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Landscape Fire Management Gap Analysis on the Level of The Federation of Bosnia and Herzegovina, Bosnia and Herzegovina



HELVETAS

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LIST OF INSTITUTIONS AND EXPERTS INVOLVED IN THE PREPARATION OF THE GAP ANALYSIS

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Cantonal Forestry Directorate Central Bosnia Canton
Cantonal Forestry Directorate Sarajevo Canton
Cantonal Directorate for Civil Protection and Firefighting of Herzegovina Neretva Canton
Cantonal Directorate for Civil Protection Sarajevo Canton
Federal Directorate for Civil Protection
Federal Hydrometeorological Institute
Forestry Company "Srednjobosanske Šume" d.o.o. Donji Vakuf
Forestry Company "ŠPD-ZDK" d.o.o. Zavidovići
Forestry Environmental Action – Fea
Institute for Statistics of the Federation of Bosnia and Herzegovina
Public Institution for Protected Areas in Sarajevo Canton
Ministry of Agriculture, Water Management and Forestry of the Federation of Bosnia and Herzegovina
Ministry of Agriculture, Water Management and Forestry of the Canton 10
Ministry of Agriculture, Water Management and Forestry-Central Bosnia Canton
Ministry of Agriculture, Forestry and Water Management Zenica-Doboj Canton

LIST OF ACRONYMS

BiH	Bosnia and Herzegovina
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
LFM	Landscape Fire Management
LFMWB	Landscape Fire Management in the Western Balkans
LF	Landscape Fires
UXO	Unexploded Ordnance

EXECUTIVE SUMMARY

This gap analysis provides a comprehensive evaluation of the Landscape Fire Management system in FBiH, Bosnia and Herzegovina assessing its effectiveness. The primary objective is to identify key deficiencies, hereafter referred to as gaps and propose actionable recommendations to bridge those gaps and enhance the country's LFM system's capacity to manage landscape fires. This aims to safeguard natural resources and local communities' livelihoods, and to integrate the landscape fire management among all relevant stakeholders. This gap analysis was developed through a participatory approach, facilitated by multiple workshops organized by the Landscape Fire Management in the Western Balkans (LFMWB) Programme. These workshops brought together participants from the LFM network of FBiH, Bosnia and Herzegovina to collaboratively define, discuss and prioritize the identified gaps and measures for bridging them.

This gap analysis first identifies and defines the gaps, then offers brief explanation and context for each of the gaps. It then proposes a well-defined desired future state concerning the respective gaps. The desired state serves as a milestone and a reference for all intended improvements and actionable measures. To achieve this, the gap analysis document culminates in a detailed implementation framework table. This table acts similarly as a strategic action plan, listing each identified gap alongside proposed measures for bridging the gap, their period of implementation, the responsible institutions for undertaking or assisting in implementing the proposed measures, an approximation of a foreseen budget, and a priority level (urgency). The priorities in the implementation framework are colour-coded as follows: Green (I) stands for the highest priority, Yellow (II) for moderate priority, and Blue (III) for lower priority measures.

The analysis reveals critical gaps across all four main phases (prevention, preparedness, suppression, and post-fire management) of the landscape fire management system in FBiH, Bosnia and Herzegovina:

- Prevention: Effective prevention of Landscape Fire Management (LFM) is compromised by a lack of law on forests and a corresponding lack of integrated policies and strategies in the field of landscape fire management. This deficiency in the legal framework is compounded by poor public engagement, specifically a lack of a media campaign and education on the danger of landscape fires, as well as a lack of general awareness of the importance of prevention. Furthermore, enforcement is severely hindered by illegal construction and non-compliance with regulations, an inadequate penalty policy, a lack of a register of individuals who deliberately cause fires, and a lack of trained inspection service for fire protection in certain cantons.
- Preparedness: National Preparedness for Landscape Fire Management (LFM) is undermined by underdeveloped forest transport infrastructure and a lack of a water reservoir network, severely limiting access and suppression capability. These operational deficiencies are compounded by a lack of modern technologies and material technical resources for early fire detection and early warning system, and the absence of a fire risk map. Organizational capacity is weakened by the complexity of administrative organization, underdeveloped volunteer fire departments in certain cantons, and not enough mobilized local population. Also, data and resource management suffer from a lack of data in landscape fire management, inaccessible data for private forests, incomplete data of land mined areas, and insufficient equipment and training of firefighters.
- Suppression: National Suppression capabilities for Landscape Fire Management (LFM) are hindered by the absence of an alert and coordination system and a resulting lack of quick response. This operational deficiency is compounded by a lack of firefighting equipment and aerial support, undermining the speed, effectiveness, and capacity for sustained response during landscape fire incidents.

- Postfire Management: Effective Postfire Management is compromised by a lack of a comprehensive methodology for damage assessment after landscape fires and insufficient post fire damage assessment and scientific research for effective management. This deficiency in data and evidence-based planning results in the neglect of LFM principles in recovery planning and a e lack of adequate monitoring of burnt areas. Furthermore, the long-term environmental recovery is hindered by a lack of integrated approach to ecological restoration (land rehabilitation).

The successful implementation of the proposed recommendations is envisioned over a five-year period and is contingent upon strong coordination among government agencies, academic institutions, and local communities (science-policy-practitioners interface). This holistic approach aims to address both immediate critical needs and facilitate long-term systematic improvements, thereby significantly bolstering FBiH, Bosnia and Herzegovina's overall capacity to manage landscape fires effectively and sustainably.

The Landscape Fire Management (LFM) gap analysis report was fully validated and accepted by all participating stakeholders

BACKGROUND

Landscape fire management is an increasingly critical aspect of environmental stewardship, particularly in regions prone to landscape fires. FBiH, Bosnia and Herzegovina, a diverse and ecologically rich entity within Bosnia and Herzegovina, faces challenges in managing landscape fires. Characterized by a mix of forested mountains and agricultural land, FBiH, Bosnia and Herzegovina's varied topography create a complex environment for landscape fire risk and response. In the last decade, the region has experienced a rise in fire incidents, driven by factors such as prolonged drought and land abandonment. These incidents not only threaten ecosystems but also pose huge risks to local communities.

Effective landscape fire management requires understanding of the existing system, policies and practices, as well as identification of gaps that hinder prevention and preparedness. This gap analysis serves as a vital tool in this context, offering a structured approach to assess the current situation of landscape fire management in FBiH, Bosnia and Herzegovina. By evaluating key components – such as institutional frameworks, resource availability, community engagement and technological capabilities, this analysis aims to pinpoint deficiencies and highlight the opportunities for improvements.

To mitigate the negative impacts of LFs in the WB, it is necessary to have inclusive, cross-boundary cooperation and knowledge exchange to strengthen the capacities for landscape fire management (LFM) in the region. All of these aspects are incorporated in the Landscape fire management in the Western Balkans Programme. The Landscape Fire Management in the Western Balkans (LFMWB) is a project financed by the Swiss Agency for Development and Cooperation – SDC and coordinated by Farmahem from Skopje, North Macedonia with backstopping support from Helvetas Swiss Intercooperation from Switzerland. The first phase is designed to be implemented in the period from 01.02.2022 until 31.12.2026.

To perform the gap analysis process, the following steps should be followed:

Identification of current situation

Identifying the current situation for a gap analysis process requires an assessment of the existing landscape fire management practices. This should also include reviewing institutional frameworks, such as those overseen by FMAWF, to understand how well-prepared FBiH is to prevent and respond to landscape fires.

Identification of desired state

The desired state of landscape fire management in FBiH, Bosnia and Herzegovina should be focused on preventive measures and proactive systems that integrate modern technologies, trained personnel, robust legal and institutional frameworks, and local community engagement.

Identification of gaps

Understanding areas for improvement and learning opportunities from current to desired state.

Action Plan

To address the identified gaps and achieve the desired state of landscape fire management in FBiH, a phased and integrated action plan should be implemented. During a series of workshops held in FBiH, Bosnia and Herzegovina, key stakeholders, from all administrative levels—including representatives from civil protection, forestry sector, environmental agencies, local governments, and NGOs—actively participated in the development of a SWOT analysis. These workshops provided a platform to openly discuss strengths, weaknesses, opportunities, and threats related to landscape fire management. Stakeholders identified

institutional gaps, challenges in coordination, and the need for better prevention and preparedness. As a result, an action plan will be developed, outlining priority measures such as capacity building, improved collaboration on all administrative levels, investment in preventive measures, and enhanced public awareness. The workshops fostered a sense of shared responsibility and laid the foundation for a more strategic and unified approach to landscape fire management in FBiH, Bosnia and Herzegovina.

Current status of the LFM

The current landscape fire management (LFM) system in the FBiH, Bosnia and Herzegovina faces numerous challenges, including limited institutional capacities, outdated equipment, and insufficient prevention and early warning mechanisms. However, important steps have been taken through the LFMWB programme, within which a comprehensive Report on LFM in FBiH, Bosnia and Herzegovina was developed in close cooperation with key stakeholders from relevant institutions. This report provides a valuable overview of existing capacities, legal frameworks, and operational practices. Building on this foundation, the current gap analysis aims to further improve the status of LFM by identifying critical weaknesses and proposing targeted actions to enhance prevention, preparedness, and response across all levels of governance.

Objectives of the gap analysis

The main objective of the gap analysis is the transition from the current situation toward the desired state in landscape fire management in the FBiH, Bosnia and Herzegovina. For this purpose, a multi-step roadmap is needed:

1. Strengthen institutional capacity and coordination by establishing a central landscape fire management body, clarifying roles on all administrative levels in FBiH, Bosnia and Herzegovina.
2. Upgrade infrastructure and systems by deploying modern detection tools (e.g. satellite monitoring), reliable communication networks, and enhanced firefighting equipment.
3. Invest in training and personnel development, delivering regular capacity-building programmes, cross-agency drills, and knowledge exchange with regional and international best-practice partners.
4. Raise public awareness and foster local community engagement through targeted education campaigns, volunteer programmes and incentives for landowners to adopt fire-resilient practices.

Scope and approach of the gap analysis

The gap analysis focuses on identifying key weaknesses and areas for improvement within the current landscape fire management system in the FBiH, Bosnia and Herzegovina. Its scope includes institutional capacity, legal and policy frameworks, equipment and infrastructure, coordination mechanisms, public awareness, and the use of technology in fire prevention and response. A participatory approach was applied, with active involvement of stakeholders from FBiH during the 4th workshop of the LFMWB Programme. During this workshop, participants jointly identified and refined the main gaps based on their field experience and institutional perspectives. The Regional Fire Monitoring Centre (RFMC) played a critical role in supporting and guiding the process, providing expert input and helping to shape and polish the gap analysis document to ensure its accuracy, relevance, and alignment with regional and international best practices.

1. GAP IDENTIFICATION ON LANDSCAPE FIRE MANAGEMENT IN THE ENTITY OF FEDERATION OF BOSNIA AND HERZEGOVINA

This document presents both the current status and the future desired state of landscape fire management in the FBiH, Bosnia and Herzegovina, with a focus on the key pillars: prevention, preparedness, suppression, and post-fire management. It outlines existing challenges and capacities in each of these areas while proposing concrete improvements needed to strengthen the overall system. The goal is to move towards a more proactive, coordinated, and resilient approach that minimizes fire risks and enhances recovery efforts.

1.1 PREVENTION

In FBiH, Bosnia and Herzegovina, fire prevention efforts face significant challenges due to limited public awareness, lack of comprehensive education campaigns, and insufficient enforcement of fire safety regulations. A major gap is the absence of a dedicated law on forests, which hampers the implementation of effective forest management and fire prevention measures. Without clear legal frameworks, it is difficult to regulate activities that increase fire risks or to promote sustainable land use practices. The gap analysis emphasizes the need for stronger community engagement, better coordination among institutions, and the development of targeted prevention programmes.

Table 1. *Identification of gaps in the prevention phase of the current LFM system*

No.	Identification of gaps in the prevention phase of the current LFM system
	LACK OF LAW ON FORESTS IN THE FEDERATION OF BOSNIA AND HERZEGOVINA
1.1	The adoption of the Federal law on Forests represents a key step in strengthening the preventive fight against landscape fires. This law will enable uniform standards and regulations that will ensure the protection of forest ecosystems and reduce the risk of landscape fires. Additionally, securing adequate resources for forest management and training personnel will contribute to a more efficient response to potential fires at the landscape level. Ultimately, the law will lay the groundwork for collaboration between different levels of government, fostering a collective approach to preserving natural resources and local communities. Desired state: *Law on forests in Federation of Bosnia and Herzegovina is adopted.*

1.2	**LACK OF COMPREHENSIVE MEDIA CAMPAIGN AND EDUCATION ON DANGER OF LANDSCAPE FIRES, AS WELL AS A LACK OF GENERAL AWARENESS ABOUT THE IMPORTANCE OF PREVENTION** A comprehensive media campaign on the dangers of landscape fires needed to raise public awareness about this issue. Such a media campaign can help protect the most vulnerable areas by pre-emptively informing people and local communities about the associated dangers concerning landscape fires, enabling them to take proactive measures to prevent the occurrence of landscape fires. The lack of general awareness about the importance of landscape fire prevention represents a serious obstacle in reducing risks and preserving natural resources. Many local communities are not adequately informed about the measures they can take to prevent fire outbreaks. Educating citizens and raising awareness on this issue are crucial for changing behaviour and fostering collective responsibility. By increasing awareness of the importance of prevention, we can more effectively protect local communities from the destructive consequences of landscape fires. Desired state: *Coordinated and ongoing media campaign about the danger of landscape fires. General public understands importance of landscape fire prevention in Federation of Bosnia and Herzegovina.*
1.3	**ILLEGAL CONSTRUCTION AND NON-COMPLIANCE WITH REGULATIONS** Illegally constructed buildings in rural areas are a widespread problem that significantly contributes to the spread of fires, especially in areas near forest complexes that are susceptible to landscape fires. Illegal buildings are often built without regard for spatial planning. Illegal construction extends into forest and agricultural areas increasing exposure to landscape fire risk. Such developments typically lack adherence to spatial planning regulations, including establishment of buffer zones and firebreaks. These illegal structures are often associated with unregulated waste disposal and unsafe energy connections, all of which can contribute to fire ignition and spread. Illegal constructions not only amplify the vulnerability of local communities but also exacerbates the social, economic and ecological impacts of landscape fires. Desired state: *Construction in rural areas is planned, regulated and compliant with land-use laws ensuring safe distance from fire-prone areas.*
1.4	**INADEQUATE PENALTY POLICY AND LACK OF A REGISTER OF INDIVIDUALS WHO DELIBERATELY CAUSE FIRES** Inadequate penalty policy and the lack of a register of individuals who deliberately cause fires pose a serious problem in the fight against landscape. Inadequate and low penalties failed to deter potential offenders from such acts, further compromising fire resilience. Additionally, the absence of a centralized register makes it difficult to effectively monitor and identify offenders, reducing the potential for preventing future incidents. Desired state: *A clear and strict penalty policy for people who deliberately cause fires. An implemented register of such individuals exists, helping authorities to track and prevent repeated offences.*
1.5	**LACK OF TRAINED INSPECTION SERVICE FOR FIRE PROTECTION IN CERTAIN CANTONS** One of the shortcomings in terms of prevention is the inadequately trained inspection service for fire protection. The lack of experts in this field reduces the implementation and effectiveness of existing preventive measures and response plans. Therefore, it is important to invest efforts in training and strengthening the capacities of the inspection service to ensure better risk management for fires. Desired state: All cantons have well trained inspection service for fire protection.
1.6	**LACK OF POLICIES AND LFM STRATEGY IN THE FIELD OF LANDSCAPE FIRE MANAGEMENT** This gap creates serious challenges in effective prevention and response to landscape fires. Without coordination among different sectors and levels of government, it is difficult to achieve sustainable solutions and unified action. Additionally, such fragmentation can lead to inefficient use of resources, further increasing the risk of fire outbreaks. To improve risk management, it is essential to develop comprehensive policies and LFM strategy that integrate various aspects of fire protection and engage all relevant stakeholders. Desired state: *Developed policies and strategy in the field of landscape fire management.*

1.2 PREPAREDNESS

Preparedness for landscape fire management in the FBiH, Bosnia and Herzegovina is hindered by limited resources, outdated equipment, and insufficient training of personnel involved in fire response. The absence of standardized protocols and a lack of coordinated contingency planning among different administrative levels reduce the effectiveness of firefighting efforts. Furthermore, there is a need to improve communication systems and ensure timely access to accurate fire risk information. Strengthening institutional capacities, investing in modern tools and technologies, and enhancing regular training and simulation exercises are essential steps identified in the gap analysis to improve overall preparedness and readiness for landscape fire incidents.

Table 2. *Identification of gaps in the preparedness phase of the current LFM system*

No.	Identification of gaps in the preparedness phase of the current LFM system
2.1	**UNDERDEVELOPED FOREST TRANSPORT INFRASTRUCTURE** In some areas, the forest transport infrastructure is not well developed. Without proper forest transport infrastructure, it becomes difficult for firefighting teams to quickly reach fire affected areas. As a result, response time is slower, fire suppression efforts are less effective and the risk of larger forest fires increases. Desired state: *Forest transport infrastructure in the Federation of Bosnia and Herzegovina is well developed, allowing for quick and safe access for firefighting teams.*
2.2	**LACK OF MODERN TECHNOLOGIES AND MATERIAL-TECHNICAL RESOURCES FOR EARLY FIRE DETECTION AND EARLY WARNING SYSTEM** A significant deficiency in terms of preparedness relates to the use of modern technologies and equipment, which will need to be updated in the future to respond more effectively to the challenges of landscape fires. This gap refers to the insufficient availability and use of advanced tools and equipment needed to detect fires in early stages. Areas in FBiH lack modern surveillance systems such as remote sensing, drones, satellite monitoring. Desired state: *Modern technologies and material-technical resources are available and used for early fire detection and early warning system.*
2.3	**LACK OF WATER RESERVOIR NETWORK** This gap makes fire suppression more difficult, especially during dry weather conditions. Investing in the construction and maintenance of water reservoir network is crucial for improving the capacity of local communities to deal with landscape fires and protect natural resources. A network of well distributed water reservoirs is important for effective landscape fire suppression. In many fire-prone areas, the absence of well-placed reservoirs limits the capacity of firefighting units to respond quickly, especially in remote or mountainous areas where natural water sources are unavailable. Without such a water reservoir network, response times are prolonged and overall preparedness and resilience of the landscapes is reduced. Desired state: *Water reservoir network is available and strategically placed in fire-prone areas, ensuring reliable water supply for firefighting operations and reducing response time during landscape fire.*
2.4	**UNDERDEVELOPED VOLUNTEER FIRE DEPARTMENTS IN CERTAIN CANTONS** In the Federation of Bosnia and Herzegovina, volunteer fire departments are not well developed, and they can play a key role in better preparedness for the dangers of landscape fires. Existing volunteer fire departments in FBiH struggle with inadequate funding and lack of essential equipment. This hampers their ability to respond effectively to emergencies, undertake training, and maintain proper operational standards. Desired state: *Volunteer fire departments are well developed and fully trained to face landscape fires in FBiH, Bosnia and Herzegovina.*

	LACK OF DATA IN LANDSCAPE FIRE MANAGEMENT
2.5	At the level of the FBiH, Bosnia and Herzegovina, there is no landscape fire database. Partial data exist at the cantonal level. The lack of a landscape fire database creates challenges in effectively managing and responding to landscape fire incidents. Without centralized and comprehensive data on fire incidents, including their causes, locations, and impacts, it becomes difficult for authorities to analyse trends, allocate resources efficiently, develop prevention strategies, and implement timely response measures. This gap can lead to inadequate preparedness during fire events. Establishing a reliable database would facilitate better decision-making, enhance community awareness, and improve overall landscape fire management in FBiH. Desired state: *Comprehensive and centralized landscape fire database is established at the level of FBiH, Bosnia and Herzegovina.*
	ABSENCE OF LANDSCAPE FIRE RISK MAP
2.6	Developing a fire risk map is crucial as it provides valuable insights into areas most susceptible to landscape fires, enabling proactive prevention and management strategies. A risk map would support decision makers in planning fuel management, establishing firebreaks and firefighting equipment strategically. It would raise awareness among local communities about areas of higher landscape fire danger. The lack of such a map weakens both operational response and long-term landscape fire management planning. Desired state: *Developed landscape fire risk map*
	INCOMPLETE DATA OF LAND MINED AREAS
2.7	In the FBiH, Bosnia and Herzegovina, according to official data, 10% of the area is mined; however, all areas have not been fully mapped, which further poses a danger from LF. Incomplete data on mined areas pose further risk to landscape fire management and emergency response in regions affected by mines and unexploded ordnance. Insufficient information about the locations, boundaries, and conditions of these sites can hinder effective planning and development of preventive measures. Without complete data, authorities may struggle to assess potential hazards, coordinate responses to landscape fires, and implement preventive measures. Therefore, accurate and complete data on mined areas is essential for ensuring better landscape fire management. Desired state: *Established comprehensive and up-to-date database that maps all mined areas and boundaries.*
	INSUFFICIENT EQUIPMENT AND TRAINING FOR FIREFIGHTERS
2.8	One of the key gaps in the system is the insufficient equipment and training, which should be at a much better level as a measure of preparedness to respond to the dangers of LFs. Desired state: *Firefighters in FBiH, Bosnia and Herzegovina are trained and well equipped.*
	COMPLEXITY OF ADMINISTRATIVE ORGANIZATION
2.9	The complexity of administrative organization often leads to insufficiently effective coordination between different levels of government in landscape fire management. This can hinder rapid responses to fire outbreaks, as well as the implementation of prevention strategies. To improve efficiency, it is essential to simplify administrative processes and strengthen collaboration among institutions at all levels. Desired state: *Better coordinated system where all levels of government—federal, cantonal, and local—work together clearly and efficiently in managing landscape fires.*
	NOT ENOUGH MOBILIZED LOCAL POPULATION
2.10	Active involvement of local communities in training and preventive activities can enhance their preparedness and strengthen collective efforts in dealing with landscape fires. Without strong engagement, valuable local knowledge remains unused. Low community mobilization also limits prevention and preparedness efforts such as safe agricultural practices. Strengthening local community participation is crucial for building a sustainable and effective landscape fire management system. Desired state: *Strengthened local community engagement in the landscape fire events.*

	INACCESSIBLE DATA FOR PRIVATE FORESTS
2.11	In FBiH, there are 20% of private forests. Increasing access to available information about private forests can enhance collaboration between owners, local communities, and relevant institutions, thereby strengthening efforts to preserve and protect these resources from landscape fires. Desired state: *Data for private forests and their owners are available.*

1.3 SUPRESSION

Fire suppression capacities in the FBiH, Bosnia and Herzegovina are limited by outdated equipment, insufficient personnel, and lack of clear coordination mechanisms between institutions at local, cantonal, federal and state level. The absence of a unified command system and standardized operating procedures often leads to delays and inefficiencies during landscape fire response. Access to remote and rugged terrain remains a challenge due to underdeveloped forest road infrastructure. The gap analysis highlights the urgent need for investment in modern firefighting equipment, training of specialized suppression teams, mobilization of local population and the establishment of clear protocols for joint operations.

Table 3. *Identification of gaps in the suppressive phase of the current LFM system*

No.	Identification of gaps in the suppressive phase of the current LFM system
	ABSENCE OF AN ALERT AND COORDINATION SYSTEM AND LACK OF QUICK RESPONSE
3.1	At the level of Bosnia and Herzegovina, there is no effective alert and coordination system to ensure a better response during the suppression phase. Currently, there is no centralized platform for real-time fire alerts, nor is there a unified communication channel for coordinating actions between relevant institutions such as civil protection, forestry companies, fire brigades, and local authorities. This leads to delays in information sharing, slow mobilization of resources, and uncoordinated responses during landscape fire events. Without a functioning alert system, early detection and timely warnings to affected communities are also limited. Also, there is poor communication at all levels which represents a significant deficiency in terms of better preparedness for a quicker response during the occurrence of a landscape fire. Delays in detecting and responding to wildfires often result in fires spreading rapidly and becoming more difficult and costly to control. This is largely due to poor communication infrastructure, lack of real-time data sharing, and the absence of well-coordinated rapid response teams. Desired state: *Established functional alert system and unique communication channel for all administrative levels, enabling better communication and quick response to landscape fires in FBiH, Bosnia and Herzegovina.*
	LACK OF FIREFIGHTING EQUIPMENT AND AERIAL SUPPORT
3.2	Many fire brigades, especially at the local and cantonal level, operate with outdated or insufficient tools, vehicles, and protective gear, which limits their effectiveness and increases safety risks during operations. In addition, the country lacks a dedicated and readily available aerial firefighting capacity, such as helicopters and air tractors, which are crucial for responding to large landscape fires, especially in the Herzegovina area. Desired state: *FBiH, Bosnia and Herzegovina is equipped with modern firefighting equipment and have ready aerial forces that can respond to landscape fire threats in the most vulnerable parts of FBiH, such as the Herzegovina area.*

1.4 POST-FIRE MANAGEMNET

Post-fire management in the FBiH, Bosnia and Herzegovina is underdeveloped and lacks a systematic approach to damage assessment, ecological restoration, and recovery planning. There are no standardized procedures for evaluating fire impacts on ecosystems, infrastructure, or local communities, and post-fire rehabilitation activities are rarely implemented. The absence of dedicated funding and further limits effective recovery efforts. The gap analysis emphasizes the need to establish clear post-fire protocols, develop monitoring and reporting systems, and integrate restoration measures into federal and cantonal policies. Strengthening post-fire management will help reduce long-term environmental damage, support ecosystem recovery, and improve resilience to future fires.

Table 4. *Identification of gaps in the post-fire management phase in the current LFM system*

No.	Identification of gaps in the post-fire management phase in the current LFM system
4.1	**LACK OF A COMPREHENSIVE METHODOLOGY FOR DAMAGE ASSESSMENT AFTER LANDSCAPE FIRES** The absence of such a methodology inhibits proper analysis of the actual extent of LF damage, which can lead to poor planning and resource allocation for recovery of burnt areas. Developing and implementing a standardized methodology would enable more accurate assessments, thereby improving recovery strategies and long-term measures for LF protection. Desired state: *Methodology for damage assessment after landscape fires is developed at the level of FBiH, Bosnia and Herzegovina.*
4.2	**LACK OF APPLICATION OF LFM PRINCIPLES IN POST-FIRE RECOVERY PLANNING AND BURNT AREA RESTORATION** In FBiH, Bosnia and Herzegovina, post-fire recovery efforts are currently not guided by the principles of landscape fire management (LFM), which limits the effectiveness and sustainability of rehabilitation activities. Recovery planning is often reactive, uncoordinated, and lacks a long-term approach. Key elements such as risk reduction, ecological restoration, community involvement, and prevention of future landscape fires are rarely integrated into post-fire actions. This results in repeated damage to the same areas and increased vulnerability to future landscape fires. Desired state: *Post-fire recovery planning fully integrates landscape fire management (LFM) principles into all stages of planning and implementation in FBiH, Bosnia and Herzegovina, and have developed integrated approach to ecological restoration.*

4.3	**INSUFFICIENT POST-FIRE DAMAGE ASSESSMENT AND SCIENTIFIC RESEARCH FOR EFFECTIVE MANAGEMENT** **4.3.1 Lack of Standardized Damage Assessment Methods** Currently, there is no fully established system of standardized procedures for conducting post-fire landscape damage assessments. This results in inconsistent data collection, reporting, and analysis across institutions, complicating planning and response efforts. Standard operating procedures (SOPs), statistical forms, and simple assessment protocols are needed to ensure that damage assessments are conducted consistently and reliably. Desired State: Relevant institutions have established standardized methods and tools for post-fire damage assessment, enabling consistent, high-quality data collection across all affected landscapes. **4.3.2 Insufficient Scientific Research on Post-Fire Management** Beyond operational assessments, there is a lack of systematic scientific research on post-fire management. This includes studies on ecological recovery, soil and hydrological impacts, vegetation regeneration, fuel load changes, biodiversity effects, and the effectiveness of restoration or mitigation measures. Inadequate research limits the ability to develop evidence-based strategies for landscape rehabilitation, risk reduction, and long-term resilience. Decision-making often relies on outdated assumptions rather than empirical knowledge, reducing the effectiveness of recovery efforts and future fire prevention. Desired state: *Researchers and institutions have conducted systematic studies on post-fire impacts and management strategies, and their findings have guided adaptive restoration, rehabilitation, and prevention measures, ensuring effective and ecologically sustainable post-fire management.*
4.4	**LACK OF ADEQUATE MONITORING** Monitoring after the rehabilitation of burned areas is not on an adequate level, which very often leads to the occurrence of new landscape fires. This includes limited tracking of fire occurrence, causes, affected areas, and ecological impacts, as well as weak follow-up on implemented landscape fire prevention and recovery measures. Desired state: *Better monitoring of burned sites in FBiH, Bosnia and Herzegovina is established.*

2. IMPLEMENTATION FRAMEWORK

The implementation framework outlined in this gap analysis provides a set of targeted measures to improve landscape fire management in the FBiH, Bosnia and Herzegovina. It focuses on strengthening institutional coordination, developing legal and policy frameworks, enhancing technical and human capacities, and integrating modern technologies for fire prevention, preparedness, suppression and recovery. Key actions include investment in firefighting equipment and aerial support, development of community-based fire prevention programmes, and integration of scientific research and monitoring into landscape fire management practices. The plan also emphasizes the importance of stakeholder engagement and sustained funding to ensure long-term impact. The primary focus is on strengthening institutional coordination, developing comprehensive legal and policy frameworks, enhancing technical and human capacities, and integrating modern technologies for effective fire prevention, preparedness, suppression, and recovery.

To strengthen institutional coordination, it is essential to establish a multi-agency task force that facilitates collaboration among governmental bodies, NGOs, and local communities involved in landscape fire management. Clearly defining roles and responsibilities for each stakeholder will ensure efficient coordination and response during landscape fire incidents.

Also, developing legal and policy frameworks is crucial, necessitating a review and update of existing legislation related to landscape fire management. This will create a coherent legal framework that supports proactive measures and facilitates swift response. It is also important to develop policies that promote sustainable land-use practices, which help reduce the risk of landscape fires.

Enhancing technical and human capacities involves investing in modern firefighting equipment, including personal protective gear and aerial support capabilities for efficient fire suppression. Comprehensive training programmes for personnel involved in fire management should be provided, focusing on both technical skills and leadership development.

The integration of modern technologies plays important role in landscape fire management. Utilizing satellite imaging and GIS technology for real-time monitoring and analysis of fire-prone areas will enable better-preparedness strategies. Furthermore, developing and deploying early warning systems can alert communities about fire risks and enhance response times.

Community-based fire prevention programmes should be initiated to educate the public about fire prevention strategies, encouraging local participation in fire management efforts. Implementing community-driven reforestation projects will also promote resilient landscapes and help reduce fire risks. Integrating scientific research and monitoring is vital. Collaborating with academic institutions will facilitate research on fire behaviour, ecosystems, and climate impacts, thus informing management practices. Establishing a monitoring system to evaluate the effectiveness of fire management strategies will provide data for necessary policy adjustments.

The implementation of these targeted actions will facilitate the transition from a reactive to a proactive landscape fire management approach in FBiH, Bosnia and Herzegovina. By focusing on coordination, capacity building, community involvement, and the integration of modern technologies, the region can enhance its resilience to landscape fires.

Implementation framework

Priority I - High

Priority II - Moderate

Priority III - Low

No.	IDENTIFIED GAP	MEASURES/ACTIONS TO BE TAKEN	PERIOD OF IMPLEMENTATION	RESPONSIBLE INSTITUTIONS	FORESEEN BUDGET (EUR)
1	PREVENTION				
1.1	LACK OF LAW ON FORESTS IN THE FEDERATION OF BOSNIA AND HERZEGOVINA	1.1.1 Adoption of the Forest Law of the Federation of Bosnia and Herzegovina, amendments to the Fire protection and firefighting Law	1-3 years	FMAWF, federal civil protection, Government of FBiH	-
		1.1.2 Incorporation of LFM principles in Forest Law of the FBiH			
1.2	LACK OF COMPREHENSIVE MEDIA CAMPAIGN AND LACK OF EDUCATION ON THE DANGER OF LANDSCAPE FIRES, AS WELL AS LUCK OF GENERAL AWARENESS OF THE IMPORTANCE OF PREVENTION	1.2.1. Creation of communication strategy and educational materials about the danger of landscape fires	Up to 1 year	Ministries of education (federation, cantons, municipalities)	60,000
		1.2.2 Raise awareness about the importance of prevention of landscape fires			100,000
		1.2.3 Including LFM principles into education system in high schools			50,000
1.3	ILLEGAL CONSTRUCTION AND NON-COMPLIANCE WITH REGULATIONS	1.3.1. Amendments of the Construction Law. Construction in rural and fire prone areas should be prohibited	1-3 years	Ministries of spatial planning and construction (federal, cantonal)	-
1.4	INADEQUATE PENALTY POLICY AND LACK OF A REGISTER OF INDIVIDUALS WHO DELIBERATELY CAUSE FIRES	1.4.1 Review of the criminal laws on the level of FBiH and cantonal laws	Up to 5 years	Ministry of internal affairs (federal, cantonal)	-
		1.4.2 Introduce higher penalties for those who intentionally start fires in open areas			
		1.4.3 Introduce prison sentences for individuals who repeatedly and intentionally start fires			

1.5	LACK OF TRAINED INSPECTION SERVICE FOR FIRE PROTECTION IN CERTAIN CANTONS	1.5.1 Increase the number of fire protection inspectors and their field activities	1-3 years	Federal and cantonal inspection agencies	-
1.6	LACK OF INTEGRATED POLICIES AND STRATEGIES IN THE FIELD OF LANDSCAPE FIRE MANAGEMENT	1.6.1 Creation of strategic documents related to landscape fire management on the FBiH level	1-3 years	FMAWF	50,000
		1.6.2 Review of the existing cantonal laws for fire protection	1-3 years	Cantonal ministries of agriculture, water management and forestry	20,000
2	PREPAREDNESS				
2.1	UNDERDEVELOPED FOREST TRANSPORT INFRASTRUCTURE	2.1.1 Construction of new forest roads in accordance with forest management plans (FMP)	Up to 5 years	Cantonal forestry companies	2,000,000
2.2	LACK OF MODERN TECHNOLOGIES AND MATERIAL-TECHNICAL RESOURCES FOR EARLY FIRE DETECTION AND EARLY WARNING SYSTEM	2.2.1. Introduce new technologies for early detection (i.e. drones, satellite images, NFFIS)	1-3 years	Ministry of Security BiH, federal civil protection, FMAWF, cantonal ministries of forestry	1,000,000
		2.2.2 Purchase of material-technical resources for early fire detection and early warning system in all cantons in FBiH			2,000,000
2.3	LACK OF WATER RESERVOIR NETWORK	2.3.1 Conduct research on potential location for water reservoirs	Up to 5 years	FMAWF, cantonal forestry companies	300,000
2.4	UNDERDEVELOPED VOLUNTEER FIRE DEPARTMENTS IN CERTAIN CANTONS	2.4.1 Establish volunteer fire brigades in cantons where they are underdeveloped	1-3 years	Federal civil protection, cantonal civil protection	20,000
		2.4.2 Organize specific landscape fire management trainings for volunteer firefighters in FBiH			20,000
2.5	LACK OF DATA IN LANDSCAPE FIRE MANAGEMENT	2.5.1 Creation of unique landscape fire database in FBiH	1-3 years	FMAWF, federal civil protection	30,000
2.6	ABSENCE OF FIRE RISK MAP	2.6.1 Creation of landscape fire risk map in FBiH	1-3 years	FMAWF, federal civil protection	30,000

2.7	INCOMPLETE DATA OF LAND MINED AREAS	2.6.1 Mapping of all mined areas in FBiH	Up to 5 years	Federal civil protection, cantonal civil protection agencies	80,000
2.8	INSUFFICIENT EQUIPMENT AND TRAINING OF FIREFIGHTERS	2.7.1 Development of specific landscape fire management training programmes for professional firefighters in FBiH	1-3 years	Government of FBiH, cantonal governments	700,000
		2.7.2 Procurement of modern firefighting equipment for professional firefighters in FBiH			
		2.8.1 Organize quick response training for cases of large-scale landscape fire			
2.9	COMPLEXITY OF ADMINISTRATIVE ORGANIZATION	2.9.1 Amendments to the constitution of BiH and laws related to fire protection	1-3 years	State and entity parliament	-
2.10	NOT ENOUGH MOBILIZED LOCAL POPULATION	2.10.1 Ensure active involvement of local people in preventive LFM activities through awareness raise campaigns	Up to 5 years	Municipalities	100,000
		2.10.2 Educate local people about the danger of burning ground vegetation in spring and summer seasons			
		2.11.2 Establish quick information exchange between different administrative levels (federal, cantonal, local)			
2.11	INACCESSIBLE DATA FOR PRIVATE FORESTS	2.12.1 Creation of database of private forests in FBiH	Up to 5 years	Cantonal forestry directorates	10,000
3	SUPRESSION				
3.1	ABSENCE OF AN ALERT AND COORDINATION SYSTEM AND LACK OF QUICK RESPONSE	3.1.1 Establish emergency phone number on state level - 112	1-3 years	Ministry of security BiH, BiH Representative House, BiH House of Peoples	-
3.2	LACK OF FIREFIGHTING EQUIPMENT AND AERIAL SUPPORT	3.2.1 Conducting comprehensive study on aircrafts types that best fits for FBiH	1-3 years	Ministry of Defence BiH, Armed Forces BiH, federal government, cantonal governments	10,000,000
		3.2.2 Purchase of adequate aircrafts for aerial firefighting in FBiH			

4	POST FIRE MANAGEMENT				
4.1	LACK OF A COMPREHENSIVE METHODOLOGY FOR DAMAGE ASSESSMENT AFTER LANDSCAPE FIRES	4.1.1 Creation of methodology for damage assessment after landscape fires	Up to 5 years	FMAWF	10,000
4.2	NEGLECT OF LFM PRINCIPLES IN RECOVERY PLANNING	4.2.1 Incorporate LFM principles in recovery planning including Forest management plans (FMP)	1-3 years	Cantonal forest companies	10,000
4.3	INSUFFICIENT POST FIRE DAMAGE ASSESSMENT AND SCIENTIFIC RESEARCH FOR EFFECTIVE MANAGEMENT	4.3.1 Funding of scientific research in fire damage assessment 4.3.2 Incorporate fire damage assessment in Forest management plans (FMP)	1-3 years	Cantonal forest companies, Faculty of Forestry, FMAWF	20,000
4.4	LACK OF ADEQUATE MONITORING	4.4.1 Establish a centralized landscape fire monitoring system in FBiH 4.4.2 Introduce remote sensing and GIS tools for better landscape fire damage assessment	Up to 5 years	Cantonal forest companies	50,000
4.5	LACK OF INTEGRATED APPROACH TO ECOLOGICAL RESTORATION (LAND REHABILITATION)	4.5.1 Develop a strategy for post-fire ecological restoration in FBiH 4.5.2 Funding of pilot projects for ecological restoration after LF in FBiH	1-3 years	FMAWF, cantonal ministries of forestry	80,000

3. MONITORING AND EVALUATION

Monitoring and evaluation are essential components of the gap analysis implementation process, ensuring that progress is tracked and results are measured over time. A clear framework should be established to regularly assess the effectiveness of actions taken, identify challenges, and adapt strategies as needed. This includes setting measurable indicators, collecting data on fire incidents, response times, recovery efforts, and community engagement. Involvement of relevant institutions, scientific bodies, and local stakeholders is key to ensuring transparency and accuracy. Regular reporting and evaluation will help improve accountability, guide future planning, and ensure continuous improvement of landscape fire management in FBiH, Bosnia and Herzegovina. Furthermore, in FBiH, Bosnia and Herzegovina, the collaboration with the Federal Ministry of Agriculture, Water Management, and Forestry as a partner institution will play important role in the monitoring and evaluation process.

The Federal Ministry of Agriculture, Water Management, and Forestry possesses both the expertise and authority necessary to oversee and guide the monitoring and evaluation of landscape fire management initiatives. Its involvement will ensure that monitoring and evaluation activities align with national policies and priorities related to land use, agriculture, and forestry, fostering a holistic approach to landscape fire management. The Ministry's capacity to provide technical support and access to relevant data will enhance the overall efficacy of monitoring and evaluation process.

A comprehensive monitoring and evaluation framework should be developed, encompassing a set of measurable indicators that reflect both the efficiency of landscape fire prevention and the effectiveness of response efforts. The Federal Ministry will be instrumental in defining these indicators, ensuring they are realistic, relevant, and capable of capturing the multifaceted aspects of landscape fire management. This may include metrics related to fire incidence rates, response times, community engagement levels, and changes in land use practices.

Data collection and analysis are crucial elements of the monitoring and evaluation process. The Ministry will facilitate the gathering of data through collaboration with local agencies, NGOs, and scientific institutions. This approach will provide a robust and accurate picture of landscape fire management outcomes, enabling stakeholders to make informed decisions. Regular data updates will ensure that information remains current and applicable to ongoing strategies.