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LANDSCAPE FIRE MANAGEMENT
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Landscape Fire Management Gap Analysis in North Macedonia



ФАРМАХЕМ ФАРМАЦЕМ

HELVETAS

Република Северна Македонија
Министерство за земјоделство, шумарство и водостопанство

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

Regional Executive Agency – FARMAHEM (REA)
Regional Fire Monitoring Center (RFMC)
Ministry of agriculture, forestry, and water economy (MAFWE)
Ministry of Environment and Physical Planning (MoEPP)
State Inspectorate for Forestry and Hunting (SIFH)
State Inspectorate for Environment (SIE)
State Hydrometeorological Service (SHS)
Agency for Real Estate Cadastre (AREC)
National Park Mavrovo (NPM)
National Park Galicica (NPG)
National Park Pelister (NPP)
National Park Shar Mountain (NPSM)
Public Enterprise for Management and Protection of the Multipurpose Area "Jasen" – Skopje
State Statistical Office (SSO)
Public Enterprise "National Forests" (PENF)
Public Enterprise "Parks and Greenery" (PEPG)
Public Enterprise Pastures (PEP)
Directorate for Protection and Rescue (DPR)
Crisis Management Center (CMC)
Forest Police (FP)
UKiM, Hans Em Faculty of Forest Sciences, Landscape Architecture and Environmental Engineering (HAF)
UGD, Military Academy, General Mihailo Apostolski - Skopje
National Association of Private Forest Owners (NAPFO)
Association of Local Self-Government Units (ZELS)
Macedonian Ecological Society (MES)
Voluntary Fire Department Sveti Nikole
Voluntary Fire Department "Entuzijast" – Ohrid
Territorial Fire Department – Struga
Territorial Fire Department – Rankovce
Territorial Fire Department – Kumanovo
Territorial Fire Department – Kriva Palanka
Territorial Fire Department – Kocani

LIST OF ACRONYMS

CMS	Crisis Management System
CMC	Crisis Management Centre
DPR	Directorate for Protection and Rescue
PRS	Protection and rescue system
LF	Landscape fire
LFM	Landscape Fire Management
LFMWB	Landscape Fire Management in the Western Balkan
MAFWE	Ministry of Agriculture, Forestry and Water Economy
MoEPP	Ministry of Environment and Physical Planning
MoD	Ministry of Defence
MoI	Ministry of Interior
MoE	Ministry of Education
MKFFIS	Macedonian Forest Fire Information System
NGOs	Non-governmental organizations
NMK	North Macedonia
NPs	National Parks
NAPFO	National Association of Private Forests Owners
PENF	Public Enterprise National Forests
PEP	Public Enterprise Pastures
PRS	Protection and Rescue System
PEs	Public Enterprises
RFMC	Regional Fire Monitoring Center
SSO	State Statistical Office
SWOT	Strengths, Weaknesses, Opportunities, and Threats
TPPEs	Territorial fire protection units
UXO	Unexploded ordinances
UHMR	Hydrometeorological Service of North Macedonia

EXECUTIVE SUMMARY

This gap analysis provides a comprehensive evaluation of the Landscape Fire Management system in North Macedonia 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 of its 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 national LFM networks of North Macedonia 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, meaning: 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 North Macedonia :

- Prevention: Significant shortcomings in prevention include insufficient public awareness and education in fire risks, absence of a comprehensive National Landscape Fire Management Plan, and inadequate integration of LFM principles within educational curricula. Addressing these issues requires immediate launch of a national public awareness campaign and establishment of a dedicated Stakeholders Fire Management Planning Committee. Additionally, the development of comprehensive national landscape fire risk maps and improved management practices for pasture lands and evergreen forests are crucial.
- Preparedness: Key preparedness gaps include shortage of adequately trained staff and essential resources, and limited aerial firefighting capabilities. Recommended actions involve establishment of a national LFM training centre, and establishment of a properly developed network of meteorological stations. The creation of national-level fuel mapping, risk maps, and an early warning system, along with the implementation of a fuel management strategy, has also been identified as a high-priority investment.
- Suppression: Major challenges in suppression include declining operational capacity of voluntary firefighting associations, absence of an efficient incident command system, and scarcity of modern fire weather instruments and tools. High-priority recommendations include securing permanent financing for voluntary firefighting associations, establishing a legal framework for an incident command system, and acquisition of firefighting equipment such as fire trucks and aerial means.
- Post-Fire Management: Post-fire management is hindered by gaps in specialized forensic services for fire investigation, limited scientific research capacity, and challenges with data collection and utilization. While specific cost estimates aren't provided, improvements can be facilitated through broader development of the national LFM plan, resolution of legal ownership issues for private landowners, and development of clear regulations for firebreak construction and maintenance.

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 North Macedonia'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

The Landscape Fire Management in Western Balkans (LFMWB) Programme is a strategic initiative designed to enhance landscape fire management (LFM) capabilities across the Western Balkans region. This vital program, financed by the Swiss Agency for Development and Cooperation, brings together expertise and resources to address the growing challenges of landscape fires in the region. Under the coordination of FARMAHEM Skopje and with backstopping support from HELVETAS Swiss Intercooperation, the programme strengthens regional capacity for landscape fire prevention and management.

The overall goal of this LFMWB is to increase the resilience of Western Balkan forests and landscapes against fires and benefit the people who depend on these landscapes for their livelihoods and socioeconomic development using a participatory approach that includes the local population in the processes, promotes gender equality, and further strengthens public awareness of the importance of safeguarding natural resources. This goal is aligned with the SDC's Framework strategic components: Climate-resilient development and Sustainable management of natural resources.

The Programme outcomes:

(1) Better cooperation: A lasting regional network is established and contributes to cross-boundary knowledge exchange and cooperation in landscape fire management (LFM);

(2) Better capacities: Strengthened capacities on broader LFM approaches allow for effective cross-sectoral collaboration at multiple levels;

(3) Better policies: Revised policies and strategies on LFM are in place to support sustainable landscape management at local, national, and regional levels; initiate inter-sectoral collaboration, improved working approaches, and involvement of the community and key stakeholders in the development processes.

This document serves as a natural continuation of the National Landscape Fire Management Report for North Macedonia, building upon its foundational assessment of the country's landscape fire management. While the National LFM Report provides a comprehensive overview of the current state, this analysis focuses specifically on identifying critical gaps in policies, institutional frameworks, and implementation mechanisms that need to be addressed to strengthen the country's landscape fire management capabilities.

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.

GAP ANALYSIS AS A STRATEGIC TOOL

The Gap Analysis is a structured assessment used as a tool that compares the current state to the desired future state, analyzing actual results and comparing them to expected results, and identifying differences or "gaps' between them. This analysis helps to understand what steps to take to achieve the desired goals or results and recommends measures and actions to mitigate them.

Gap analysis is a valuable tool for making informed and transparent decisions and encouraging improvements in the implementation process. This analysis also helps organizations overcome deficiencies and break down barriers between their current and desired state.

Addressing ground principles for the creation and implementation of the gap analysis:

- Data-driven analysis: The gap analysis is based on concrete data and information, not assumptions.
- Alignment with the goals: The identified gaps and implementation framework (bridging the defined gaps and reaching the desired state) have been aligned with the goals and priorities of the Landscape Fire Management approach.
- Implementation period and sustainability: First, the main attention is needed to solve the most critical gaps in order to increase the impact of the realized efforts.
- Feasibility: The implementation framework is both realistic and feasible and can be successfully implemented under the provision of necessary resources, professionalism, and dedication.
- Involvement of stakeholders: This gap analysis, engages relevant key stakeholders through the existing National network of the Landscape Fire Management in North Macedonia in fostering a participatory and transparent approach where all parties contribute valuable insights to ensure the effective/efficient implementation framework.
- Continuous improvement: The gap analysis provides a basis for an ongoing dynamic process that should involve collaborative interaction among key stakeholders in bridging the identified gaps. Regular updates to the gap analysis of the fire protection system are necessary to adapt to changing circumstances.
- Communication: Effective communication and collaboration between relevant stakeholders is paramount in ensuring all parties involved in the process are aligned and have mutual understanding.

OBJECTIVES OF THE LFM GAP ANALYSIS

The Gap analysis of the landscape fire management system in the Republic of North Macedonia serves as a comprehensive assessment tool designed to evaluate the current landscape fire management system against the desired future state. This analysis is a direct continuation of Chapter Eight (VIII) of the Landscape Fire Management Report for North Macedonia, where the initial framework for this assessment was established.

The primary objectives of this LFM gap analysis are to:

- ✓ Identify and document existing gaps and challenges in the current landscape fire management practices within North Macedonia.
- ✓ Compare the present state of landscape fire protection/management systems with desired future capabilities.
- ✓ Highlight specific deficiencies/gaps that need to be addressed through systematic improvement.
- ✓ Provide a foundation for developing concrete steps and activities to enhance the country's LFM system.
- ✓ Guide the transformation of the current landscape fire management system into a comprehensive Landscape Fire Management System.
- ✓ Support the establishment of effective LFM principles and governance structures.

This document is designed to serve as a practical roadmap for transitioning from the current landscape fire management system to a more robust and effective landscape fire management system in North Macedonia. By identifying specific gaps and proposing targeted solutions, it provides decision-makers and stakeholders with a clear direction for system improvements.

SCOPE AND APPROACH

The Gap analysis employs a comprehensive methodology that covers all phases of landscape fire management in North Macedonia, ensuring a thorough evaluation of the entire system.

Scope of Analysis:

The analysis encompasses a comprehensive evaluation of the entire landscape fire management system in North Macedonia, covering four fundamental phases:

- ✓ Prevention: Including risk assessment and monitoring systems, public awareness and education programs, land management practices, fuel management strategies, prevention infrastructure, and legal and regulatory frameworks.
- ✓ Preparedness: Including Resource availability and allocation, training and capacity building, equipment and technology readiness, inter-agency coordination mechanisms, emergency response protocols, communication systems, and stakeholder roles and responsibilities.
- ✓ Fire Suppression: Such as operational procedures and protocols, command and control systems, resource mobilization, firefighting techniques and capabilities, inter-agency cooperation during incidents, cross-border cooperation mechanisms, and safety protocols and procedures.
- ✓ Post-Fire Management: Such as damage assessment methodologies, recovery and rehabilitation strategies, environmental impact evaluation, social and economic impact assessment, lessons learned documentation, and system improvement procedures.

Methodological Approach:

The analysis employed a structured, multi-phase methodological approach designed to ensure comprehensive stakeholder participation and thorough system evaluation, with expert support provided throughout the entire process of the preparation of this document by the Regional Fire Monitoring Center (RFMC).

The approach of this gap analysis encompasses all phases of landscape fire management, including landscape fire prevention, preparedness, suppression, and post-fire management in North Macedonia. This extensive evaluation was conducted during the 2nd and 3rd National Landscape Fire Management Workshop and meeting of the National Landscape Fire Management network in North Macedonia, where the main shortcomings/gaps of the current landscape fire management system were defined through a SWOT analysis.

Throughout the workshops and working groups, stakeholders demonstrated a strong professional interest in contributing to the preparation of this document.

1. GAP IDENTIFICATION ON LANDSCAPE FIRE MANAGEMENT IN NORTH MACEDONIA

This document, in a form of a gap report, presents the findings of the analysis as identified gaps in the current landscape fire management system in North Macedonia. Focusing on four (4) key stages of fire management prevention, preparedness, suppression, and post-fire management this chapter represents several gaps defined, described, and future desired stages to improve the country's resistance to landscape fires, as well as the protection of the environment and the local community.

By examining these areas, we can better understand the challenges North Macedonia faces in managing fire risks and ensure a more comprehensive, coordinated approach to wildfire management. The following outlines the specific gaps identified across these crucial areas.

GAP analysis for each of the elements of the four categories (Prevention, Preparedness, Suppression, and Post-fire Management), was done according to the following structure:

1. GAP formulation
2. Detailed description of the gap – explanation of root causes of the GAP
3. Desired state – The Desired state is actually an outcome or achieved objective in the period between 1 and 5 years. While the desired state defines WHAT needs to be achieved within a period 1-5 years, the Implementation plan proposes concrete measures/activities on HOW the desired state will be achieved.

1.1. PREVENTION

Prevention is a key phase and of great importance for reducing the likelihood of fires occurring and mitigating their impact before they escalate. By implementing preventive measures, such as creating firebreaks, managing vegetation, and enforcing fire safety regulations, the risk of uncontrolled fires is minimized. This proactive approach not only protects ecosystems, property, and human lives but also reduces the long-term costs and resource demands associated with firefighting and recovery. Effective prevention strategies ensure that fire management efforts are sustainable and focus on minimizing fire risks before they become catastrophic.

Although the LFM system in North Macedonia is based on a large number of laws and regulations that are in force, an important point is their implementation, control, and constant monitoring.

Table 1 *Gap Analysis, Main gaps identified in the prevention phase of the LFM system in North Macedonia*

No.	IDENTIFIED GAPS IN THE PREVENTION PHASE OF THE LFM SYSTEM
1.1	**INSUFFICIENT PUBLIC AWARENESS AND UNDERSTANDING OF LANDSCAPE FIRE MANAGEMENT (LFM)** One of the major gaps in the current Landscape Fire Management (LFM) system in the Republic of North Macedonia is the insufficient level of public awareness regarding the importance of LFM practices among local communities, institutions, and key stakeholders. This lack of understanding significantly hinders the effectiveness of fire prevention and management strategies, as the community's engagement and proactive participation in fire management efforts are limited. The general public and many local authorities may not fully comprehend the risks associated with landscape fires or the long-term impact they have on both the environment and public safety. This lack of awareness often results in inadequate preparation and response to fire risks, leaving communities more vulnerable to fires when they occur. Additionally, without a clear understanding of the role of LFM, stakeholders may be less motivated to adopt or support preventive measures. This gap affects not only the general population but also local governance and institutions, which may not prioritize LFM or incorporate it into broader land-use and development policies. Without a strong institutional commitment, the necessary measures to protect vulnerable areas from fires are not adequately enforced or coordinated. A significant gap, such as the lack of LFM public awareness campaigns, can have far-reaching implications and effects, especially in the regions prone to landscape fires. While local and regional initiatives may exist, there is no cohesive National LF Campaign, with standardization in messaging, resources, or promotional materials. This can lead to inconsistent awareness levels that may affect preparedness across different regions. Addressing this gap is essential to improving fire prevention, enhancing community resilience, and reducing the negative impact of landscape fires on North Macedonia's environment and its people. Desired state: A well-informed, proactive community has been established with a comprehensive understanding of the risks and implications of landscape fires, as well as the importance of landscape fire management practices. This achieved state has resulted in a more resilient and prepared society that successfully mitigates fire risks and effectively manages landscape fires for the long-term benefit of the environment and local communities.
1.2	**INSUFFICIENT INCLUSION OF THE LFM PRINCIPLES IN THE EDUCATION PROGRAMMES** The insufficient inclusion of landscape fire management principles in all education programs (kindergartens, primary schools, high schools, universities, etc.) is a significant issue that undermines effective landscape fire management. As landscape fires become more frequent and severe due to climate change and other human activities, the need for comprehensive education in landscape fire management has never been more critical. Furthermore, there are no well-defined programmes for landscape fire education, for a specific target group by age, gender, cultural values, and language which leads to different vulnerabilities of the population on landscape fire events. Incorporating sufficient knowledge about Landscape Fire Management (LFM) into educational programs is crucial for building a skilled and informed workforce capable of addressing fire risks in an effective and proactive manner. By educating future generations—particularly in fields such as forestry, environmental science, agriculture, and public policy—about fire prevention, preparedness, response, and recovery, educational programs play a vital role in fostering a culture of fire safety and resilience. Well-informed professionals can contribute to better decision-making in both public and private sectors, ensuring that fire management practices align with best practices, regulatory standards, and climate change adaptation strategies.

1.2	Education programs that emphasize LFM also enhance public awareness and community engagement. As future leaders, workers, and citizens are equipped with a deep understanding of fire risks, they are more likely to adopt and promote fire-resistant practices in their personal and professional lives, benefiting entire communities. Furthermore, integrating LFM into education ensures the development of innovative solutions to the evolving challenges of wildfire management, contributing to the resilience of landscapes, ecosystems, and communities. The insufficient knowledge about landscape fire management in educational programs can be attributed to several potential causes, such as, including lack of integration into educational curricula and limited coverage in related fields. Even when fire management topics are covered, they are introduced only briefly in broader courses related to environmental management, forestry, or disaster risk reduction. This limits the depth of knowledge students acquire about the specific challenges and strategies related to landscape fire management. Another cause of this gap is lack of expertise among educators. Teachers and professors in educational institutions may lack the specialized training and expertise in landscape fire management. Without instructors who are well-versed in this area, it is difficult for students to gain a thorough understanding of fire management principles, risks, and strategies. The existing educational programs at the University of agriculture and forestry focus more on theoretical aspects of environmental management and less on practical, hands-on training in fire management. Landscape fire management requires real-world knowledge, including the use of technology (e.g., GIS, satellite monitoring), fieldwork, and direct experience in fire prevention and suppression, which may not be adequately addressed in traditional academic settings. Opportunities for students to engage in field-based learning, internships, or work with fire management agencies are limited. Practical exposure to fire management activities—such as firebreak creation, wildfire response, and controlled burns—helps students connect theoretical knowledge with real-world fire challenges. There is also limited awareness of the importance of Landscape Fire Management. Educational policymakers and institutions may not fully recognize the importance of incorporating landscape fire management into educational programs. Additionally, there is limited collaboration between academia and fire management authorities. Educational institutions do not have strong partnerships with relevant government bodies, fire management agencies, or non-governmental organizations involved in landscape fire management. Collaboration between academia and fire management professionals is essential for ensuring that the latest research, strategies, and practical experiences are incorporated into educational programs. Landscape fire management requires an interdisciplinary approach, integrating fields such as ecology, geography, meteorology, and public policy. Educational programs that fail to adopt this holistic perspective may leave students with a limited understanding of the complex, interconnected nature of fire management. Addressing the gap of insufficient knowledge about landscape fire management in educational programs requires a multi-faceted approach, including curriculum reform, improved coordination between educational institutions and fire management agencies, increased funding for research and training, and enhanced public awareness of fire risks. By integrating fire management principles into the broader educational system, North Macedonia can ensure that future generations are better equipped to manage landscape fire risks effectively. Desired state: Comprehensive integration of LFM principles across relevant educational curricula, where students at various levels of education gained the knowledge, skills, and practical experience needed to effectively manage and mitigate landscape fire risks.

ABSENCE OF A NATIONAL LANDSCAPE FIRE MANAGEMENT PLAN

Landscape Fire Management (LFM) Plan at the national level is crucial because it provides a unified framework for managing wildfire risks across the entire country. It should serve as an essential blueprint for coordinating efforts among stakeholders, an overview of the historical fire events, and current stage, vegetation management, setting priorities, and allocating resources for fire management activities through the entire process of LF management in all phases from prevention to post-fire management activities. A national plan outlines prevention, preparedness, suppression, and recovery strategies, ensuring that local, regional, and national agencies are aligned. This approach helps optimize the use of resources, ensures the safety of communities and ecosystems, and enhances resilience to wildfires, especially in regions with varying topographies, climates, and fire risks.

Additionally, a national LFM plan integrates fire management with broader environmental policies, such as climate change adaptation and land use planning, creating a holistic approach to fire risk reduction. It also facilitates public awareness campaigns, improves inter-agency coordination, and sets the groundwork for policies that prioritize fire prevention and resilience.

The absence of a National Landscape Fire Management Plan results in taking unharmonized actions of various stakeholders. A fragmented, uncoordinated approach to fire management could result in significant environmental, economic, and social consequences, undermining efforts to build resilience and minimize the impact of wildfires.

The national landscape fire management plan

The absence of a national landscape fire management plan in North Macedonia can be attributed to a combination of political, institutional, financial, and awareness-related barriers, including:

1.3. One of them is lack of political will and prioritization - Landscape fire management has not been viewed as a top priority by national government leaders or policymakers. This resulted in the lack of resources and attention dedicated to developing and implementing a comprehensive national fire management plan.

Fire management falls under multiple agencies, including forestry, agriculture, disaster management, and local government. Lack of clear coordination mechanism, lead to fragmented efforts with no central leadership for developing a cohesive, unified national fire management plan. This fragmented approach can lead to duplication of efforts or gaps in coverage.

There is also lack of awareness at the national level – among key decision-makers. There is limited recognition of the risks and potential long-term impacts of landscape fires on the environment, economy, and communities. As a result, the development of a national plan is not prioritized.

Inadequate human resources are another cause for not having national landscape fire management plan. There is lack of personnel with specialized knowledge in fire management, land-use planning, and risk assessment for developing and implementing a national landscape fire management plan.

Limited resources and funding are another factor that delays the creation and implementation of such a plan, as well as limited involvement of the stakeholders. In addition, in North Macedonia landscape fire.

In addition, in North Macedonia landscape fire management has historically been neglected, and fires have been managed on a case-by-case basis or through local emergency responses.

Overcoming these challenges requires strong leadership, cross-sector collaboration, sufficient resources, and a comprehensive, long-term approach to fire management planning.

Desired state: Established harmonized system for landscape fire management in which every stakeholder clearly understands its role and jurisdiction. A comprehensive, coordinated, and sustainable national fire management plan has been developed and implemented. This plan effectively integrates prevention, preparedness, response, and recovery measures, ensuring the protection of the environment, communities, and infrastructure from landscape fires.

1.4	**ABSENCE OF A STRATEGY FOR LF MANAGEMENT OF PASTURE LAND** The threat of fires on pastures stems from the failure to implement comprehensive fire prevention and mitigation strategies. As a result, landscape fire incidents are more frequent, putting livestock safety at risk and diminishing the productivity of these lands. This lack of effective management also contributes to a large number of fires occurring at the interface between pastures and forests, further exacerbating the impact on both ecosystems and agricultural resources. One of the potential causes for this gap is insufficient policy d. development. There may be a lack of strategic vision or government commitment to develop and implement a comprehensive pasture land management strategy. This could be due to competing priorities or limited focus on land use planning. There is also weak institutional coordination. Different agencies or levels of government are responsible for land use, agriculture, and environmental protection, but lack of effective coordination, hampers the process of creating a unified strategy for pasture management. Pressure to maximize immediate agricultural output is another factor that contributes to this gap, through overusing of pasture lands and neglecting the need for a more balanced and sustainable management approach. The situation is further complicated by issues with concessionaires, whose lack of adherence to proper land management practices or failure to implement fire safety measures in leased areas exacerbates the problem. This negligence not only contributes to higher fire risks but also undermines the long-term sustainability of pasture lands and surrounding ecosystems. Desired state: A comprehensive landscape fire management strategy has been implemented, with improved management of pasture land, protecting the environment and landscapes, ensuring long-term agricultural productivity.
1.5	**INSUFFICIENTLY DEVELOPED NETWORK OF METEOROLOGICAL STATIONS FOR THE NEEDS OF LFM** Insufficiently developed network of meteorological measuring stations for the needs of Landscape Fire Management (LFM) directly affects the ability to effectively monitor and predict fire risks, which are critical for proactive fire management. Meteorological data is essential for assessing fire danger, particularly factors such as temperature, humidity, wind speed, and precipitation, which are key drivers of fire behavior. Without an adequately developed network of weather stations, fire management agencies lack the necessary data to anticipate fire risks, plan resource deployment, and issue timely warnings. This gap increases vulnerability to large, uncontrolled wildfires, as decisions made without accurate weather information may lead to delayed responses or inadequate fire suppression strategies. Moreover, insufficient meteorological coverage can hinder post-fire recovery efforts, as accurate data on environmental conditions is needed to assess the extent of fire damage and guide restoration strategies. Several root causes contribute to this gap. First, there may be limited funding and resources allocated to the development and maintenance of meteorological infrastructure. Establishing a network of stations requires significant investment in both physical infrastructure and ongoing operational costs, and if fire management is not adequately prioritized in national budgets, these systems may remain underdeveloped. Another cause could be the lack of coordination and integration between meteorological services and fire management agencies. In some cases, weather data may be available, but there may be inefficiencies in sharing or integrating it into fire management strategies, making it less actionable. Additionally, geographical challenges, particularly in remote or rugged regions, can complicate the installation and maintenance of weather stations, resulting in gaps in coverage. Finally, a lack of technical expertise or training in utilizing meteorological data for fire management purposes can further limit the effectiveness of the available infrastructure, preventing the full potential of meteorological stations from being realized in fire risk assessment and mitigation efforts. Desired state: A strategically distributed network of meteorological stations has been fully developed, providing accurate, real-time data on weather conditions crucial for assessing fire risks, enabling timely, data-driven decisions for fire prevention, suppression, and post-fire recovery across all regions, including remote areas. This network ensures effective integration of weather data into landscape fire management practices, enhancing response times and improving long-term resilience.

UNRESOLVED LEGAL OWNERSHIP OF PRIVATE LAND OWNERS

The unresolved legal ownership of private land creates a fundamental barrier in landscape fire management where unclear property rights, missing documentation, and ownership disputes significantly impact prevention and response capabilities. This gap is characterized by outdated cadastral records, unresolved inheritance issues, and lost documentation during historical transitions. As a result, managers cannot effectively implement fire prevention measures, maintain firebreaks, or ensure emergency access across properties. Community engagement in fire prevention is weakened due to ownership disputes, making it particularly challenging to implement landscape fire management strategies that require coordination across multiple properties. The gap also hampers post-fire rehabilitation efforts, as unclear ownership complicates the implementation of recovery measures.

1.6

The potential root causes for this gap include outdated or incomplete land registration systems, lack of proper documentation, and disputes between landowners or between private individuals and the state. In some cases, conflicting claims over land ownership, due to historical land rights issues or unclear inheritance processes, can create a complex legal environment that delays resolution. There may also be limited capacity or resources within government agencies to address these legal challenges, leading to prolonged uncertainty. Furthermore, political or economic interests might create barriers to resolving ownership issues, particularly in regions with high land value or where land rights are contested by multiple parties.

Desired State: A clearly defined and legally resolved system of land ownership has been established where private land rights are well-documented and legally recognized. This has ensured that landowners are identifiable and accountable for managing fire prevention, response, and recovery efforts on their land. The legal framework has facilitated the effective implementation of landscape fire management. .

ABSENCE OF LF RISK MAPS

The absence of an LF risk map is a critical gap in LF management that significantly hampers effective prevention, preparedness, suppression, and post-fire management efforts. An LF risk map provides detailed information about the probability of fire occurrence across different regions/landscapes, hazard, vulnerability, exposure, and resilience. Without this essential tool, managing and mitigating landscape fire risks becomes challenging and inefficient. The lack of targeted planning would hinder the country's ability to reduce fire risks, protect communities, and maintain resilient landscapes.

The lack of a national landscape fire risk map in North Macedonia stems from mix of factors, such as for example insufficient institutional coordination. Fire management is spread across multiple institutions, such as forestry departments, environmental agencies, local government bodies, and emergency services. Coordination and collaboration are essential to gather, analyze, and share information about fire risks across different regions.

Besides there is a lack of centralized management. Without a central body responsible for overseeing landscape fire management and risk assessment, there may be no clear leadership in creating a unified national fire risk map. A fragmented approach to fire management can lead to inconsistent and incomplete data collection.

1.7

Inadequate fire management planning is demonstrated by lack of comprehensive, forward-thinking fire management strategies at the national level. Fire risk mapping has not been seen as a priority, since broader fire management plans and strategies are not yet in place.

In addition, there is limited funding and resources. The development of a national landscape fire risk map requires funding for data collection, technology, research, and ongoing updates. Financial constraints within government budgets or a lack of investment in fire prevention and management result in the omission of this critical tool. Also, key political decision makers do not recognize the value of landscape fire risk mapping as a preventive tool.

Addressing the lack of a national landscape fire risk map requires overcoming these challenges through enhanced data collection, improved coordination between institutions, increased funding, and capacity-building initiatives.

Desired state: North Macedonia has created and continuously maintains a comprehensive, accurate, and up-to-date national landscape fire risk map. This map serves as a critical tool in managing fire risks across the country. By doing this, North Macedonia has improved its landscape fire management system and has built a more resilient and informed society capable of reducing the risks and impacts of landscape fires..

1.8.	INADEQUATE PLANNING AND SILVICULTURAL PRACTICES IN CONIFEROUS FORESTS AND AFFORESTATIONS The current gap in thinning practices represents a significant vulnerability in fire prevention strategies. Many evergreen forests, especially pine plantations, have developed dense canopy structures with excessive fuel accumulation. The absence of regular thinning operations has created stands with continuous vertical fuel arrangements, where ground fires can easily transition into devastating crown fires. This situation is exacerbated by the climate conditions, where prolonged dry periods and heat waves increase the fire risk. The lack of systematic thinning also results in competition between trees for resources, leading to stressed vegetation being more susceptible to fire damage. The gap of inadequate thinning practices in evergreen forests can stem from several root causes. First, lack of proper knowledge or expertise in forest management techniques may lead to ineffective thinning, where forests are either overthinned or left too dense, compromising forest health and increasing fire risk Economic constraints and limited technical capacity have contributed to irregular maintenance schedules, while the absence of clear guidelines for thinning operations has led to inconsistent practices across different forest areas. Additionally, insufficient training for forest managers and workers in proper thinning methods can contribute to this issue. Limited funding and resources for forest management programs can prevent the implementation of optimal thinning practices, as proper thinning requires investment in labor, equipment, and long-term management plans. Another potential root cause is political or economic factors that prioritize short-term timber production over sustainable forest management, leading to neglect of proper thinning. In some cases, lack of enforcement of forest management regulations or weak policy frameworks may result in non-compliance with thinning standards, further exacerbating the issue. Finally, historical land management practices, where thinning has not been a priority, may have set a precedent for poor practices, making it harder to shift towards more effective methods. Desired state: Adequate silvicultural practices have been developed and implemented, with particular care for the vulnerable coniferous forests. This ensures science-based, sustainable forest management practices, utilizing proper techniques in maintaing healthy, resilient forests..

1.2 PREPAREDNESS

Preparedness focuses on the readiness of all stakeholders involved in the LFM to effectively respond to landscape fires. This includes:

- Training and capacity building: Review of training programs for firefighters, volunteers, and other responders, and assessment of the availability and adequacy of equipment and resources.
- Planning and Coordination: Evaluating the effectiveness of emergency response plans and coordination mechanisms between agencies and organizations.
- Community Engagement: Examining community involvement in landscape fire preparedness activities.

Preparedness, often referred to as the pre-suppressive stage of landscape fire management, involves a specific set of measures that enable stakeholders to effectively manage landscape fire suppression. Identifying gaps (as shown in Table 2) during this stage, among other factors, results in recommendations for improving training programs, updating response plans, improving coordination mechanisms, and increasing community involvement, all of which contribute to improving overall landscape fire preparedness.

Table 2 *Gap Analysis, Main gaps identified in the preparedness phase of the LFM system in North Macedonia*

No.	IDENTIFIED GAPS IN THE PREPAREDNESS PHASE OF THE LFM SYSTEM
2.1	**ABSENCE OF SPECIALLY DESIGNED NETWORK OF WATER RESERVOIRS FOR LF SUPPRESSION** The lack of a network of water reservoirs specifically designed for landscape fire (LF) suppression presents significant challenges in effective suppression. This Gap highlights a critical deficiency in fire suppression infrastructure. Water reservoirs play a crucial role by providing immediate access to reliable water sources during fire suppression. Without this network of water reservoirs, suppression efforts are often inefficient, allowing fires to spread unchecked while the fire service teams scramble to locate sufficient water supply for suppression within immediate distance. This escalates fire behaviour and intensity, impacting both humans and the environment. There are isolated cases, such as Jasen, where reservoirs exist and are in good condition, but there is no such system at the national level. The root causes of this stem from several factors. One of the key reasons is the lack of investment in infrastructure. In many areas, limited financial resources mean that building specialized reservoirs for fire suppression may not be prioritized, especially when funds are needed for other infrastructure projects. Another contributing factor is the lack of expertise required to design and build specialized reservoirs for fire suppression. Many regions may not have access to the technical knowledge or resources needed to develop such systems. Additionally, there is a general lack of awareness regarding the importance of water reservoirs as a key tool for fire preparedness, with landscape fire management often not prioritizing the creation of these networks. Geographical and environmental constraints also play a role, as some regions may not have access to suitable land or water sources, making the implementation of a dedicated network of reservoirs difficult. Another contributing factor is insufficient coordination among key stakeholders, such as municipal authorities, fire departments, and water management agencies, which can result in missed opportunities to develop a cohesive and efficient water reservoir system. Finally, in regions where landscape fires are not viewed as an immediate threat, there may be a lack of awareness or urgency in addressing the need for specialized fire suppression infrastructure, leading to the absence of such a network. Desired state: A network of water reservoirs has been established for efficient landscape fire suppression and a decreased burnt area. This well-developed, strategically designed network of water reservoirs has been dedicated to landscape fire suppression, which ensures efficient access to water during emergencies. This network has been integrated into broader fire management plans, supporting rapid and effective response to wildfire threats.

2.2

LACK OF QUALIFIED LFM STAFF

The shortage of qualified LFM staff poses a significant vulnerability in North Macedonia's approach to managing landscape fires. This gap manifests through insufficient number of personnel with specialized expertise in fire behavior, prevention strategies, and modern firefighting techniques. Current staffing often depends on seasonal or temporary workers who lack comprehensive training in landscape fire management. Additionally, many existing staff members have limited experience with advanced fire management technologies and contemporary firefighting methods. Compounding this issue is the inadequate succession planning, which leaves a gap in replacing experienced personnel as they retire.

The root causes of this gap could stem from several factors. One potential cause is inadequate investment in training and professional development, which leaves existing staff without the necessary skills and knowledge to manage landscape fires effectively. Additionally, there may be a lack of specialized education or training programs focused on landscape fire management, leading to a shortage of qualified personnel in the field.

Another root cause could be the low prioritization of LFM staffing in policy and budget allocation, particularly in regions where landscape fires are not viewed as a significant threat or immediate concern. This lack of emphasis on LFM roles may discourage individuals from pursuing careers in the field, further exacerbating the staffing shortage.

Geographical challenges may also play a role, particularly in remote or rural areas where qualified personnel may be less likely to relocate due to personal or professional reasons. Finally, insufficient coordination and collaboration between various stakeholders—such as fire departments, government agencies, and training institutions—could lead to gaps in recruitment, training, and retention of qualified LFM staff.

Desired State: Properly qualified LFM staff with specialized expertise across all aspects of landscape fire management has been established. This workforce has been supported by continuous professional development programs, ensuring effective implementation of prevention, preparedness, and response activities throughout the landscape.

2.3

LACK OF AERIAL FIREFIGHTING RESOURCES

The gap refers to the insufficient availability or deployment of aerial firefighting resources, such as firefighting helicopters, planes, or drones, to support landscape fire suppression efforts. Air support plays a critical role in fire suppression efforts in hard-to-reach terrain whether in the initial phase of suppression or large-scale landscape fires. The lack of aerial firefighting resources leads to the impossibility of timely intervention in inaccessible terrains, large-scale fires, and during severe fire season with a large number of fires at the same time.

The root causes of the gap lack of aerial firefighting resources could include insufficient investment in aerial firefighting equipment, such as aircraft and helicopters, necessary for effective landscape fire management. Budget constraints may prevent the acquisition and maintenance of these resources, particularly in regions where fire risks are not seen as immediate threats. Another root cause could be the lack of specialized training programs to develop skilled aerial firefighting crews, particularly trained pilots, who are crucial to the success of aerial fire suppression efforts.

Additionally, there may be logistical and regulatory barriers that prevent the deployment or operational use of aerial resources, such as limited access to airspace or inadequate coordination between firefighting agencies. In some cases, the lack of trained pilots could be further compounded by low salaries, difficult working conditions, or limited career incentives, leading to a shortage of qualified personnel. Finally, the absence of a strategic national or regional plan for integrating aerial firefighting resources into broader fire management systems could contribute to the gap in resources and operational readiness.

Desired state: A well-equipped aerial firefighting fleet, with proper resources including aircraft and helicopters, has been fully integrated into the landscape fire management system. This fleet has been supported by a team of highly trained pilots and aerial firefighting support personnel, ensuring rapid and effective response to fire emergencies.

2.4	**OUTDATED VEHICLES AND SHORTAGE OF PROPER EQUIPMENT FOR LF SUPPRESSION** Outdated vehicles and insufficient equipment are critical gaps identified in the suppression phase of landscape firefighting. This gap significantly hampers the effectiveness, efficiency, and safety of firefighting operations. The consequences of using outdated and insufficient equipment for landscape firefighting are significant and numerous. They affect the safety of firefighters, the efficiency of firefighting operations, public safety, and the environment. One of the key reasons for this gap is inadequate funding or resource allocation, which may prevent the timely replacement or upgrading of vehicles and equipment necessary for effective fire suppression. Another cause could be poor maintenance practices or a lack of regular updates to the existing equipment, which can lead to the deterioration of vehicles and tools over time. The absence of a long-term strategic plan for equipment management may also contribute to this gap, as fire departments may lack foresight in anticipating future needs or investing in modern technology. Additionally, there may be a shortage of qualified personnel with the expertise needed to operate and maintain specialized fire suppression vehicles and equipment, further limiting their effectiveness. In some cases, the lack of coordination between different agencies or authorities may result in inefficient procurement processes, leading to mismatches in equipment types or failure to acquire suitable tools for the job. Desired state: Well-maintained vehicles equipped with the latest technology and tools specifically designed for landscape fire suppression have been procured. This ensures rapid and efficient response during emergencies, with personnel having been trained to operate and maintain the equipment to the highest standards.
2.5	**LACK OF TRAINED HUMAN RESOURCES IN LFM** Having a sufficient number of trained human resources in landscape fire management (LFM) is crucial because they possess the specialized knowledge and skills necessary to manage complex, large-scale fires in diverse environments. Currently, firefighters in North Macedonia are primarily trained to address urban fires, focusing on structures, buildings, and more localized fire scenarios. This training does not adequately prepare them for the unique challenges of landscape fire management (LFM), which requires specialized skills to handle large-scale fires in natural environments, involving complex terrain, diverse vegetation, and unpredictable fire behavior. The root causes of this gap could include a focus on training for urban fire extinguishing rather than for landscape fire management, leaving a significant shortage of personnel skilled in managing fires in larger, more complex environments. Another cause could be a lack of awareness or prioritization of landscape fire management as a distinct field, leading to insufficient investment in training personnel for these specific needs. Additionally, there may be logistical and financial barriers that prevent firefighters from accessing specialized LFM training, such as limited resources or funding for training programs. The shortage of qualified instructors or experts in the field may also hinder the expansion of appropriate training opportunities. Desired state: A well-trained workforce of landscape fire management professionals, equipped with the necessary skills to effectively manage fires in diverse landscapes, has been established. This has been supported by comprehensive training programs, including a national LFM training center, ensuring that firefighters are adequately prepared to handle landscape fire suppression challenges.

ABSENCE OF A NATIONAL-LEVEL FUEL MAP

This gap refers to the absence of detailed mapping of potential fire fuels, such as vegetation and combustible materials, across the country. The absence of a national-level fuel map is a significant gap in landscape fire management that has far-reaching implications for landscape fire prevention, preparedness, response, and recovery. Fuel maps provide critical information about the type, amount, and distribution of the fuel. Mapping the updated distribution of fuels and describing their properties improves decision-making, evaluation, and risk management of wildland fires because it considers vegetation changes due to previous fires and the dynamic nature of forest fuels.

2.6

The main root causes for this gap could include insufficient data collection and analysis on fire-prone vegetation and fuels, leading to a lack of comprehensive and up-to-date information. Limited resources or technical expertise may prevent the creation and maintenance of a national-level fuel map. Additionally, fragmented approaches to land and fire management across different regions or jurisdictions could lead to inconsistent mapping efforts, further complicating the development of a unified, nationwide fuel map. There may also be a lack of prioritization of this resource at the national policy level, with other fire management needs taking precedence. Lastly, inadequate coordination between agencies responsible for environmental monitoring, land management, and fire suppression could result in missed opportunities to gather and integrate fuel data for landscape fire planning.

Desired state: A comprehensive, up-to-date national-level fuel map that accurately identifies and categorizes all wildland fuels has been developed. This map has been integrated into national landscape fire management strategies, ensuring proper preparedness, prevention, mitigation, and suppression efforts based on detailed fuel data across the country.

LACK OF REGULATION ADDRESSING THE CONSTRUCTION AND MAINTENANCE OF FUELBREAKS AND FIREBREAKS

The absence of standardized rulebooks addressing the construction and maintenance of firebreaks is a significant gap in landscape fire management that can lead to inconsistencies and inefficiencies in prevention and mitigation actions. Firebreaks, which are gaps in vegetation designed to stop or slow the spread of fire, are critical components of landscape fire management strategies. The lack of clear, comprehensive guidelines can result in ineffective firebreak implementation, increased landscape fire risks, and unnecessary environmental impact.

2.7

Potential root causes for this gap could include the absence of standardized methodologies for designing, constructing, and maintaining fuelbreaks and firebreaks, making it difficult for authorities to implement regulations effectively. Even though regulations may exist, they may lack the specific, actionable details required to guide proper implementation, leading to inconsistent or ineffective fire prevention measures.

Furthermore, a lack of technical expertise and resources to develop and enforce comprehensive guidelines for fuelbreak and firebreak construction could contribute to this gap. There may also be insufficient coordination between the various authorities involved, such as land management agencies, fire departments, and local governments, which could result in fragmented or poorly executed efforts. Finally, the incomplete regulation may reflect a broader lack of prioritization of fire prevention at the policy level, leaving critical gaps in the overall fire management strategy.

Desired state: Comprehensive and clear regulations that address the construction and maintenance of fuelbreaks and firebreaks have been established. These are supported by proper methodologies for effective implementation and are consistently enforced across regions, ensuring that fire prevention measures are standardized, well-coordinated, and maintained to effectively reduce the risk and spread of landscape fires.

1.3 SUPPRESSION

The suppression stage of Landscape Fire Management focuses on direct measures and/or tactics to extinguish or localize landscape fires, aiming to mitigate their devastating impacts. Despite all prior preventive measures, landscape fires will inevitably occur. Effective suppression involves targeting one or more elements of the fire triangle—heat, oxygen, or fuel, in order to localize or extinguish landscape fires. The specific measures employed depend on which element is targeted. Quick and coordinated action is crucial to control fires efficiently and minimize their consequences. The suppression stage of LFM marks a critical juncture where all the previous measures (prevention and preparedness) are rendered either successful or obsolete and will influence, if not determine, the success of the suppression efforts. This is why prevention and preparedness measures are extremely important and will either hinder or aid the suppression efforts and safety of the firefighting units on the ground and in the air.

The following gaps in the suppression phase of the landscape fire management system in North Macedonia are defined as follows:

Table 3 *Gap Analysis, Main gaps identified in the suppression phase of the LFM system in North Macedonia*

No.	IDENTIFIED GAPS IN THE SUPPRESSION PHASE OF THE LFM SYSTEM
3.1	**LACK OF VOLUNTARY FIREFIGHTING ASSOCIATIONS** Volunteer firefighting associations are a vital component of suppression operations, particularly in rural and remote areas where professional firefighting resources are limited. The volunteers already included in the national system provide initial responses to LF and possess valuable local knowledge and community connections. Despite their importance, due to different reasons, their number in the last two decades has significantly decreased. As a result, in many rural and remote areas, professional firefighters are unable to cover the entire territory or respond to fires adequately and promptly. The main root causes for this gap could include a lack of resources and support for these associations, which hinders their ability to function properly. Many of these organizations may face challenges in securing funding, equipment, and training, which are essential for their operations. Additionally, a lack of organizational capacity, including insufficient leadership and management, may contribute to their inability to remain active and engaged in firefighting activities. There may also be a general lack of coordination between voluntary associations and professional firefighting units, leading to inefficiencies and disorganization. Furthermore, inadequate government support or recognition could lead to a lack of motivation among volunteers, making it difficult for these associations to recruit and retain active members. Desired state: A well-established network of fully operational voluntary firefighting associations has been created, with many registered organizations actively involved in landscape fire management. These associations are well-resourced, adequately trained, and equipped, ensuring effective support for professional firefighting teams and contributing to fire suppression efforts.

ABSENCE OF AN INCIDENT COMMAND SYSTEM FOR COORDINATION AND MANAGEMENT OF LF FIREFIGHTING

Effective fire suppression requires not only preventive and pre-suppression measures but also a well-defined chain of command and coordination. According to the Forests Law, the entity responsible for managing forests is obligated to organize the initial fire suppression response. Typically, this responsibility falls to the PENF (Public Enterprise National Forests) through its regional subsidiaries. During this initial stage, the PENF oversees all fire suppression efforts. If the PENF is unable to control the fire, they must seek assistance from the local fire service, though the PENF remains in command of the operation. In case the fire still proves uncontrolled, the DPR (Directorate for Protection and Rescue) will step in with additional resources, taking over command of the operation. In case the government declares officially a state of crisis, the Crisis Management Center (CMC) assumes responsibility for coordinating the firefighting efforts. This includes managing foreign assistance, such as directing international aerial resources to combat the fire.

The identified gap pertains to the absence of a Next-Generation Incident Command System (NICS) for landscape fire management. The NICS will serve as the focal point in the form of a center with a "higher command view", for incident command and management, providing real-time support, managing and distributing real-time feeds – such as vehicle locations, airborne images, video, weather, critical infrastructure, and terrain – to first responder decision-makers.

This gap stems from several factors. One key issue is the lack of standardized procedures and protocols, which can lead to fragmented coordination and inefficiencies during fire incidents. Without unified guidelines, the response to fires can become disorganized, affecting the overall effectiveness of firefighting efforts.

3.2

Another contributing factor is inadequate training and expertise among firefighting personnel and incident commanders. Without sufficient training in incident command systems, decision-making can be poor, resources may be misallocated, and communication can break down, leading to confusion and delays during critical moments.

Insufficient communication infrastructure is another root cause. If real-time information cannot be effectively exchanged, coordination among firefighting teams, agencies, and authorities is severely compromised, impeding the ability to respond swiftly and efficiently. Additionally, fragmented organizational structures can complicate coordination, especially when multiple agencies or jurisdictions are involved in fire management, making centralized decision-making difficult.

The lack of resources for implementing an effective incident command system also plays a significant role. Establishing and maintaining such a system requires considerable investment in technology, personnel, and financial support, which may be lacking in some areas. Furthermore, cultural or institutional resistance to change can hinder the adoption of new, more effective incident command frameworks, with existing practices or systems being deeply ingrained.

Lastly, the absence of political or institutional prioritization can prevent the development of an efficient incident command system. When fire management is not given the necessary attention or support at the policy level, essential systems and structures may be neglected or underdeveloped.

Desired state: A fully functional and efficient incident command system for the coordination and management of landscape fire firefighting has been established. This system is supported by standardized procedures and protocols, ensuring seamless communication, effective resource allocation, and unified decision-making. All personnel involved have been adequately trained, with real-time information exchanged efficiently across all relevant agencies and teams.

3.3	**ABSENCE OF FIRE WEATHER INSTRUMENTS, KITS AND TOOLS** The identified gap is related to the absence of specific fire weather instruments, kits, and tools for fast and easy weather observation with high accuracy, reliability, and usability during fire suppression when it matters the most. Besides the various factors that influence fire behavior and the designed suppression measures, weather conditions are of prime importance. This is especially important in situations where there are no meteorological stations near the fire's vicinity. One primary cause for this gap is inadequate funding and resource allocation, which may prevent the acquisition of necessary weather monitoring equipment and tools for fire management. Budget constraints often lead to the prioritization of other areas, leaving fire weather instruments underfunded or overlooked. Another key cause is the lack of awareness or understanding of the critical role fire weather plays in landscape fire management. Fire weather instruments, which are crucial for forecasting and understanding the conditions that contribute to fire behavior, may not be seen as a priority by decision-makers, leading to their absence or underdevelopment in fire management strategies. Furthermore, limited technical expertise in selecting, installing, and maintaining specialized fire weather tools can contribute to this gap. Fire weather instruments require specialized knowledge to ensure they are correctly calibrated and used effectively for fire prediction and prevention. In addition, lack of coordination may prevent the effective use of fire weather instruments, which are essential for early detection and rapid response. Finally, insufficient training in the use of fire weather instruments and tools could prevent their effective utilization by firefighting teams, limiting their impact on fire prediction and suppression efforts. Desired state: Widespread availability and integration of fire weather instruments, kits, and tools has been achieved, fully equipping them to provide accurate, real-time weather data essential for effective landscape fire suppression. These tools have been systematically deployed and maintained, with trained personnel able to interpret and apply the data for improved fire prediction, prevention, and suppression efforts.

1.4. POST-FIRE MANAGEMENT

Post-fire management refers to the activities implemented after the suppression of LF, addressing their impacts and supporting landscape recovery. This phase typically includes a range of activities aimed at restoring landscapes, reducing LF risk, supporting community recovery, and minimizing the risk of future fires at the landscape level.

This phase includes:

- Assessment and monitoring: assessment of the consequences of landscape fires and monitoring of the burnt area.
- Risk reduction: identifying the level of risk and measures for reduction.
- Restoration: Measures and activities related to restoration of burned areas.
- Support of local community and economy: facilitate the recovery of affected communities and support economic recovery.

By implementing effective post-fire management activities, stakeholders can minimize the short/long-term impacts of landscape fires and promote sustainable landscape management. In this context, following gaps of the post-fire management phase are defined as follows:

Table 4 *Gap Analysis, Main gaps identified in the post-fire management in North Macedonia*

No.	IDENTIFIED GAPS IN POST-FIRE MANAGEMENT PHASE OF THE LFM SYSTEM
4.1	**ABSENCE OF A SPECIALIZED FORENSIC SERVICE FOR LF INVESTIGATION** The absence of a specialized forensic service team for landscape fire investigation is an important gap in post-fire management activities. This severely hinders the design of preventive measures and inhibits the repercussions of the perpetrators, especially arsonists (such as illegal logging etc.) ability to conduct thorough and systematic investigations into the causes and origins of landscape fires, leading to several challenges and implications. The root causes for this gap could include insufficient funding and resources allocated to the development of forensic capabilities. Establishing such a service requires investment in training, equipment, and expert personnel, which may not be available in areas where fire management and prevention are already underfunded or stretched thin. Additionally, there may be a lack of expertise and specialized knowledge in fire forensic science, which is crucial for investigating the origins and progression of fires. This knowledge may not be sufficiently developed or accessible in many regions, leading to an absence of skilled professionals capable of conducting these investigations. Fragmented or inconsistent coordination between fire management agencies, law enforcement, and environmental organizations can also hinder the creation of a dedicated forensic service. Without clear collaboration or communication between these entities, efforts to investigate landscape fires may remain uncoordinated and inefficient. Finally, the absence of clear legal frameworks and regulations governing fire investigation practices can contribute to this gap. In some regions, there may not be established protocols for how fire investigations should be conducted, leading to a lack of uniformity and effectiveness in addressing fire-related incidents. Desired state: A functional Specialised Forensic Service dedicated to investigating landscape fires has been established. This service has been equipped with expert personnel, proper tools, and clear protocols to thoroughly investigate the causes, origins, and impacts of fires. The forensic team actively collaborates with fire management agencies, law enforcement, and environmental organizations to ensure comprehensive and effective investigations.
4.2	**INSUFFICIENT SCIENTIFIC RESEARCH ON POST-FIRE MANAGEMENT** Proper post-fire management is essential for landscape recovery, prevention of future fires, and mitigation of environmental and economic impacts. However, there is often insufficient scientific research dedicated to understanding and optimizing post-fire management practices. Consequently, oftentimes times postfire measures and actions are used improperly, and in turn have negative impacts on the landscapes, biodiversity, and local economy. The main cause for the gap in insufficient scientific research on post-fire management could include a lack of funding and resources dedicated to research in this area. Another key cause could be the limited collaboration between scientific institutions, fire management agencies, and policymakers. Without strong partnerships, the necessary research may not align with practical needs or be fully integrated into real-world fire management strategies. Additionally, there may be a lack of specialized expertise in post-fire ecology, restoration techniques, and community recovery, which are critical components of post-fire management. Furthermore, the complexity of post-fire landscapes—such as the diverse ecological, economic, and social impacts—can make it difficult to conduct research that addresses all relevant factors. This complexity may discourage investment in scientific inquiry or result in fragmented studies that fail to provide comprehensive solutions. Finally, in some cases, short-term fire response and suppression efforts may overshadow the need for long-term research on recovery and restoration. This focus on immediate action rather than long-term sustainability can hinder the development of evidence-based strategies for post-fire management. Desired state: Scientific research dedicated to post-fire management, with proper funding mechanisms established, has focused on understanding the ecological, economic, and social impacts of fires, and has developed effective strategies for recovery and restoration.

4.3.	INSUFFICIENT/INEFFICIENT USE OF MKFFIS PLATFORM FOR POST-FIRE ANALYSIS The main component of the Macedonian Forest Fire Information System (MKFFIS) is designed to be a comprehensive tool for tracking, assessing, and managing forest fires in North Macedonia. Due to poorly established legal regulations, it is not fully clear which institutions/parties should use MKFFIS in LFM the meaning of the Fire danger rating. Hence, MKFFIS does not fulfill its intended purpose. Furthermore, the stakeholders who should use MKFFIS should also fill in and update statistical forms which are integral to MKFFIS. This hinders the feeding of the fire database and statistics, led by various stakeholders all in one place. The root causes for this gap can be attributed to several factors. One significant issue is the human factor: while the system itself may be functional, it relies heavily on personnel to input and update data. In many cases, a lack of proper training, awareness, or motivation among staff leads to underutilization or incorrect usage of the system. Another root cause is the lack of coordination among the various institutions and agencies involved in fire management, such as forestry services, firefighting teams, and local authorities. Without clear communication and collaboration, data is often not shared effectively or inputted in a timely manner, which prevents the platform from being fully leveraged for post-fire analysis. Additionally, there may be institutional barriers such as bureaucratic delays, unclear responsibilities, or a lack of accountability for data entry and usage, which further hinder the efficient operation of the platform. Limited resources or technical support could also contribute to underutilization, as institutions may lack the means to ensure consistent and accurate data collection or may not prioritize the platform's use for post-fire analysis. Finally, there may be a general lack of awareness or understanding of the platform's potential benefits for post-fire analysis. If stakeholders do not fully recognize how the system can aid in improving fire management strategies and response efforts, they may not be motivated to invest the necessary time or effort into using it effectively. Desired state: The Macedonian Forest Fire Information System (MKFFIS) platform is efficiently and consistently utilized for post-fire analysis, with trained personnel regularly inputting timely, accurate, and comprehensive data. The system then provides protocols and decision support based on the assessed risk level.

2. IMPLEMENTATION FRAMEWORK

The preparation of an effective Implementation framework for the management of landscape fires in North Macedonia requires a comprehensive understanding of the multifaceted challenges as well as shortcomings/gaps previously determined, which bring landscape fires and a strategic approach to their resolution. In the previous analysis, the strengths, and the weaknesses of the landscape fire management system in North Macedonia, were identified. Despite the presence of qualified firefighting personnel and effective cooperation with neighboring countries for mutual aid, the system faces several critical gaps. These gaps were highlighted through a comprehensive gap analysis, which examined in detail the existing LFM system in North Macedonia.

The gap analysis identifies various gaps in the LFM, ranging from limited resources and infrastructure vulnerabilities to inadequate community preparedness and post-fire recovery efforts. Specifically, challenges such as resource constraints, insufficient communication and insufficient management of combustible material were identified as areas requiring immediate attention and intervention.

In response to these identified gaps, this framework has been precisely developed, which aims to describe a series of targeted measures and activities aimed at improving landscape fire management in North Macedonia. By addressing the gaps identified in the gap analysis, this Implementation framework seeks to strengthen the country's resilience to landscape fires, minimize their impact on ecosystems and communities, and encourage sustainable land management practices.

In the very structure of the Implementation framework, the emphasis is placed on a multifaceted approach that integrates prevention, preparedness, suppression, and post-fire management efforts. Each component of the Implementation framework is carefully tailored to address specific gaps in the LFM system, with a clear delineation of responsibilities and allocation of resources to ensure effective implementation. Furthermore, this framework emphasizes the importance of cooperation and collaboration between government agencies, emergency responders, communities, and stakeholders at all levels. By fostering a culture of shared responsibility and collective action, North Macedonia can better navigate the complexities of LFM and build resilience against evolving fire threats.

By leveraging the strengths of the existing LFM system in North Macedonia and addressing the identified gaps, it is possible to collectively work towards a safer, more resilient future for all citizens and the environment. Through proactive measures and strategic interventions outlined in this Implementation framework, North Macedonia can strengthen its capacity to mitigate, respond, and recover from landscape fires, ensuring the well-being and prosperity of current and future generations.

2.1. Defined framework

The final part of the document offers an Implementation framework based on the Gan analysis. The Framework represents a crucial component of this approach, serving as a strategic bridge between identified gaps and the practical implementation of solutions. This comprehensive plan translates analytical findings into concrete, actionable steps for improving North Macedonia's landscape fire management system. The implementation framework primary role is to provide a structured and systematic approach to addressing the gaps identified through the SWOT analysis. It serves multiple essential functions:

- ✓ Strategic Direction: The framework establishes clear priorities and direction for system improvements from prevention to post-fire management, ensuring that resources and efforts are allocated effectively to address the most critical needs first.

- ✓ Implementation Guidance: It provides detailed guidance for stakeholders on how to implement recommended changes, including specific steps, timelines, and resource requirements. This ensures that improvements are implemented in a coordinated and efficient manner.
- ✓ Resource Planning: The framework helps stakeholders understand and prepare for the resources needed to implement improvements, including financial requirements, human resources, equipment, and training needs.
- ✓ Accountability Framework: By clearly defining responsibilities and timelines, the framework creates accountability among stakeholders and provides a basis for monitoring progress and measuring success.
- ✓ Coordination Tool: It serves as a coordination mechanism among various stakeholders, ensuring that different organizations and agencies work together effectively towards common goals.

Finally, this comprehensive methodological framework, developed with continuous guidance and expert support from RFMC, ensures that the Gap analysis provides not only a thorough assessment of the current system but also practical, implementable solutions or a practical guide for implementing necessary improvements in the North Macedonian landscape fire management. The approach emphasizes stakeholder participation and consensus-building while maintaining focus on practical, achievable outcomes.

IMPLEMENTATION FRAMEWORK

NO.	IDENTIFIED GAPS	SUB. NO	MEASURES	PERIOD OF IMPLEMENTATION	RESPONSIBLE INSTITUTION/S	FORESEEN BUDGET (EUR)	PRIORITY
1.		PREVENTION					
	INSUFFICIENT PUBLIC AWARENESS AND UNDERSTANDING OF LANDSCAPE FIRE MANAGEMENT (LFM)	1.1.1.	Developing and adopting a national LF public awareness campaign	Up to 1 year	Government agencies, Media, TPPEs, Ministries, DPR, NPs, PEs, Community groups, and environmental organizations.	~45.000 EUR	I
	INSUFFICIENT INCLUSION OF THE LFM PRINCIPLES IN THE EDUCATION PROGRAMMES	1.1.2.	Integrate LFM principles into primary and high school educational programs.	Up to 5 years	MoE, Academic Institutions and Universities, professional Associations, and NGOs.	~15.000 EUR	II
		1.1.3.	Incorporate LFM principles into the existing specialized courses and programs in universities that focus on landscape management	Up to 5 years	MoE, Academic Institutions and Universities, professional Associations and NGOs.	~10.000 EUR	
	ABSENCE OF A NATIONAL LANDSCAPE FIRE MANAGEMENT PLAN	1.1.4.	Establishment of a Stakeholders Fire Management Planning Committee	Up to 1 year	MAFWE, MoEPP, DPR, CMC, Scientists, NAPFO, Universities, Fire Management Agencies or Services, and Local Government Authorities.	/	I
		1.1.5.	Provide training for the fire management planning committee	Up to 5 years	MAFWE, MoEPP, DPR, CMC, Scientists, NAPFO, Universities, Fire Management Agencies or Services, Local Government Authorities.	~35.000 EUR	
		1.1.6.	Preparation of the national LFM plan	Up to 5 years	MAFWE, MoEPP, DPR, CMC, Scientists, NAPFO, Universities, Fire Management Agencies or Services, Local Government Authorities.	~60.000 EUR	
	ABSENCE OF A STRATEGY FOR LF MANAGEMENT OF PASTURE LANDS	1.1.7.	Development of a comprehensive LFM strategy for pasture lands.	Up to 5 years	MAFWE, PE Pastures, Science, and Education Institutions/Faculties	~40.000 EUR	II

NO.	IDENTIFIED GAPS	SUB. NO	MEASURES	PERIOD OF IMPLEMENTATION	RESPONSIBLE INSTITUTION/S	FORESEEN BUDGET (EUR)	PRIORITY
	INSUFFICIENTLY DEVELOPED NETWORK OF METEOROLOGICAL STATIONS FOR THE NEEDS OF LFM	1.1.8.	Analysis of the current state of meteorological stations.	Up to 5 years	UHMR, MAFWE.	~15.000 EUR	II
		1.1.9.	Establishment of the network of meteorological stations developed for the needs of LFM	Up to 5 years	UHMR, MAFWE.	~600.000 EUR	
		1.1.10.	Conduct training and exercises to enhance the understanding and use of fire weather information among landscape fire management stakeholders.	Up to 5 years	UHMR, MAFWE.	35.000 EUR	
	UNRESOLVED LEGAL OWNERSHIP OF PRIVATE LAND OWNERS	1.1.11.	Conducting a study for the current state of the unresolved legal land ownership	Up to 1 year	NEPRO, Cadastre agency, Property law enforcement units, Local self-government, Mediation etc.	15.000 EUR	III
		1.1.12.	Establish mechanisms for land tenure regularization, including surveys, documentation, and legal procedures to resolve disputes and ensure clear title ownership	Up to 5 years	NEPRO, Cadastre agency, Property law enforcement units, Local-self government, Mediation etc.	/	
		1.1.13.	Training of the private land owners. Establishment of mechanisms for land tenure regularization, including surveys, documentation, and legal procedures.	Up to 5 years	NEPRO, Cadastre agency, Property law enforcement units, Local-self government, Mediation etc.	35.000 EUR	

NO.	IDENTIFIED GAPS	SUB. NO	MEASURES	PERIOD OF IMPLEMENTATION	RESPONSIBLE INSTITUTION/S	FORESEEN BUDGET (EUR)	PRIORITY
	ABSENCE OF LF RISK MAPS	1.1.14.	Creation of LF risk map	Up to 5 years	Research institutions and universities, DPR, CMC, MAFWE, MoEPP, Local self-government.	400.000 EUR	I
		1.1.15.	Creating bylaws that will ensure the integration of the risk map in the National LFM system.	Up to 5 years	Research institutions and universities, DPR, CMC, MAFWE, MoEPP, Local self-government.	/	
1.8.	INADEQUATE PLANNING AND SILVICULTURAL PRACTICES IN CONIFEROUS FORESTS AND AFFORESTATIONS	1.1.1.	Pilot Implementation Projects featuring selected research sites and team of experts.	Up to 5 years	PENF, MAFWE, MoEPP.	300.000 EUR	I
2.			PREPAREDNESS				
2.1.	ABSENCE OF SPECIALLY DESIGNED NETWORK OF WATER RESERVOIRS FOR LF SUPPRESSION	1.1.1.	Analysis of the current state and drafting of a plan for the network of water reservoirs for LF suppression.	Up to 1 year	MAFWE – Water resource management department, Fire Management Agency, Civil Engineering, Local self-government, PENF and DPR etc.	~25.000 EUR	I
		1.1.2.	Construction of a net of water reservoirs for LF suppression	Up to 5 years	MAFWE – Water resource management department, Fire Management bodies, Civil Engineering, Local self-government, PENF and DPR etc.	According to action 2.1.1 (the plan will define the cost)	

NO.	IDENTIFIED GAPS	SUB. NO	MEASURES	PERIOD OF IMPLEMENTATION	RESPONSIBLE INSTITUTION/S	FORESEEN BUDGET (EUR)	PRIORITY
	LACK OF QUALIFIED LFM STAFF	1.1.3.	Develop comprehensive training programs tailored to different levels of expertise within LFM	Up to 1 year	Government, MAFWE, PENF, DPR, Military academy, MoD, MoI, Universities.	~15.000 EUR	II
		1.1.2.	Implementing of the training programme (2.2.1)	Up to 1 year	Government, MAFWE, PENF, DPR, Military academy, MoD, MoI, Universities.	~50.000 EUR	
	LACK OF AERIAL FIREFIGHTING RESOURCES	2.3.1.	Conducting a study of the current state and needs	Up to 5 years	Government, DPR, MoD, MoI.	~25.000 EUR	I
	OUTDATED VEHICLES AND SHORTAGE OF PROPER EQUIPMENT FOR LF SUPPRESSION	2.4.1.	Conducting a study of the current state and needs	Up to 1 year	PEs, PENF, Ministries, Government, Local-self-government, DPR, TPPE, Volunteer FF organizations etc.	~10.000 EUR	II
		1.1.3.	Procurement of landscape firefighting equipment and specialized vehicles, according to study (2.4.1)	Up to 5 years	PEs, PENF, Ministries, Government, Local-self-government, DPR, TPPE, Volunteer FF organizations etc.	According to action 2.4.1 (the plan will define the cost)	
	LACK OF TRAINED HUMAN RESOURCES IN LFM	1.1.1.	Preparation of a detailed plan for a national LFM center	Up to 5 years	Government, DPR, HEF	~25.000 EUR	I
	ABSENCE OF A NATIONAL-LEVEL FUEL MAP	1.1.1.	Adopting a national fuel classification scheme	Up to 5 years	Scientific and Educational institutions, MAFWE, PENF, DPR, CMC, etc.	~65.000 EUR	I
		1.1.4.	Adopting a fuel mapping methodology	Up to 5 years	Scientific and Educational institutions, MAFWE, PENF, etc.	~30.000 EUR	
		1.1.5.	Preparation of the national-level fuel map	Up to 5 years	Scientific and Educational institutions, MAFWE, PENF, etc.	~400.000 EUR	
	LACK OF REGULATION ADDRESSING CONSTRUCTION AND MAINTENANCE OF FUEL BREAKS AND FIREBREAKS	1.1.1.	Development of the regulation for construction and maintenance of firebreaks and fuelbreaks	Up to 5 years	MAFWE, MoEPP, Local self-government, DPR, Land use planning and regulatory bodies, etc.	/	II

NO.	IDENTIFIED GAPS	SUB. NO	MEASURES	PERIOD OF IMPLEMEN-TATION	RESPONSIBLE INSTITUTION/S	FORESEEN BUDGET (EUR)	PRIORITY
		SUPPRESSION					
	LACK OF VOLUNTARY FIREFIGHTING ASSOCIATIONS	1.1.1.	Ensuring of mechanism for establishment and permanent functioning of the fire protection societies (volunteers)	Up to 1 year	Volunteer FF Associations, DPR, MoI, Loca-self government, TPPEs.	/	I
	ABSENCE OF AN INCIDENT COMMAND SYSTEM FOR COORDINATION AND MANAGEMENT OF LF FIREFIGHTING	1.1.2.	Establish a legal framework for the introduction of ICS for LF fighting	Up to 5 years	Government, DPR, CMC, MoD, MoI.	/	I
		1.1.3.	Provide compre-hensive training programs on LF incident command and ICS implemen-tation for firefight-ing personnel at all levels, including incident command-ers, section chiefs, and field operatives.	Up to 5 years	Government, DPR, CMC, MoD, MoI.	~110.000 EUR	
	ABSENCE OF FIRE WEATHER INSTRUMENTS, KITS AND TOOLS	1.1.4.	Procurement of appropriate equipment, tools, and instruments.	Up to 1 year	Government bodies, Agencies, Ministries, Local self-government, TPPEs, DPR, CMC.	~95.000 EUR	III
		1.1.5.	Implementation of trainings for the use of appropriate types of equipment, tools, and instruments.	Up to 1 year	Government bodies, Agencies, Ministries, Local self-government, TPPEs, DPR.	95.000 EUR	
		POST-FIRE MANAGEMENT					
4.1.	ABSENCE OF A SPECIALIZED FORENSIC SERVICE FOR LF INVESTIGATION	1.1.6.	Established specialized forensic service for LF forensic investigation	Up to 5 years	Government, MoI, DPR	/	II
	INSUFFICIENT SCIENTIFIC RESEARCH ON POST-FIRE MANAGEMENT	1.1.7.	Establishment of permanent financial funds to support scientific research on LFM	Up to 5 years	Government, Ministry of Education (MoE), MAFWE,	/	II

NO.	IDENTIFIED GAPS	SUB. NO	MEASURES	PERIOD OF IMPLEMEN-TATION	RESPONSIBLE INSTITUTION/S	FORESEEN BUDGET (EUR)	PRIORITY
	INSUFFICIENT/ INEFFICIENT USE OF MKFFIS PLATFORM FOR POST-FIRE ANALYSIS	1.1.8.	System study analysis, actual status, usage, and needs for improvement with recommendations for actions.	Up to 1 year	CMC	~15.000 EUR	I

*Budget – there is no additional research on the amount of the budget determined in this list.

*Description of the priorities:

I	II	III
High priority	Moderate priority	Low priority

3. MONITORING AND EVALUATION

The monitoring and evaluation framework serves as the fundamental tool for tracking progress and ensuring effective implementation of the identified measures addressing gaps in North Macedonia's landscape fire management system. This systematic approach enables continuous assessment of achievements, challenges, and needed adjustments throughout the implementation process.

3.1. LEAD MONITORING INSTITUTION

The Ministry of Agriculture, forestry and water economy (MAFWE) takes the lead role as the primary Country Partner Institution responsible for overseeing the monitoring process. Their role is supported by key institutions including the Protection and Rescue Directorate (PRD), Crisis Management Center, Public Enterprise "National Forests", and the Forestry Faculty and others. This multi-institutional approach ensures comprehensive oversight and expertise from all relevant sectors.

3.2. MONITORING PROCESS

The monitoring process is structured around bi-annual meetings, strategically timed before and after the fire season. The first meeting in March/April focuses on preparedness and planning for the upcoming fire season, while the October/November meeting assesses the effectiveness of implemented measures during the past fire season. These meetings serve as crucial checkpoints for evaluating progress and making necessary adjustments.

During each meeting, three key areas are addressed:

1. **Progress Review:** A thorough assessment of implemented measures compared against planned timelines and budgets. This includes quantitative and qualitative evaluation of achievements.
2. **Challenge Identification:** Open discussion of obstacles encountered during implementation, including resource constraints, coordination issues, and unexpected challenges.
3. **Adaptive Management:** Development of solutions and adjustments to overcome identified challenges, including potential timeline revisions and resource reallocation.

3.3. EVALUATION COMPONENTS

The evaluation framework utilizes three sets of key performance indicators:

1. **Implementation Progress Indicators:** These track the completion rate of planned activities, adherence to timelines, and efficient use of allocated budgets.
2. **Effectiveness Measures:** Assessment of how well the implemented measures are achieving their intended outcomes and contributing to the desired states identified in the gap analysis.
3. **Sustainability Indicators:** Evaluation of the long-term viability of implemented measures and their integration into existing systems.

3.4. REPORTING AND DOCUMENTATION

A comprehensive documentation system ensures transparency and continuity. Each bi-annual meeting is thoroughly documented through detailed minutes, complemented by progress reports from implementing agencies. An annual report synthesizes the year's achievements, challenges, and recommendations for future actions.

MEETING DOCUMENTATION:	ANNUAL REPORT:
• Detailed minutes of bi-annual meetings	• Comprehensive yearly assessment
• Progress reports from implementing agencies	• Recommendations for next year
• Updated implementation framework	• Budget revision proposals

3.5 MONITORING PROCESS

The monitoring process is structured around bi-annual meetings, strategically scheduled before and after the fire season. The first meeting, held in March/April, focuses on preparedness and planning for the upcoming fire season, while the second meeting, in October/November, evaluates the effectiveness of the measures implemented during the previous season. These meetings serve as key milestones for assessing progress and making necessary adjustments.

Each meeting addresses three key areas:

1. **Progress Review:** A comprehensive assessment of the measures implemented, comparing actual progress against planned timelines and budgets. This includes both quantitative and qualitative evaluations of achievements.
2. **Challenge Identification:** An open discussion of the obstacles encountered during implementation, such as resource constraints, coordination challenges, and unforeseen issues.
3. **Adaptive Management:** The development of solutions and adjustments to address the identified challenges, including potential revisions to timelines and resource reallocation.

3.6. EVALUATION COMPONENTS

The evaluation framework employs three sets of key performance indicators:

1. **Implementation Progress Indicators:** These track the completion rate of planned activities, adherence to timelines, and the efficient allocation of budgets.
2. **Effectiveness Measures:** An assessment of how effectively the implemented measures are achieving their intended outcomes and contributing to the desired states identified in the gap analysis.
3. **Sustainability Indicators:** These evaluate the long-term viability of the measures implemented and their integration into existing systems.

3.7. STAKEHOLDER ENGAGEMENT

The framework emphasizes active stakeholder involvement through various feedback mechanisms. Regular surveys capture stakeholder perspectives, while direct feedback channels ensure continuous communication. Public consultation sessions provide opportunities for broader community input. To reach the goal there are going to be developed communication channels such as:

- ✓ Feedback Mechanisms
- ✓ Regular stakeholder surveys
- ✓ Direct feedback channels
- ✓ Public consultation sessions

3.8. QUALITY ASSURANCE

To maintain objectivity and reliability, the framework incorporates independent verification mechanisms. This includes peer review of monitoring reports and periodic external evaluations when necessary. Effective implementation of this monitoring and evaluation framework be based on:

1. The Ministry of Agriculture, Forestry, and Water Economy should establish a dedicated monitoring team with representatives from all supporting institutions.
2. Standard templates for reporting and documentation should be developed and agreed upon by all participating institutions.
3. A secure digital platform for sharing documents and tracking progress should be established.
4. Regular training sessions for monitoring team members should be scheduled.
5. Clear communication channels between institutions should be established and maintained.
6. A detailed annual calendar of monitoring activities should be developed and distributed to all stakeholders.

The success of this framework depends heavily on the commitment and active participation of all involved institutions.