights aim to inform policymakers, practitioners and stakeholders in developing resilient and adaptive approaches to landscape fire management.

STRENGTHS	WEAKNESSES
- The existence of legal framework including laws and bylaws in the field of fire protection - Existing procedures including operational fire protection plans - Awareness-raising campaigns - Abundant water resources - Sufficient number of experts in the field of fire protection - Institutional capacities - Existing intersectoral communication	- Lack of Law on Forests of the Federation of Bosnia and Herzegovina - Population migrations (from rural to urban areas, and migrations to other countries) - Lack of a Forestry Program of the Federation of Bosnia and Herzegovina - Complex organizational setup of the socio-political system - Lack of human and material resources - Lack of effective communication between certain responsible institutions within the system - Inadequate implementation of existing laws - Inadequate penal policies - Unresolved property disputes - Water source network - Lack of public awareness - Lack of awareness of decision makers - Underdeveloped tourist infrastructure and rural development at the local level - Difference between the cadastral records and the actual on-site conditions

OPPORTUNITIES	THREATS
- Developing awareness-raising programs about landscape fire protection - Rural development - Introducing LFM principles into the educational system - Introducing digital technologies in prevention measures - Utilization of EU funds (pre-accession and international funds) - Increase of capacity in terms of LFM - Creation of a record of known offenders - Modernization and innovation of fire protection monitoring - Introduction of prescribed burning practices - Adoption of a Law on Forests of the Federation of Bosnia and Herzegovina	- Climate change (temperature extremes, air pollution) - Population migration - Increased landscape fire occurrence and intensity - Inconsistent implementation of policies related to LFM - Large number of illegal dumpsites - Inadequate identification of offenders and failure for them to be prosecuted - Large areas of the FBiH, Bosnia and Herzegovina contaminated with mines

In conclusion, LFM system SWOT analysis will help to collectively shape the region's capacity to address landscape fire challenges. The system benefits from notable strengths including the existence of legal framework in the field of fire protection. The analysis also reveals critical weaknesses that hinder the system's effectiveness. Fragmented governance across the FBiH, Bosnia and Herzegovina's decentralized cantonal structure often leads to inconsistent policy implementation and resource allocation, while limited technological adoption and insufficient training of personnel exacerbate vulnerabilities in landscape fire prevention and preparedness. These shortcomings underscore the urgent need for enhanced coordination, capacity building and investment in modern tools to bolster resilience against landscape fires. Also, the FBiH, Bosnia and Herzegovina stands at a crossroads of significant opportunities and pressing threats. Opportunities abound in the form of adoption of a new Law on Forestry, which should have included LFM principles. The future of the LFM system in the FBiH, Bosnia and Herzegovina hinges on its ability to bridge these divides, capitalizing on its strengths and opportunities while confronting its weaknesses and threats. Strengthening institutional capacities, harmonizing legal frameworks and investing in both technological and human capacities will be pivotal to enhance prevention and preparedness.

IX. Landscape Fire Management Guidelines

Developing LFM guidelines is essential as they provide a clear framework for decision-making and actions, ensuring consistency and efficiency in processes. They can also help to organize and navigate complex situations by outlining best practices and standards. This chapter delves into guidelines for effective landscape fire management. The guidelines are divided into four categories, based on the phases in landscape fire management:

1. **Prevention:** This category focuses on strategies to minimize the risk of landscape fires through education, engagement of all government levels including state, federal, cantonal, and local levels as well as engagement of local communities.
2. **Preparedness**: Guidelines under this category address the importance of resource allocation and training for personnel to ensure that local communities and government bodies at all levels are ready to respond effectively when a landscape fire occurs.
3. **Suppression:** This section outlines best practices for extinguishing fires once they have ignited, including tactics, safety measures for firefighting crews, and the use of equipment and resources.
4. **Post-Fire Management:** The final category will discuss the actions needed after a fire has been extinguished, focusing on recovery, rehabilitation of affected areas, and measures to prevent future fires.

IX.1. Prevention

Landscape Fire risk map: The development of an interactive fire risk map is a key step towards effective LFM in Bosnia and Herzegovina. By identifying high-risk zones, responsible institutions can prioritize resource allocation, implement preventive measures, and enhance community preparedness. Additionally, such maps facilitate informed decision-making for land use planning and development, ultimately contributing to the protection of local communities and their property as well as natural resources.

Creation of a unique database: It is necessary to create a unique database on the level of the FBiH, Bosnia and Herzegovina, which would contain data for all cantons regarding landscape fires. Such a database consolidates important information, including fire occurrence, duration, and response effectiveness, enabling comprehensive analysis and trend identification over time. A well-maintained landscape fire database can significantly improve the overall resilience and preparedness of communities facing threats of landscape fires.

The adoption of adequate laws which will be in accordance with LFM principles: All existing laws, both federal and cantonal, related to landscape fires need to be complemented and aligned with LFM principles.

The adoption of a federal law on forests: As previously mentioned in this report, the federal law on forests has not been in effect since 2009, and forests in the FBiH, Bosnia and Herzegovina are managed based on cantonal laws on forests. In the upcoming period, it is necessary to adopt a federal law on forests that will adequately address LFM principles.

Introduction of LFM principles in forest management plans (FMP): For better prevention, it is necessary to introduce LFM principles in operational plans, including the ten-year FMPs and the harvest projects that are developed for each forest compartment individually.

Modernization and innovation including early warning system: Establishing an early warning system for fires is essential for better fire prevention. An early warning system for landscape fires is important for mitigating the impact of fires on communities and ecosystems. By utilizing advanced technology, such as satellite imagery, weather data, and real-time monitoring, these systems can detect fire risks and potential outbreaks at an early stage. Timely alerts enable emergency services and local authorities to mobilize resources and implement preventive measures before fires escalate. Also, an effective early warning system enhances public awareness and preparedness, allowing communities to react quickly and appropriately in the face of landscape fire threats. This measure can proactively identify and mitigate fire risks before they escalate, thereby serving as prevention. Also, this same suite of innovations enhances preparedness by equipping authorities and local communities with the foresight and resources needed to respond promptly and effectively when threats emerge.

Incorporation of LFM in education: Education from an early age is a very important measure, which can significantly impact the reduction of the number of fires by increasing young people's awareness of the dangers that arise when a fire occurs. By incorporating LFM principles into school curriculums and community programs, we can foster a sense of responsibility and preparedness in future generations, ultimately leading to a safe environment for everyone.

Raising awareness of people in local communities: Having in mind that many fires start in agricultural areas when local people burn ground vegetation which then spreads to nearby forest, educating the local population about the dangers of landscape fires is crucial. Raising awareness about safe practices for managing vegetation and the potential consequences of fire can help prevent such incidents. Community outreach programs, workshops, and informational campaigns can be effective in teaching residents about fire risks and promoting responsible LFM principles.

Proper determination of the offenders and their prosecution: The Criminal Law of the FBiH, Bosnia and Herzegovina does not provide sufficiently rigorous penalties for offenders that cause fires, thus leaving the possibility for repetition of the same criminal offense. In the upcoming period, it is necessary to increase penalties in value so that offenders can be appropriately penalised in order to discourage further offenses.

IX.2. Preparedness

Development of unique landscape fire protection plans on the level of the FBiH, Bosnia and Herzegovina: Currently, fire protection plans are being developed at the cantonal level within forestry enterprises for forest fires only. In the future, landscape fire protection plans will be needed to be develop as well. This is crucial for coordinating fire prevention and response efforts across the entire region. Such plans would establish standardized protocols and strategies for LFM, ensuring that all cantons work towards common goals. Well-developed landscape fire protection plans are critical for protecting both human interests and natural environments from the devastating impacts of landscape fires.

Early detection of fires using remote sensing and surveillance: For better preparedness, modernization is needed in terms of acquiring remote sensing tools such as thermal cameras and drones to enable early detection of fires and provide efficient response. Improving and modernizing the early detection systems in cantonal forestry companies in the FBiH, Bosnia and Herzegovina are crucial for effectively managing landscape fire risks and protecting valuable forest resources. Early detection of fire using remote sensing increases the speed and accuracy of fire detection, allowing for quicker response times.

Construction of fuel breaks and firebreaks, as well as roads: As a measure of preparedness, construction of fuel breaks and firebreaks is very important since they can help stop or slow the spread of fires. Also, access roads provide access for fire vehicles and firefighters.

Fuel management and fuel classification: Given the critical role that wildland fuels play in the susceptibility, ignition, behaviour, intensity and burn severity of landscape fires, effective fuel management is paramount. Wildland fuels i.e., all organic combustible materials (biomass), whether dead or alive, naturally accumulate and overload landscapes, providing the energy needed to sustain LF. This increases the fire risk levels, making fuel management a priority. In order to minimize the risk of landscape fires, the wildland fuels must be very well understood, classified, inventoried and mapped. Their type, distribution, quantity and characteristic are key in proper landscape management.

Cooperation on all administrative levels: Cooperation between the two entities as well as cooperation among the cantons within the FBiH, Bosnia and Herzegovina, is essential for more effective fire prevention. For more effective landscape fire management, better cooperation among institutions at all levels is necessary. Only through joint collaboration we can successfully act on preparedness for landscape fires.

Cross-border cooperation for better prevention and preparedness: Cross-border cooperation with neighbouring countries can contribute to better prevention efforts through joint capacity building and knowledge exchange on the topic of landscape fires. By sharing best practices, resources, and experiences, all parties can enhance their collective ability to manage and mitigate fire risks, ultimately leading to more resilient landscapes.

Creation of a register of known offenders in the FBiH, Bosnia and Herzegovina: On the level of the FBiH, Bosnia and Herzegovina, it is necessary to create a register of known offenders who started fires in order to facilitate the investigation of cases related to intentional fire-setting.

Harmonization of the cadastral data with the actual situation: According to data from the Federal Geodetic Administration for Property and Legal Affairs, there are many cadastral data that do not correspond to the actual situation in the field. Cadastral records have many areas recorded as agricultural land while they have been overgrown with forest and vegetation for many years. For this reason, it is necessary to harmonize the cadastral data with the actual situation.

Establishing explosive ordnance disposal priorities with focus on landscape fire protection: As already mentioned in this report, 10 % of forest areas in the FBiH, Bosnia and Herzegovina are covered with UXO (unexploded ordnance). Because of that, it is necessary to determine demining priorities. In practice, fires often start near minefields, which makes fire extinguishing complicated as the only possible method of extinguishing fires in minefields is from the air.

Use of data from Federal Hydrometeorological Institute: The Weather Forecast and Meteorological Alarm Service is intended for everyone residing in Bosnia and Herzegovina, with the goal of effectively planning activities that may be influenced by weather conditions. The Federal Hydrometeorological Institute forwards all types of forecasts and warnings to civil protection, government, media, energy companies, automatically via email, to ensure that information reaches citizens. The information provided by the FHI should be used to improve preparedness and suppression efforts of LFM. The goal is to deliver the daily results of the risk assessment to the operational centres of civil protection, which should align their activities with the provided information.

IX.3. Suppression

Establishment of a unified emergency phone number on a state level: The initial activities for the introduction of the unified emergency number 112 in Bosnia and Herzegovina began more than ten years ago. After the adoption of the Law on the Protection and Rescue of People and Material Goods in 2008, the Ministry of Security of Bosnia and Herzegovina initiated activities for the introduction of the unified European emergency number - 112. This activity is currently stopped in the House of Peoples of the Parliamentary Assembly of Bosnia and Herzegovina.

Establishment of an effective aerial suppression system: Currently, the aerial firefighting system in Bosnia and Herzegovina includes usage of helicopters of the Armed Forces of Bosnia and Herzegovina. In case of large-scale fires, assistance is requested from neighbouring countries for aerial firefighting. In the future, it will be necessary to establish a better aerial suppression system for combating landscape fires.

Modernization and innovation of firefighting equipment: The firefighting equipment used by cantonal forestry companies in the Federation of Bosnia and Herzegovina is in most cases very old. In addition to donations from various international organizations, further investments are needed to better respond to landscape fires.

Education on firefighting techniques: Employees of cantonal forestry companies who are dealing with forest fires during the fire season are in special need of this education. Education on firefighting techniques encompasses a range of training programmes and knowledge-sharing initiatives aimed at equipping individuals, such as firefighters, foresters, and community members, with the skills and understanding necessary to effectively prevent, control, and extinguish fires.

Better cooperation between the governing institutions at all levels: Due to the complexity of the administrative organization of Bosnia and Herzegovina, it is necessary to ensure improvements of existing cooperation between different levels of government in cases of landscape fires.

IX.4. Post-Fire Management

Creation of methodology for assessment of direct and indirect damages: Damage from fires is assessed after the fire is extinguished and is divided into two groups: direct damage, which is the destruction of soil, biomass, and seedlings, and indirect damage, which includes the revitalization of the burned area. It is necessary to develop a unique methodology for determining direct and indirect damages on the level of the FBiH, Bosnia and Herzegovina.

Creation of mixed stands: After the recovery of burned area, it is necessary to establish mixed stands of those tree species that have shown better resistance to fires.

Monitoring revitalization of burned areas: Constant monitoring of burned areas after a fire is extinguished is necessary for a better post-fire analysis . Monitoring of burnt areas is crucial for assessing the impacts of landscape fires on ecosystems and local communities. This monitoring helps in understanding the long-term effects of fire on biodiversity, soil health, and water quality, providing valuable data for future landscape fire management practices.

Prophylactic measures against harmful pests and pathogens: After the occurrence of a landscape fire, danger from other secondary and tertiary threats occurs. There's a high probability that the burnt areas may become more vulnerable to invasive plant species and weeds, outcompeting the tree species and disrupting the stand composition, than the forestry manages and aims to recover. Trees damaged by the fire can be more vulnerable to insects and diseases, leading to further degradation of the ecosystem. Establishment of prophylactic measures to inhibit the development of harmful pests and pathogens is necessary. This means that a post-fire management plan with strictly defined measures should be implemented.

Usage of remote sensing and monitoring aiding post fire management measures and estimations: Remote sensing is very important in post-fire management as it provides high-resolution imagery and data that allow for detailed assessments of burnt areas. This technology enables the rapid identification of affected areas, helping disaster response teams prioritize rehabilitation efforts. Remote sensing can monitor vegetation recovery and changes in land use over time, offering insights into ecosystem resilience and the success of restoration strategies. By analysing spatial and temporal data, authorities can improve both future landscape fire management plans and preparedness for potential reoccurrences.

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