Firelogue

Fire Up the Dialogue

Strengthening Integrated Wildfire Risk Management in Europe: Insights and recommendations for different stakeholder groups

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Project: Cross-sector dialogue for Wildfire Risk Management

Acronym: Firelogue

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LIST OF ABBREVIATIONS

Abbreviation	Meaning
AR / VR	Augmented reality / Virtual reality
CI	Critical infrastructures
CSA	Coordination and Support Action
CSO	Civil society organisation
D	Deliverable
DG	Directorate General
DRR	Disaster risk reduction
EC	European Commission
EU	European Union
IA	Innovation Action
IFM	Integrated fire management
IWFRM	Integrated wildfire risk management
JT	Just transition
LULUCF	Land use, land use change and forestry
MS	Member State (EU)
NbS	Nature-based solution
SFM	Sustainable forest management
R&D	Research and development
WF	Wildfire
WFRM	Wildfire risk management
WG	Working group
WP	Work package

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Executive summary for policymakers

Purpose of the Deliverable

This report provides actionable options for enhancing wildfire risk management in Europe, addressing the increasing frequency and severity of wildfires due to climate change, the expansion of urban interfaces, low and inadequate forest management, land use change, and the abandonment of agricultural land. It identifies potential gaps in current management, operational practices, and scientific knowledge, and offers options for addressing these gaps tailored to the needs of policymakers, practitioners, scientists, and the general public.

This executive summary for policymakers highlights the insights derived from the results of two workshop cycles across five working groups (environment, societal, infrastructure, insurance, and civil protection) organised by the Firelogue project over the course of 2023 and 2024. Further recommendations for other stakeholder groups, including academia, practitioners and civil society, are contained in the main body of the report. The insights in this executive summary are targeted towards policymakers at the national level, as well as at the EU level (European Commission, European Parliament, and Council of the EU).

Key Insights for Policymakers

1. **Enhancing the role of *environmental* management and forests for WFRM**

⇨ To better address the synergies between forest management and WFR reduction, policymakers should promote the full integration of WFRM into commercial forestry practices being aware of related opportunity costs and incentivize the sustainable forest management in non-profitable wooded lands.

⇨ To improve wildfire risk management options in protected areas and promote synergies between nature conservation and wildfire risk policies, policymakers should integrate wildfire risk management options into protected areas management and nature conservation policies.

⇨ To promote private sector participation in WFR reduction and embed risk ownership and finance in WFR reduction measures, policymakers should adopt relevant policies and tools to promote private sector participation in WFR reduction.

⇨ To provide guidance on the definition of Nature-based Solutions (NbS) for WFRM, policymakers should define and acknowledge NbS for WFRM in relevant laws, policies and EU programmes.

⇨ To improve the communication around the benefits of sustainable fire management and 'good fires' for WFRM and nature conservation to promote social acceptance of WFRM actions, policymakers should effectively govern and communicate the purpose of prescribed burning and sustainable fire management as a tool for WFR reduction and nature conservation to society.

2. **Improving *societal* engagement and improved communication strategies for WFRM**

⇨ To promote better societal adherence to emergency instructions, policymakers should develop centralised and inclusive communication platforms and mandate the adoption and adherence to standardised communication guidelines by practitioners.

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- ⇨ To address the risk awareness deficiency in society, policymakers should fund and promote public risk awareness initiatives.
- ⇨ To promote the adoption of standardised and inclusive information about WFRM, policymakers should enforce regulations for standardised and inclusive emergency information.
- ⇨ To promote better coordination of spontaneous volunteers, policymakers should adopt policies that enable volunteer engagement.
- ⇨ To remove the barriers and bureaucracy in recovery support mechanisms, policymakers should enact simplified procedures for accessing emergency support.
- ⇨ To promote psychological support for impacted communities as well as practitioners and first responders, policymakers should allocate resources to mental health services.

3. **Protecting *critical infrastructure* and improving the role of infrastructure providers for WFRM**

- ⇨ To promote a multi-governance approach to wildfire prevention and infrastructure resilience, policymakers should encourage collaboration and coordination among government agencies, follow a multi-risk governance approach and policy coherence, encourage community engagement in the while cycle of disaster management, and develop comprehensive support systems for policymakers.
- ⇨ To strengthen legal frameworks for promoting critical infrastructure resilience against wildfire risk and support the development and implementation of new/updated codes for infrastructure upgrading or safeguarding against wildfires, policymakers should ensure the full implementation and monitoring of CER and SEVESO III EU Directives, develop and implement new policies and regulations that address the wildfire-infrastructure interface, and consider data sharing and cooperation of stakeholders in the regulations.
- ⇨ To advance technology usage in the whole cycle of wildfire risk management for critical infrastructures, policymakers should improve knowledge on the effectiveness of fire prevention technologies by integrating scientific advancements into policy frameworks.
- ⇨ To enhance risk assessment for managing wildfires for critical infrastructures, policymakers should promote better data accessibility for fire management research, and promote landscape management.
- ⇨ To address the lack of standardisation in wildfire risk management and critical infrastructure resilience, policymakers should take the lead in creating certification schemes for personnel and systems involved in wildfire management.
- ⇨ To focus more on research and innovation, policymakers should use legislation to support the need for wildfire data collection and availability covering ignition points and causes.

4. **Enhancing the role of the *insurance* sector in enabling nature-based solutions for WFRM**

- ⇨ To promote transparency and the adoption of Disaster Risk Reduction (DRR) and Nature-based Solutions (NbS), insurance regulators at the EU level (e.g. the European Insurance and Occupational Pensions Authority EIOPA) and Member State level (e.g. IVASS in Italy, DOPIS in Greece, DGSFP in Spain, etc.), should consider steps that assure that the pricing of parametric and other insurance products is transparent and differentiated to incentivise the adoption of DRR and NbS.

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- ⇨ To encourage insurers to add nature-positive projects, including NbS, to their investment portfolios (and divest from nature-negative projects), and encourage insurers to withdraw underwriting services to nature-negative projects, insurance regulators for the EU and Member States should consider regulations that incentivise or require pro-nature investing and divesting.
- ⇨ To encourage public and private insurers to provide client discounts for collective NbS, potentially through community insurance models, the European Parliament, European Council and Member State governments can incentivise community-based insurance through policy or legal measures.
- ⇨ To promote transparency on insurers' impacts on nature and biodiversity, the European Commission could make the recommendations by the Task Force on Nature-related Disclosures (TNFD) compulsory for large financial institutions.
- ⇨ To incentivise Member State governments to invest in cost-effective DRR and NbS, EU regulators can institute pre- and post-disaster financing measures that incentivise actions at MS scale.

5. **Enhancing *civil protection* and improving capacities and capabilities of first responders**

- ⇨ To promote and optimise technological innovation (unmanned, IT, tools), harmonisation and technical interoperability, the European Commission, particularly DG ECHO, and through the European Parliament and the Council for legislative interventions, can take appropriate policy measures to promote and optimise technological innovation and harmonisation across MS.
- ⇨ To provide EU guidance on safety, aerial practices, volunteering, building codes, and forest management, EU regulators should produce policy guidelines or adopt legislative measures (e.g. EU Directive) with a view to move towards harmonisation across MS.
- ⇨ To promote interoperability by sharing responders' professional knowledge, improve terrain cooperation and share expertise with non-fire prone countries, policymakers should support the sharing of knowledge, empower the existing networks and cooperation between responder units at the national and EU level (DG ECHO).
- ⇨ To promote knowledge sharing by teaching, training and drilling on operational techniques, material and tools, suppression practices, standards, safety, etc, policymakers should support knowledge sharing by funding training efforts through policy and legislative measures.

Expected Impact of the options for enhancing wildfire risk management in Europe

These options for enhancing wildfire risk management in Europe are closely are aligned with the EU Gaps Explorer[1] and seek to support the implementation the recommendations to (i) reinforce the EU's disaster response, (ii) improve the coordination and coherence between EU national policies, (iii) support proactive prevention operations, (iv) integrate fire management with sustainable forest management, and (v) improve fire preparedness through participative, multilevel governance. The options are further detailed in this report and include specific implementation steps for different stakeholder groups, including policymakers, as well as academia/scientific community, practitioners, and the general public/civil society organisations. A multi-stakeholder and multi-level governance approach will enable better integrated wildfire risk management across Europe.

[1] Disaster Risk Management Knowledge Centre, *Forest Fires / European Commission*, [Online]. Available at: https://drmkc.jrc.ec.europa.eu/science-for-drm/gaps-explorer/forest-fires#!/true.

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1. Introduction

Wildfire risk is becoming an increasingly critical issue in Europe. Climate change and land use changes further exacerbate the risk of extreme wildfires, impacting their frequency and intensity.[2] The complexity of the wildfire risk problem is further compounded by a multitude of stakeholders, including the forestry and agricultural sector, civil protection authorities, first responders, critical infrastructure operators, insurers, civil society organisations, policy-makers and other governance institutions. Sometimes, these groups operate in silos, making it challenging to develop and adopt integrated approaches to wildfire risk management.

The Firelogue project, funded by the EU Horizon 2020 Green Deal, seeks to address these challenges by fostering cross-sector dialogue and collaboration. Through a series of workshops and webinars, Firelogue has sought to break down silos between stakeholder groups and identify cohesive strategies and measures for integrated wildfire risk management in Europe. As a Coordination and Support Action (CSA) within the meaning of EU Horizon-funded projects, Firelogue has facilitated these discussions involving various Green Deal Innovation Actions, including TREEADS[3], SILVANUS[4], and FIRE-RES[5], as well as FirEUrisk[6]. By bringing different stakeholder groups and fire-related projects together, Firelogue has sought to create synergies, resolve conflicts and co-develop actionable options for more effective and integrated WFRM in Europe.

This report presents options for improving WFRM in Europe, as developed by the Firelogue project. These options are addressed to different stakeholder groups, with implementation steps and expected benefits. This report highlights the importance of collaborative governance and integrated systems-thinking to overcome existing conflicts and fragmented approaches to wildfire management. By emphasising the need for shared strategies and approaches, as well as inclusive decision-making processes that consider justice aspects of wildfire risk management, these options aim to strengthen Europe's integrated approach to wildfire risk management.

2. Methodology and scope

The Firelogue project engaged with various experts through two series of workshops, held in Solsona, Spain from 6-7 July 2023 and Nea Makri, Greece from 9-11 April 2024. These experts were organised into five thematic working groups (WGs):

- Environment (led by CTFC)
- Societal (led by VOST Portugal)

[2] See, OECD (2023), Taming Wildfires in the Context of Climate Change, OECD Publishing, Paris, https://doi.org/10.1787/dd00c367-en.
[3] TREEADS Project, [Online]. Available at: https://treeads-project.eu/.
[4] SILVANUS Project, [Online]. Available at: https://silvanus-project.eu/.
[5] FIRE-RES Project, [Online]. Available at: https://fire-res.eu/.
[6] FIREURISK Project, [Online]. Available at: https://fireurisk.eu/.

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- Infrastructure (led by KEMEA)
- Insurance (led by IIASA)
- Civil protection (led by TIEMS)

The results from the discussions were analysed and summarised in various deliverables, including *D4.4 Workshop Results I* (results from Solsona workshop)[7], *D4.5 Workshop Results II* (results from Nea Makri workshop)[8], *D5.1 Discourse analysis*[9], and *D5.2 Synthesis report of workshop findings*.[10] An interim version of the policy options was discussed with experts and European Commission representatives in a dedicated workshop in Brussels in November 2024. The options set out in this report will be further discussed and validated during the Firelogue Clustering Event in May 2025, and an updated version of this report will be produced in October 2025.

The options for improving WFRM in Europe are aimed at different stakeholders, grouped into four categories:

- **Scientific community**: Academic institutions, researchers, scientists.
- **Practitioners**: Land owners and managers, first responders, private actors including businesses, critical infrastructure operators.
- **Policymakers**: Policy- and decisionmakers at the national and EU level, including relevant DGs at the European Commission such as DG ECHO, DG ENV, DG AGRI, etc.
- **General public and CSOs**: Civil society organisations (CSOs), organisations representing the public, and NGOs.

Following the Firelogue workshops in Solsona and Nea Makri, the consortium partners and WG leads worked closely together to fine-tune the options for enhancing WFRM in Europe for each working group. During a series of monthly meetings, the project partners worked on a Miro board using a coherent format to develop the high-level recommendations from the workshop discussions into actionable options. This format includes a problem statement, actionable options targeted towards specific stakeholder groups, implementation steps, as well as expected benefits. These options were derived from internal discussions around the following questions:

1. *Is this recommendation clear and understandable?*
2. *Is the recommendation needed and helpful?*
3. *Is the recommendation practicable and feasible?*
4. *Is there a need to modify this recommendation?*
5. *Are these the most important recommendations? Are there gaps / overlaps?*

[7] Berchtold, C., et al (2023) 'D4.4 Working Group Results'. *Firelogue Deliverable 4.4,* [Online]. Available at: https://firelogue.eu/resources.php.
[8] Overmeyer, M., et al (2024) 'D4.5 Working Group Results II'. *Firelogue Deliverable 4.5,* [Online]. Available at: https://firelogue.eu/resources.php.
[9] Dong, X., et al (2025) 'D5.1 Report on the Discourse Analysis of the Cross-Working Groups' Dialogue Formats'. *Firelogue Deliverable 5.1,* [Online]. Available at: https://firelogue.eu/resources.php.
[10] Vinders, J., et al (2025) 'D5.2 Synthesis Report on Workshop Findings'. *Firelogue Deliverable 5.2,* [Online]. Available at: https://firelogue.eu/resources.php.

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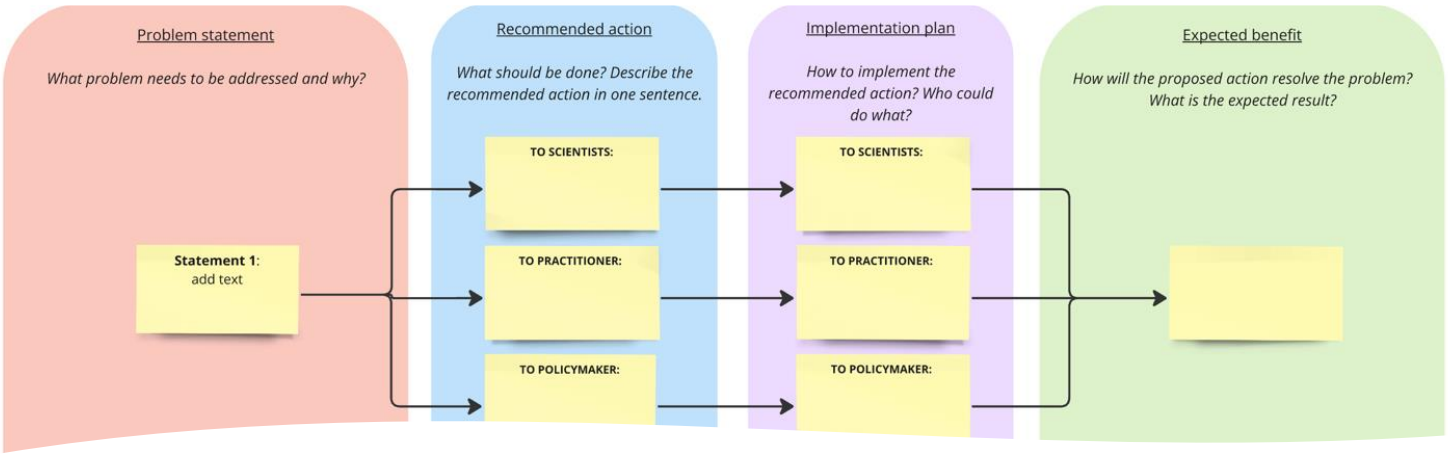
Figure 1: Snapshot of the Miro board format for refining options for addressing WFRM challenges



2.1 Options for enhancing WFRM in Europe

The recommendations in this report are designed as **actionable options** to address specific challenges identified during the WG discussions. While they do not exclude the possibility of exploring additional solutions, they represent the insights and outcomes derived from the WG discussions, webinars, and other activities conducted as part of the Firelogue project. These options were carefully identified by the WG leads based on extensive input from the Solsona and Nea Makri workshops, as well as a series of online webinars hosted by the various WGs. It is important to note that while these options reflect key findings from these collaborative activities, they may not encompass the views of all WG members or represent a formal consensus. Instead, they serve as a synthesis of the most relevant and impactful ideas generated through this process.

3. Understanding the Wildfire Risk Management context

Wildfires are an ongoing and increasingly severe threat to various countries in Europe, particularly southern European countries, but increasingly more northern European countries as well due to the effects of climate change. The responsibility and capability of managing wildfire risk is shared among a broad range of stakeholder groups and across all disaster management phases, including prevention, preparedness, response and recovery.

3.1 Governance considerations

Effective and integrated wildfire risk management in Europe requires multi-level and multi-stakeholder collaboration. Focusing solely on suppression or prevention is insufficient when used in isolation. Suppression-only tactics can lead to fuel build-up, potentially making future fires more severe, while prevention alone cannot address the immediate threat of active wildfires. Therefore, integrated

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approaches are needed, which combine prevention, preparedness, response, and recovery and adaptation. This involves coordination between local, regional, national, and EU policymakers, as well as coordination between different policy areas, departments, administrations and jurisdictions. Furthermore, wildfire risk governance requires strong collaboration with other stakeholder groups, including practitioners and first responders, local communities, the scientific community, infrastructure operators, financial services and industry.

The governance of wildfire risk is not an isolated policy area, but rather takes place within an existing policy and regulatory framework that spans from a local level, to regional, national and European level as well as across different jurisdictions, such as different EU Member States. In this multi-level governance environment, breaking down silos and collaborating across administrative boundaries are often seen as critical steps in promoting better integrated wildfire risk management across Europe. A recent study produced by the Firelogue and Fire-Res partners looks at the coherence across different policy and legal documents at the EU level.[11]

The recommendations in this report seek to build on the existing policy and regulatory framework, and identify specific frameworks at the EU level where it is relevant for the implementation of the recommendation. This knowledge was gathered through the Firelogue workshops in Solsona and Nea Makri as well as a policy-oriented workshop in Brussels in November 2024, involving representatives from the European Commission, the Firelogue partners, and linked IAs.

3.2 Justice considerations

The consideration of the justice dimension in the context of wildfire risk management is becoming increasingly more important, particularly in the context of climate change, the EU's Green Transition, the EU Green Deal, and Just Transition concept. Justice considerations are often grouped in the following three dimensions:

- **Distributive justice** relates to the "distribution of exposure and vulnerability patterns as well as WFRM responsibilities, competences, costs and benefits across society."[12]
- **Procedural justice** relates to the "engagement processes for (multi-) stakeholder integration into WFRM and representation of plural worldviews in risk governance."[13]
- **Restorative justice** relates to the 'restoration and compensation mechanisms, including insurance schemes, disaster funds and managed retreat."[14]

[11] Plana, E., Serra, M., Smeenk, A., Regos, A., Berchtold, C., Huertas, M., Fuentes, L., Trasobares, A., Vinders, J. N., Colaço, C., & Bonet, J. A. (2024). Framing Coherence Across EU Policies Towards Integrated Wildfire Risk Management and Nature-Based Solutions. *Fire*, *7*(11), 415. https://doi.org/10.3390/fire7110415.
[12] Schinko, T., Berchtold, C., Handmer, J. *et al.* A framework for considering justice aspects in integrated wildfire risk management. *Nat. Clim. Chang.* **13**, 788–795 (2023). https://doi.org/10.1038/s41558-023-01726-0, p. 791.
[13] Ibid.
[14] Ibid.

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Schinko et al (2023) applied these three dimensions to the wildfire risk management context and the four response phases of **prevention**, **preparedness**, **response**, and **recovery and adaptation**.[15] Where conflicts exist between policy objectives, the framework for considering justice aspects in a wildfire risk management context may be useful to find synergies and develop a coherent policy approach that addresses justice considerations. Justice dimensions span across all Firelogue working groups and the recommendations in chapter 4 were viewed and developed with the three justice dimensions across the four disaster response phases in mind.

3.3 Cross-cutting considerations of WFRM

Whilst the Firelogue workshops were organised into five working groups (environment, societal, infrastructure, insurance, and civil protection), some cross-cutting aspects of WFRM were identified across all working groups, such as the **language** and **terminology** that is being used between different stakeholder groups, the use and implementation of **nature-based solutions**, the **role of forests** and forest management, **community engagement** and cross-sector collaboration, **funding, governance and policy dynamics**, and the **role of technology**. These cross-cutting topics are further elaborated on in Firelogue D5.2[16] and can be seen as a red thread throughout the WG recommendations that follow in this report.

[15] Schinko, T., Berchtold, C., Handmer, J. *et al.* A framework for considering justice aspects in integrated wildfire risk management. *Nat. Clim. Chang.* **13**, 788–795 (2023). https://doi.org/10.1038/s41558-023-01726-0.
[16] Vinders, J. et al (2025) *D5.2 Synthesis of Workshop Findings: A briefing note for policymakers*. Firelogue Deliverable 5.2. Available at: https://firelogue.eu/resources.php.

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4. Options for addressing WFRM challenges and expected benefits

This section sets out the options for addressing WFRM challenges and is divided into five sub-sections, covering the five Firelogue working groups, **environment** (section 4.1), **society** (section 4.2), **infrastructure** (section 4.3), **insurance** (section 4.4) and **civil protection** (section 4.5). The options presented here do not exist in isolation, and many synergies and overlaps can be found with the European Commission's Gaps Explorer on Forest Fires.[17] The five recommendations for policymakers from the Gaps Explorer are as follows:

- Reinforce the EU's disaster response capacity
- Improve coordination and coherence between EU national policies
- Support proactive prevention operations
- Integrate fire management with sustainable forest management
- Improve fire preparedness through participative, multilevel governance.[18]

The Firelogue options for addressing WFRM challenges set out in the following sections, further build on the recommendations of the EC's Gaps Explorer. Each section sets out a range of options for addressing challenges in the WFRM context, with suggestions for different stakeholder groups, and explicit implementation steps to make each option actionable. Furthermore, each option includes a description of what the expected impact and benefits are.

4.1 Enhancing the role of the environment and forests for WFRM

The ecology/environment WG, led by the Forest Science and Technology Centre of Catalonia (CTFC), comprises 15 members with a background and interest in environmental protection and conservation. The WG includes representatives from various EU funded projects, including the linked Innovation Actions, FIRE-RES, SILVANUS, TREEADS, as well as other fire-related projects such as Pyrolife, RESONATE, ResAlliance, and FoRISK. The environment WG focused its discussions on **landscape resilience**, **climate change adaptation**, **wildfire risk management at landscape and environmental level**, **disaster risk management**, **land and forest management**, **nature-based solutions** and **biodiversity conservation**.[19]

Options for enhancing the role of the environment and forests in WFRM:

1. *Better address the synergy between sustainable forest management (SFM) and WFR reduction*
2. *Improve WFRM in protected areas and promote synergies between nature conservation and WFR reduction policies*
3. *Promote private sector participation in WFR reduction to embed risk ownership and finance WFR reduction measures*

[17] See *Forest Fires / DRMKC – Disaster Risk Management Knowledge Centre,* [Online]. Available at: https://drmkc.jrc.ec.europa.eu/science-for-drm/gaps-explorer/forest-fires#!/true. Accessed 7 March 2025.
[18] *Forest Fires / DRMKC – Disaster Risk Management Knowledge Centre,* [Online]. Available at: https://drmkc.jrc.ec.europa.eu/science-for-drm/gaps-explorer/forest-fires#!/true. Accessed 7 March 2025.
[19] *Ecology/Environment Working Group / FIRELOGUE*, [Online]. Available at: https://firelogue.eu/wg.php.

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4. *Provide guidance on the definition of Nature-based solutions (NbS) for WFRM*
5. *Improve communication around the benefits of SFM and 'good fire' for WFRM and nature conservation to promote social acceptance of WFRM actions.*

1: Better address the synergy between sustainable forest management and WFR reduction	
Policymakers: *Address the synergy between sustainable forest management and WFR reduction*	
Implementation steps:	• By promoting the full integration of WFRM into commercial practices, policymakers should be aware of related opportunity costs and incentivize the sustainable forest management in non-profitable wooded lands.
Practitioners: *Define the priorities for different landscape fuel types and exposed and vulnerable values and areas such as WUI and prioritise interventions in high-risk areas*	
Implementation steps:	• Effectively integrate wildfire risk into spatial planning, considering the fire regimes, the distribution of fuels and their inter-linkages with the rest of the land values (urban and critical infrastructures, other ecosystem services such as protective forest, protected areas and habitats, etc.) • Define guidelines for commercial SFM and WFR reduction, establishing the complementary legal, technical and economic resources around opportunity costs • Support SFM for WFR reduction in high fire-prone and low-forest profitability sites • Link forestry practices within mosaic landscapes and agroforestry to enhance landscape protection function against wildfires • Facilitate the forest ownership aggregation and updated cadastral mapping for joint fuel management at landscape level • Consider multi-benefits of WFR reduction and climate-related risk, such as drought, water provision, forest health, recreational services, etc. • Making the management of forests with little or no economic benefit more attractive • Present the benefits of sustainable forest management to emphasize the economic advantage
Scientific community: *Develop region-specific knowledge for a context-specific fire evidence-based local management regime.*	
Implementation steps:	• Develop knowledge about how other natural hazards could trigger cascading or accumulative reactions and increase wildfire risk • Develop knowledge about the impact of fires and wildfires in context-specific ecosystems and its relation to forestry practices
Expected impact and benefit: • Effective contribution of forest sector and forest bioeconomy to WFR reduction	

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• Enhancement of SFM practices for WFR reduction in non-profitable areas (currently without any fuel management) • Better allocation of limited resources implementing strategically WFR reduction fuel management accounting for the pattern of land ownership • Embedding WFR reduction in SFM related climate agendas, including GHG accounting (less vulnerability to drought, better water balance, enhancing recreational activities) • Build a network of wildfire resilient forests and agroforests able to protect citizens and values • Forests outside the economic focus are managed sustainably and offer greater resilience to fire

2: Improve WFRM in protected areas and promote synergies between nature conservation and WFR reduction policies	
Policymakers: *Integrate wildfire risk management options into protected areas management and nature conservation policies*	
Implementation steps:	• Develop WFRM assessment and planning into protected areas management plans • Based on the above, consider both, the risk of wildfires impacting on protected areas and the risk of wildfire spread across protected areas which may impact surrounding settlements and land activities • Integrate WFR reduction into the promotion of public use of protected areas • Improve knowledge on fire ecology of EU landscapes and ecosystems and align the reestablishment of fire-adapted forests and ecosystems into nature restoration policies (e.g., NRR) • Improve the coordination between environmental assessment requirements and procedures and WFRM • Accept fire as a natural phenomenon and control the natural disruption of the ecosystem if there is a risk to human life, infrastructure and ecosystem
Practitioners: *Share good practices and lessons learned based on evidence*	
Implementation steps:	• Identify experiences, studies, etc., which implement fire as a nature conservation tool, or related to the link between fire in the ecosystems and its effect on nature conservation (e.g., prescribed burns), within and beyond protected areas. • Promote the inclusion of such practices, experiences, studies, etc., in environmental planning tools
Scientific community: *Develop evidence-based knowledge about the impact of fire and wildfires (taking into account different intensities) in protected areas*	
Implementation steps:	• Develop knowledge about the relation between fires and wildfires and context-specific ecosystems

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	• Conduct research relating fire regimes in different forest landscapes • Develop knowledge about the impacts of climate change in fire regimes, and their link with biodiversity. • Identify needs of wildfire risk management applied to protected areas in a climate change context. • Identify good practices about the effects of wildfires in protected areas
Expected impact and benefit: • Better understanding of the role of fire in the ecosystem (specifically related to environmental aspects: fire behaviour; ecology, functions, etc.) • Promotion of a wildfire-resilient Natura 2000 network • At least in protected areas, promoting long-term fire adapted ecosystem according to fire ecology and natural fire regimes • Promoting the fire use for biodiversity conservation	

3: Promote private sector participation in WFR reduction to embed risk ownership and finance WFR reduction measures	
Policymakers: *Adopt relevant policies and tools to promote and support private sector participation in WFR reduction*	
Implementation steps:	• Enhance at legal, technical and funding level the WF 'protection function' of resilient landscape • Frame WF protection function into EU green infrastructure linking private ecosystem service providers with private and public beneficiaries (e.g., across Payment for Ecosystem Services). • Encourage a fuel bioeconomy and labelling of fire prevention activities (related to recommendation #1). • Encourage private actors to contribute at national/regional/local level to land management for WFR reduction, overall, those taking advantage of the landscape attributes (tourist sector, water companies, WUI, outdoor activities, etc.) • Apply EU Climate strategy by offering tools to private sector actors: planning tool, contact guarantees, funding mechanisms, carbon farming incentives, etc., to facilitate the implementation of resilient landscapes • Integrate zero risk balance to infrastructures implementation 'climate proofing' • Enhance private-public risk governance and insurance frameworks, and participatory risk assessment and planning • Create an incentive system to encourage private individuals to protect themselves and/or invest in protection (e.g. insurance)
Expected impact and benefit:	

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- Better public-private collaboration causes WFR reduction through the promotion of risk ownership and the financing of WFR reduction measures
- More resilient societies, business and infrastructures
- Integration of landscape management into Civil Protection planning and strategies

4: Provide guidance on the definition of Nature-based solutions (NbS) for WFRM	
Policymakers: *Recognise NbS for WFRM in relevant laws, policies and EU programmes*	
Implementation steps:	• Define Nbs for WFR reduction, including wildfire 'protection function' into the deployment of the Green Infrastructure • Promote the capacities (legal, guidelines) to implement NbS for WFR reduction (prescribed burning, grazing, etc.): prescriptions, liability, funds (link to R#3) • Consider NbS applied to co-occurring risk disturbances, such as droughts or bark-beetles outbreak, as an enablers of wildfire-adapted ecosystems • Promote diverse, no-regret, or relatively risk-free experimental solutions to apply public funds for NbS where cost-benefit analyses (including avoided wildfires) show positive outcomes • Promote funding aims to integrate adaptation measures and NbS into major EU programs • Consider the carbon balance of WFR reduction land management practices in national GHG inventories and include "wall to wall" mapping of emissions and fire-risk; and expand the models to include the impact of fire reduction on both CO2 and non CO2 emissions • Provide comprehensive climate risk assessments in climate adaptation policies to effectively prioritize and anticipate NbS actions • Promote practical and financial tools for NbS implementation in forests and neighbouring mosaic landscapes

Expected impact and benefit:

- Better defined and agreed understanding and criteria of NbS applied for WFR reduction
- Better recognition for NbS in financial risk management
- Reinforcing EU Green Infrastructure on wildfire protection function
- Monitoring and accountability of the ecosystem service of WF protection function
- Accountability of avoided GHG emissions

5: Improve communication around the benefits of SFM and 'good fire' for WFRM and nature conservation to promote social acceptance of WFRM actions

Policymakers: *Prescribed burning and SFM for WFR reduction must be well explained to society. Recognise prescribed burning as a tool for WFRM and nature conservation*

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Implementation steps:	• Promote fire education strategies (national level) and activities (regional level) around the contribution of SFM and landscape management for WFR reduction, and the role of fire in the ecosystems • Promote knowledge and intersectoral policies communication regarding WFRM at the EU and member state level should be increased (e.g. creating more opportunities to implement fire as a nature conservation tool within policies and enhancing wildfire 'protection function' of resilient landscapes) • Clear communication to the public about the need for forest management and fire-prevention strategies is crucial, as is bridging the gap between wildfire management knowledge and public perception. • Promoting knowledge exchange around SFM for WFR reduction across EU territories in parallel to the expansion of WF risk • Promote consistent messaging to avoid abrupt narrative shifts • Evaluation of the status quo of forest fire awareness; and regular repetition of this evaluation
Scientific community: *Develop unified messages to send to society*	
Implementation steps:	• Identify messages with scientific consensus • Define alliances with NGOs or other speakers to send homogeneous messages to society
Expected impact and benefit: • Better social understanding of the role of landscape management on WFR reduction • Social support to medium and long-term transformational processes of wildfire risk adaptation and resilience • Social awareness on changing risk landscape context • Political awareness on the multi-factorial aspects of WFRM and the need for fire-smart policy design and implementation to reduce hazardous risks in the landscapes • Public perception closer to science-based and practitioners' statements • Knowledge and lessons learned sharing on WFR reduction practices	

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4.2 Improving societal engagement and improved communication strategies for WFRM

The societal WG, led by VOST Portugal, comprises 11 members with a background and interest in addressing the societal impact of wildfires. The WG includes representatives from Fire-RES, Silvanus, TREEADS, as well as ISA, SOS Arganil, Pyrolife, CTFC, ISC UL, and ISIG. The societal WG focused bringing different experts and stakeholder groups together to discuss strategies for **clearer and concise communication with citizens**, involving **citizens in the decision-making processes** when designing new wildfire-related policies, **fostering partnerships** to enhance wildfire prevention and response efforts, and **reviewing existing wildfire policies** at the national and European scale.[20]

Options for improving societal engagement and improved communication strategies for WFRM:

1. *Promote better adherence to emergency instructions;*
2. *Address the risk awareness deficiency;*
3. *Adopt standardised and inclusive information about WFRM;*
4. *Promote better coordination of spontaneous volunteers;*
5. *Remove barriers and bureaucracy in recovery support mechanisms;*
6. *Promote psychological support.*

1: Promote better adherence to emergency instructions	
Scientific community: *Research factors effecting adherence to emergency instructions and effective communication methods.*	
Implementation steps:	Conduct research on the psychological and sociocultural factors that hinder public adherence to emergency instructions to inform more effective strategies.
Practitioners: *Create and distribute clear, simple emergency instructions and use standardised communication tools*	
Implementation steps:	Design and implement clear, multilingual emergency instructions that use visual aids to ensure inclusivity across diverse populations. Use multiple communication channels for emergency instructions that involves civil society.
Policymakers: *Develop centralised and inclusive communication platforms and mandate adherence to standardised communication guidelines.*	
Implementation steps:	Create standardised emergency messaging frameworks and maintain consistent, transparent communication to build public trust. Set guidelines for emergency communication standards.
General public / CSOs: *Participate in feedback surveys to improve clarity of emergency instructions.*	
Implementation steps:	Provide regular feedback on communication clarity.
Expected impact and benefit: • Scientists / researchers: Advance research on human behaviour in crises. Enhanced compliance, reducing risks during emergencies.	

[20] *Societal Working Group / FIRELOGUE* , [Online]. Available at: https://firelogue.eu/wg_single.php?wg=Societal.

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- Practitioners: Improved crisis communication skills. Clearer communication to ensure public safety.
- Policymakers: Increased trust in policy from public leading to consistent emergency communication standards.
- CSO / citizens: Ability to influence emergency protocols. Public feedback improves clarity and effectiveness.

2: Address the risk awareness deficiency	
Policymakers: *Identify and analyse gaps in risk awareness.*	
Implementation steps:	Conduct community-based surveys to identify awareness gaps.
Practitioners: *Develop targeted educational materials addressing awareness gaps.*	
Implementation steps:	Create and distribute tailored educational content.
Policymakers: *Fund and promote public risk awareness initiatives.*	
Implementation steps:	Create mandates for risk awareness initiatives in high-risk areas.
General public / CSOs: *Engage in community-based awareness activities.*	
Implementation steps:	Organize local awareness campaigns and distribute materials.

Expected impact and benefit:

- Scientists: New research on public awareness gaps. Improved public understanding of risks.
- Practitioners: Enhanced outreach and education programs. Increased preparedness through awareness programs.
- Policymakers: Increased policy effectiveness in risk reduction. Widespread public awareness and preparedness.
- CSOs / citizens: Greater community role in preparedness. Higher community engagement in preparedness.

3: Adopt standardised and inclusive information about WFRM	
Scientific community: *Research effective methods for inclusive emergency information.*	
Implementation steps:	Research inclusive communication best practices.
Practitioners: *Apply standardized, inclusive templates in communications.*	
Implementation steps:	Adopt inclusive design principles in emergency communication.
Policymakers: *Enforce regulations for inclusive emergency information.*	
Implementation steps:	Mandate standardization for inclusive information distribution.
General public / CSOs: *Provide feedback on accessibility and inclusivity.*	
Implementation steps:	Engage in feedback processes to improve information access.

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Expected impact and benefit:

- Scientists: Develop new inclusive communication strategies. Increased accessibility for all audiences.
- Practitioners: Apply inclusive standards in practice. Clear and standardized information during emergencies.
- Policymakers: Higher regulatory adherence and impact. Inclusive access to emergency information.
- CSOs / citizens: Increased public input on accessibility. Increased feedback improves inclusivity.

4: Promote better coordination of spontaneous volunteers	
Scientific community: *Investigate best practices for volunteer management and develop a framework for the coordination of spontaneous volunteers*	
Implementation steps:	Research volunteer coordination mechanisms.
Practitioners: *Organize and train volunteers for efficient deployment.*	
Implementation steps:	Develop volunteer training and organization protocols.
Policymakers: *Adopt policies that enable volunteer engagement.*	
Implementation steps:	Create policies for volunteer engagement in emergencies.
General public / CSOs: *Volunteer as coordinators or helpers in organized efforts.*	
Implementation steps:	Serve as volunteer coordinators or participate as responders.

Expected impact and benefit:

- Scientists: Identify best practices in volunteer coordination. Effective utilization of volunteer efforts.
- Practitioners: Efficient volunteer organization for crises. Trained volunteers are more effective in crisis situations.
- Policymakers: Legislation support for volunteer management. Policy supports organized volunteer efforts.
- CSOs / citizens: Direct involvement in community response. Community engagement enhances response capacity.

5: Remove barriers and bureaucracy in recovery support mechanisms	
Scientific community: *Identify ways to reduce bureaucratic delays in assistance.*	
Implementation steps:	Analyse and propose reforms to expedite bureaucratic processes.
Practitioners: *Optimize workflows to expedite assistance distribution.*	
Implementation steps:	Review and simplify workflows to minimize processing time.
Policymakers: *Enact simplified procedures for emergency support.*	
Implementation steps:	Introduce administrative simplifications for disaster relief.
General public / CSOs: *Advocate for streamlined processes and monitor them.*	

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Implementation steps:	Monitor and advocate for policy changes to reduce delays.

Expected impact and benefit:

- Scientists: Research on process efficiency in recovery. Faster recovery support for affected individuals.
- Practitioners: Improved assistance workflows. Reduced delays in recovery assistance.
- Policymakers: Greater transparency and efficiency in aid. Policy simplification leads to quicker aid distribution.
- CSOs / citizens: Community monitors improve process accountability. Community monitors policy changes for transparency.

6: Promote psychological support	
Scientific community: *Assess psychological impacts and recommend interventions.*	
Implementation steps:	Conduct assessments on psychological needs during emergencies.
Practitioners: *Establish accessible mental health support programs.*	
Implementation steps:	Establish mental health services and outreach programs.
Policymakers: *Allocate resources to mental health services.*	
Implementation steps:	Increase funding for mental health services.
General public / CSOs: *Promote community support groups for mental well-being.*	
Implementation steps:	Support local mental health initiatives and peer support.

Expected impact and benefit:

- Scientists: Understand mental health needs in emergencies. Better mental health outcomes post-emergency.
- Practitioners: Enhanced support network for mental health. Accessible support promotes faster psychological recovery.
- Policymakers: Higher policy impact on public mental health. Increased mental health support during crises.
- CSOs / citizens: Community support networks for resilience. Community resilience through mutual support.

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4.3 Protecting critical infrastructure and improving the role of infrastructure providers for WFRM

The infrastructure WG, led by KEMEA – Center for Security Studies, comprises of 14 members with a background and interest in critical infrastructure (CI) safety and resilience. The WG includes representatives from FIRE-RES, Silvanus, TREEADS, as well as the Cyprus Civil Defence, University of Aegean, US Fire Administration, GSN Science, IIASA, Boise State University, ESReDA, Universitat de Lleida, NTUA, NCSR Demokritos, EFI and independent experts. The infrastructure WG focused its discussions on developing policies to improve the protection and resilience of infrastructure systems, by considering infrastructure as a driving factor in the fire regime – as an ignition source and impact of fires on critical infrastructure, WFRM challenges around infrastructure protection and resilience.[21]

Options for protecting critical infrastructure and improving the role of infrastructure providers for WFRM:

1. *Promoting a multi-stakeholder approach to wildfire prevention and infrastructure resilience through improved collaboration*
2. *Strengthening the current legal frameworks or develop a new one for CIs resilience against wildfire risk*
3. *Advancing technology usage in the whole cycle of wildfire risk management for CIs*
4. *Enhancing risk assessment for managing wildfires for CIs*
5. *Addressing lack of standardisation in wildfire risk management and CI resilience*
6. *Focus more on research and innovation*

1. Promoting a multi-governance approach to wildfire prevention and infrastructure resilience through improved collaboration	
Scientific community: *Support multi-stakeholder collaboration*	
Implementation steps:	Develop approaches for continuous collaboration among stakeholders for sharing (i) resources, (ii) best practices, and (iii) training programmes.
Practitioners: *Improve collaboration among infrastructures and entities (cross-sector level) and implement comprehensive training programmes for infrastructure operators*.	
Implementation steps:	• Contribute to the development of comprehensive strategies and practical solutions to address the challenges posed by wildfires to critical infrastructure and the surrounding areas (agricultural wildlands and forests). • Establish continuous collaboration platforms among stakeholders for sharing (i) best practices, (ii) resources, and (iii) lessons learned to develop comprehensive strategies and action plans that consider wildfire

[21] *Infrastructure Working Group / FIRELOGUE*, [Online]. Available at: https://firelogue.eu/wg_single.php?wg=Infrastructure.

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	risks and incorporate strategies for prevention, preparedness and response.
Policymakers: *Encourage collaboration and coordination among government agencies, follow a multi-risk governance approach and policy coherence, encourage community engagement in the whole cycle of disaster management, develop comprehensive support systems for policymakers*	
Implementation steps:	• Create online and offline fora where stakeholders can exchange knowledge, resources, and strategies. These platforms should facilitate regular meetings, webinars, and workshops • Implement comprehensive training programs for infrastructure operators. These programs should focus on wildfire prevention, preparedness, and response strategies, ensuring that operators are equipped with the latest knowledge and skills • Establish committees that include representatives from various sectors in light of participatory process. These committees will ensure a unified approach through directives, standards, etc. for wildfire risk management experts and CI operators • Secure funding to support the establishment and maintenance of collaboration platforms, training programs, and resource-sharing initiatives. This financial support is crucial for sustained engagement and success • Create clear policy frameworks that outline the roles and responsibilities of various stakeholders in wildfire risk management for CIs. This will help ensure accountability and streamline collaboration efforts • Establish multi-risk commissions tasked with assessing wildfire risks to critical infrastructure. These commissions should consist of representatives from various sectors, including local governments, CI operators, emergency services, scientists and private industries • Establish committees that include representatives from various government agencies. These committees can facilitate communication, coordinate efforts, and ensure a unified approach to wildfire management.

Expected impact and benefit:

- Promoting a multi-governance approach and enhancing communication and collaboration among involved stakeholders will help achieve an integrated approach for the enhancement of wildfire risk management and infrastructure resilience.
- Comprehensive strategies and practical solutions will address the challenges posed by wildfires to critical infrastructure and the surrounding areas (agricultural wildlands and forests).

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2. Strengthening the current legal frameworks or develop a new one for CIs resilience against wildfire risk	
Scientific community: *Support the implementation of new/updated codes with scientific evidence*	
Implementation steps:	Support the development of new codes and updates of existing ones through research, such a stricter building codes and standards to reduce ignition hazards, zoning regulations that consider fire risk, and incentives for property owners to invest in fire resistant infrastructure.
Practitioners: *Co-create new/update codes with the scientific community*	
Implementation steps:	Encourage and train practitioners on the implementation of new codes
Policymakers: *Ensure full implementation and monitoring of CER and SEVESO III EU Directives; Develop and implement policies and regulations that address the wildfire-infrastructure interface; Consider data sharing and cooperation of stakeholders in the regulations*	
Implementation steps:	• Support the creation and updating of building codes and standards aimed at a) reducing ignition hazards, b) hardening existing infrastructures and c) to take into consideration the results of wildfire risk assessment for new CIs in a "security by design" concept. Stricter zoning regulations that account for fire risks should be a priority, alongside incentives for property owners to adopt fire-resistant infrastructure • Facilitate data sharing, interoperability and cooperation among various stakeholders. This will reduce data fragmentation and enhance the comparability of information, leading to improved understanding, communication and coordination. Ultimately, this enables a more integrated approach to wildfire risk management. • Introduce financial incentives for property and CI owners to invest in fire-resistant materials, protective barriers and monitoring technologies. This can include grants, insurance reduction, tax breaks, or low-interest loans aimed at promoting infrastructure resilience
Expected impact and benefit: • Create more resilient infrastructures/entities against wildfires • Provide better services (no service disruption, faster restoration times) to society • Reduce fire ignition from infrastructure malfunctions	

3. Advancing technology usage in the whole cycle of wildfire risk management for CIs	
Scientific community: *Conduct research on technical innovations in fire prevention and new fire resistant materials*	
Implementation steps:	• Research technological advances in remote sensing, data analysis, deterministic and stochastic modelling, and fire-resistant materials and their use.

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Practitioners: *Make better use of advanced technologies for WFRM*	
Implementation steps:	• Increase the utilisation of advanced monitoring technologies, early warning systems and detection technologies. • Promote the use of reliable and functional machinery under harsh conditions.
Policymakers: *Improve knowledge on the effectiveness of fire prevention technologies by integrating scientific advancements into policy frameworks*	
Implementation steps:	• Allocate funding specifically for research and technology initiatives focused on wildfire risk management. This investment should support innovative projects that aim to enhance resilience of CIs against wildfires • Develop policies that encourage the adoption of advanced Integrated Wildfire Risk Management and CI technologies. This could include incentives to utilize innovative practices or technologies in daily operations
Expected impact and benefit: • Improved early detection, early warning, support suppression efforts of response teams (situation awareness, coordination, resources allocation, evacuation), reducing impacts	

4. Enhancing risk assessment for managing wildfires for CIs	
Scientific community: *Provide scientific evidence for fuel management based on risk analysis*	
Implementation steps:	• Conduct detailed risk mapping and risk assessment at asset level • Integrate probabilistic fire risk modelling for rational predictions • Improve socio-economic impacts for wildfires • Promote data accessibility for fire management research • Develop integrated fire risk models • Research socio-economic impacts of wildfires
Practitioners: *Use detailed risk mapping and risk assessment at asset level. Promote better accessibility of data for fire management research. Enhance real-time risk assessment capabilities*	
Implementation steps:	• Make use of research outcome to create defensible space around infrastructure (preventive actions) • Implement appropriate measures within infrastructure to avoid fire ignition • Develop an integrated fuel treatment plan using risk mapping, prescribed burns, mechanical thinning, and fuel breaks to reduce wildfire hazards.
Policymakers: *Promote better data accessibility for fire management research. Promote landscape management*	
Implementation steps:	• Promote guidelines on wildfire risk assessment at CI. This will require regular updates based on evolving wildfire risks and scientific insights

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	• Investigate the socio-economic impacts of wildfires to understand how they affect communities and infrastructures. This assessment will inform risk management strategies and enhance community and infrastructure resilience • Develop best practices for reducing the risk of wildfires, including fuel management, across the EU.

Expected impact and benefit:

- Improved risk assessment and management, improved planning and suppression, protect infrastructure assets and the surrounding areas.

5. Addressing lack of standardisation in wildfire risk management and CI resilience	
Scientific community: *Support standardisation processes*	
Implementation steps:	Provide scientific knowledge and evidence, participate in standardisation activities
Practitioners: *Participate to the standardisation processes*	
Implementation steps:	Provide experience needs and knowledge, participate in standardisation activities
Policymakers: *Create certification schemes for personnel and systems*	
Implementation steps:	• Policymakers should take the lead in creating certification schemes for personnel and systems involved in wildfire management (e.g., register of specialists, cooperation agreements, peer-review frameworks). This will ensure that those responsible for firefighting and prevention possess the necessary skills and knowledge across the EU • Create new standards that outline qualifications and competencies (e.g., training programmes, exercises) required for wildfire management personnel (first and second responders) specifically for events involving in CIs. Maintain consistent definitions among all stakeholders • Develop standardised formats for incident reporting and data collection, to ensure consistency and common understanding

Expected impact and benefit:

- Common language and understanding, improved cooperation, enhanced situation awareness.

6. Focus more on research and innovation	
Scientific community: *Develop and research new modelling approaches, technologies and materials that enhance infrastructure resilience and reduce the risk of wildfire ignitions*	
Implementation steps:	• Respond to research needs and fill research gaps
Practitioners: *Promote data and knowledge sharing for research purposes*	

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Implementation steps:	• Collaborate with research stakeholders to share data and hands-on experience
Policymakers: *Use legislation to support the need for wildfire data collection and availability covering ignition points and causes.*	
Implementation steps:	• Incentivise collection and sharing of wildfire data, focusing specifically on ignition points and causes including impacts on affected Infrastructure • Allocate funding specifically for research projects that emphasize innovation in wildfire management for CIs • Encourage the development of new technologies, materials, and practices that can mitigate wildfire risks to CIs
Expected impact and benefit: • Understanding wildfire impacts on critical infrastructure and developing innovative solutions to be implemented.	

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4.4 Enhancing the role of the insurance sector in enabling nature-based solutions for WFRM

The insurance WG, led by IIASA, comprises various members with a background and interest in the intersection of insurance and wildfire risk management. The WG includes representatives from TREEADS, Fire-Res, CMCC, IIASA and CTFC, as well as Marsh McLennan, InsuResilience, Zurich Insurance, Global Quake Model, Guy Carpenter, SwissRe, WTW, Consiglio Nazionale delle Ricerce Instituto per la Bioeconomia, University of Lisbon, Leitha, ORRAA, Forest Re, Wharton, consorseguros.es, and Mitiga Solutions. The insurance WG focused its discussions on developing innovative solutions in the insurance sector for better integrated WFRM, options for equitable wildfire insurance and risk transfer, insurance and risk transfer incentives as well as requirements for wildfire risk reduction, notably through Nature-based Solutions (NbS), accessibility, affordability and availability of safety nets for low-income households and vulnerable businesses in wildfire risk areas, and responsibility for reducing wildfire risks through measures, including NbS such as restoring degraded ecosystems or controlled burns and other cost-effective solutions.[22]

Options for enhancing the role of the insurance sector in enabling nature-based solutions for WFRM:

1. *Assure that the conditions and terms of parametric and other insurance products are transparent and that they incentivize DRR/NbS;*
2. *Encourage insurers to add nature-positive projects, including NbS, to their investment portfolios (and divest from nature-negative projects); likewise encourage insurers to withdraw underwriting services to nature-negative projects;*
3. *Encourage public and private insurers to provide client discounts for collective NbS, potentially through community insurance models;*
4. *Promote transparency on insurers' impacts on nature and biodiversity;*
5. *Incentivize Member State governments to invest in cost-effective DRR/NBS.*

1. Assure that the conditions and terms of parametric and other insurance products are transparent and that they incentivize DRR/NbS	
Policymakers: *Insurance regulators at the EU (e.g., the European Insurance and Occupational Pensions Authority EIOPA) and Member States (e.g., IVASS in Italy, DOPIS in Greece, DGSFP in Spain, and others) should consider steps that assure that the pricing of parametric and other insurance products is transparent and differentiated to incentivize DRR/NbS*	
Implementation steps:	EU and Member State insurance regulators should consider: • A requirement for insurers to provide discounts to clients who put DRR/NbS measures into place (individually or through their communities) for all wildfire insurance products, including parametric, while considering increased premiums or coverage denial for projects harming nature;

[22] *Insurance Working Group / FIRELOGUE*, [Online]. Available at: https://firelogue.eu/wg_single.php?wg=Insurance.

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	• A requirement for greater transparency in parametric products, for instance, by informing clients of the probability of the trigger (consistent with the Insurance Distribution Directive?); • The pros and cons of the insurable interest principle (which greatly reduces the cost advantage of parametric insurance). (Note that the general mandate for EU financial supervisory authorities (ESAs) is to sustainably reinforce the stability and effectiveness of the financial system throughout the Union and to enhance consumer and investor protection.)

Expected impact and benefit:

- With low transaction costs and easy delivery, parametric insurance products have great potential for closing the wildfire insurance gap for businesses, households and governments. Moreover, unique to wildfire, DRR measures can reduce the probability and intensity of the hazard (the parametric trigger). This means that premium discounts can, in principle, be put in place to reward DRR and NbS. However, the lottery-like characteristic of the products can be exploited by insurers and consumers. Regulations on premium setting and discounts can promote equitable and transparent parametric wildfire insurance products, and at the same time incentivize DRR and NbS.

2. Encourage insurers to add nature-positive projects, including NbS, to their investment portfolios (and divest from nature-negative projects); likewise encourage insurers to withdraw underwriting services to nature-negative projects.	
Policymakers: *Insurance regulators for the EU and Member States should consider regulations that incentivize or require pro-nature investing and divesting*	
Implementation steps:	• EIOPA could follow the European Central Bank's (ECB) lead in promoting preferential treatment of capital when it supports EU goals on biodiversity, including through nature-based solutions. Indeed, EIOPA has recently proposed higher capital requirements for insurers' fossil fuel assets; this could be extended to nature-negative assets. • Regulators could also consider more aggressive requirements as regards climate-induced disasters, in particular provide forward-looking risk assessments. Again, there is precedent in California. • The TNFD could be mandatory for all major insurers (see recommendation 4).

Expected impact and benefit:

- Directing capital to nature-positive activities, including NbS for wildfire DRR.

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3. Encourage public and private insurers to provide client discounts for collective NbS, potentially through community insurance models	
Policymakers: *Community-based insurance models that incentivize NbS can be encouraged by the European Parliament, European Council, and by Member State governments.*	
Implementation steps:	• The EU and EU regulators should consider guidelines, even requirements, for private insurers to offer community products that provide premium discounts to households/businesses if suitable NbS are in place in the community. (Note, the EU Directive on Indemnity Insurance restricts public insurance monopolies and thus hinders the establishment of some forms of community insurance.)
Expected impact and benefit: • Given that most NbS for wildfire DRR are public goods (e.g., conservation barriers, appropriate prescribed burns, etc.), it is prudent to promote wildfire risk reduction measures, and especially NbS, beyond individual households/businesses to actions at the community, municipality or regional scale. The Community Rating System of the U.S. National Flood Insurance Program gives points for community DRR, e.g., creating a wetland. Community points lead to household discounts on flood insurance.	

4. Promote transparency on insurers' impacts on nature and biodiversity	
Practitioners: *Insurers are required to voluntarily disclose their investment portfolios' impacts on nature to the public and insurance clients*	
Implementation steps:	• National governments should pass legislation to implement the recommendations by the Task Force on Nature-based Disclosures (TNFD)
Policymakers: *The European Commission could make the recommendations by the Task Force on Nature-related Disclosures (TNFD) compulsory for large financial institutions*	
Implementation steps:	• The European Commission should consider making the recommendations by the Task Force on Nature-related Disclosures (TNFD) compulsory for large financial institutions, including insurers, to stimulate investment in wildfire NbS and discourage nature-negative projects, aligning with the European Sustainability Reporting Standards (ESRS), target 15 of the Global Biodiversity Framework and the EU Nature Restoration Law.
Expected impact and benefit: • Impact investing depends critically on transparent information about the sustainability of insurer portfolios. With this transparency, pressure from clients will provide incentives for insurers to invest in nature-positive projects/activities and divest from those that are nature negative.	

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5. Incentivize Member State governments to invest in cost-effective DRR/NBS	
Policymakers: *The EU regulators can institute pre- and post-disaster financing measures that incentivize actions at MS scale.*	
Implementation steps:	Suggested measures might include: • A second revision to the European Union Solidarity Fund (EUSF) to include terms and conditions for DRR and NbS; • Instituting a reinsurance instrument that provides *ex post* compensation to Member State governments, and potentially to private insurers, who implement DRR/NbS.
Expected impact and benefit: • MS governments and eventually insurance companies can benefit from EU backup for their underwriting practices and, at the same time, MSs are incentivised to require NbS.	

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4.5 Enhancing civil protection and improving capacities and capabilities of first responders

There is an important increase of activations of the EU Civil Protection Mechanism (EUCMP (see figure 2): in the last five years, the total number of activations has been more than tripled (notwithstanding Ukraine (UKR) help), compared to the 2015 –2019 period. Wildfire operations activations followed a similar increase, in the same period, and others EUCPM actions such as modules prepositioning in sensible countries must also be considered. In this context, every lever enabling an increase of effectiveness is to be used. Promoting the interoperability between civil protection forces can answer to this need of performance.

In this respect, the following four recommendations are directly coming from the IAs projects and target only a part of the topics that can be developed and improved at EU level:

- The need of a better integration of technologies into the fight, based on a better R&D management for responding agencies, r at national and EU level;
- The need of EU guidance and legislation (decisions and or directives) to substantiate and support the efforts on interoperability;
- The need to improve responders' professional knowledge, improve terrain cooperation and sharing of expertise;
- The need to share and teach internationally operational practices, which are currently unharmonized, in the aim to increase mutual knowledge and evolute slowly towards some harmonisation at EU level.

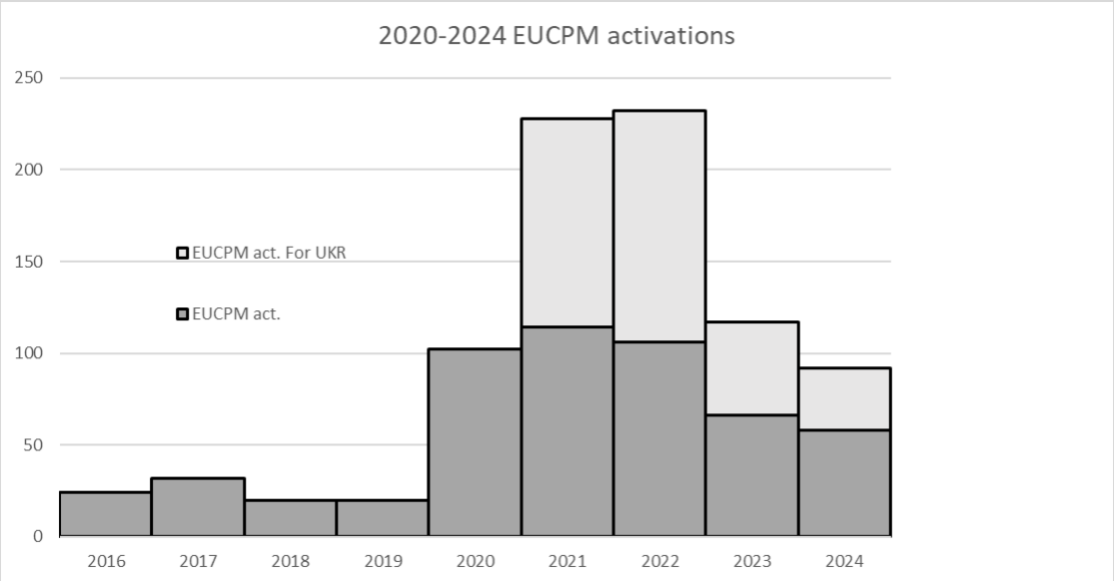

Figure 2: EU Civil Protection Mechanism (EUCPM) activations over the course of 2020-2024

The civil protection WG, led by TIEMS, comprises 12 members with a background and interest in ensuring the safety and well-being of communities by increasing the efficiency of response and civil protection capabilities. The WG includes representatives from Fire-Res, Silvanus, TREEADS, FirEUrisk and Nemausus.

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The civil protection WG focused its discussions on the role of new technologies as an improvement lever into civil protection response, improving interoperability between civil protection forces, promote knowledge sharing, and involving citizens towards resilience.
Options for enhancing civil protection and improving capacities and capabilities of first responders:

- *Promote and optimise technological innovation sourcing SYLVANUS; TREEADS)*
- *Harmonising relevant civil protection regulations (sourcing: TREEAD and FIRE-RES)*
- *Procedures and practices: Promote the sharing of responders' professional knowledge, improve terrain cooperation and share expertise with non-fire prone countries (sourcing FIRE-RES and FirEUrisk)*
- *Promote knowledge sharing by teaching, training and drilling on operational techniques, (sourcing Fire-RES and FirEUrisk)*

1. Promote and optimise technological innovation (unmanned, IT, tools), harmonisation, and technical interoperability	
Scientific community: *Increase the research in civil protection field. Improve the level of maturity in innovations. Better respond to the needs of practitioners*	
Implementation steps:	• Collect the needs of practitioners, then launch academic projects to respond to those research needs • Take part in testing trials with responders or EU R&D agency (see below) in order to validate the pertinence and the maturity
Practitioners: *Better define the needs, do not lose time being beta testers, dedicate some time for EU testing agency*	
Implementation steps:	• Integrate the innovation and R&D mindset into the responding agencies (lessons learnt culture + scientific approach) • Collaborate at national level to identify common needs
Policymakers: *Take appropriate policy measures, prepared by DG ECHO and adopted by the European Parliament, to promote and optimise technological innovation and harmonisation across MS*	
Implementation steps:	• Create a process dedicated to collect common responders needs • Fund an EU R&D agency in charge of collecting responders' needs and to organise innovation testing, facilitating procurement specifications.
Expected impact and benefit: • Increase impact of innovation for civil protection. • Better integration in the field • A solutions acceptation by several countries improves interoperability • Improve procurement requirements at national, international and EU level • Increase responders' efficiency	

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2. Harmonising relevant civil protection regulations: provide EU guidance (through Directives or other measures) on safety, aerial practices, volunteering, building codes, forest management.	
Scientific community: *Support legislative measures by providing academic and scientific backing*	
Implementation steps:	Produce studies and publications on key topics, for example: • Statistic study on firefighters fatalities during wildfires events in the EU; • Comparative study of drones aerial regulations in the EU; • Comparative study and suggestions on volunteering in Union responding agencies; • Forestry studies on resilient forests and forest management; • Holistic review of WUI building regulations in fire prone areas, etc.
Practitioners: *Cooperate with key policy stakeholders in the preparation of new codes and guidance*	
Implementation steps:	• Engage in advocacy activities at national level by identifying the needs of practitioners • Build contacts with EU parliament members taking part to EU funded projects to reinforce these ideas
Policymakers: *Produce policy guidance or adopt legislative measures (e.g. EU Directive) with a view to move towards harmonisation across MS*	

Implementation steps:	• Involve several DGs (AGRI, ECHO, ENV) to produce guidance or prepare a Parliament Directive to introduce measures to address:
	  • occupational safety,
	  • aerial practices, including drones and aircrafts ground/air safety
	  • volunteering, employed by responding agencies
	  • EU applied innovation management,
	  • building codes
	  • forest management across the EU.

Expected impact and benefit: • Progressively moving towards regulatory harmonisation across EU MS, and developing and sharing EU best practices, can better protect citizens, ecosystems and responders.	

3. Procedures and practices: Promote interoperability by sharing responders' professional knowledge, improve terrain cooperation and share expertise with non-fire prone countries	
Scientific community: *Support the inventory and comparison work*	
Implementation steps:	Produce studies and publications on key topics, for example: • Holistic review on fire suppression tactics in Europe; • Statistics on ground resources in wildfire fighting in EU; • Comparative study on human behaviour in fire fighter manoeuvre in EU; • Comparative EU study in human decision-making during wildfires fight etc.

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Practitioners: *Engage in the comparison and sharing of responders' professional knowledge*	
Implementation steps:	• Find a way to build a kind of 'national observatories' on professional practices, to inventory and share at EU level (usually practitioners don't have time to take part in this kind of work. And it's a must to have responders do this work). • Common trainings between the different fire and response services working in the boundary regions of EU Member States.
Policymakers: *Support the sharing of knowledge and cooperation between responder units at the national and EU level (DG ECHO)*	

Implementation steps:	• Issue at EU level decisions in favour of:
	  ○ Improving responders' international cooperation to share operational knowledge (exchange of experts)
	  ○ Explore the possibility of organising a European Civil Protection Erasmus between fire academies
	  ○ Funding occupational actions, workshops, lessons learnt, trials and trainings (see recommendation 4 below)
	• Invest at national level some existing structures to relay this work at regional level

Expected impact and benefit: • Bridge two important challenges: create and consolidate a first wildfire knowledge ecosystem into "non-fire-prone countries", then working to promote mutual knowledge (by empowering UCP knowledge network), towards harmonisation. All of this, in the aim of increasing ground interoperability of EU civil protection forces.	

4. Promote knowledge sharing by teaching, training and drilling on operational techniques, material and tools, suppression practices, standards, safety, etc.	
Scientific community: *Support knowledge sharing and training efforts*	
Implementation steps:	Producing ad hoc studies and publications on the best pedagogic practices for practitioners. For example: • Holistic study on firefighters training practices and tools • Analysing best methodologies for training international and heterogenous practitioners in comparison of military ones • Study on balances between theoretical and practices exercises during occupational training • Study of virtual reality limits, expertise on obtained results, etc.
Practitioners: *Engage in knowledge sharing activities*	
Implementation steps:	• Select from the practitioners' population the 'trainers for trainer' • Involve national fire academy in sharing of knowledge • Integrate it in DG ECHO training program by funding

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	• Train first responders to use innovative technologies as an integral part of the overall training processes implemented in first responders' organisations across the EU • Promote the use of Open Data which are crucial for efficient collaboration between agencies
Policymakers: *Support knowledge sharing by funding training efforts through policy and legislative measures*	
Implementation steps:	• Issue regulations at EU and national level to launch and fund this knowledge exchanges in addition to EUCPM training program • Decide who will be in charge (national Fire schools, independent contractors, DG ECHO or other EU bodies) • Organise a large number of "in person" events to let the operational responders meet, share and learn.
Expected impact and benefit: • By training and sharing professional knowledge, through in person events, the idea is to progress towards harmonisation and eventually serving the previous recommendation on increasing ground interoperability. • Side effect might be an improvement of national civil protection agencies skills	

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5. Green Deal Innovation Actions on WFRM

The options set out in this report were not developed in isolation, but are closely linked to the Green Deal funded Innovation Actions linked to Firelogue, namely TREEADS, SILVANUS and FIRE-RES, as well as the FirEUrisk project.

- TREEADS runs from December 2021 to May 2025 and seeks to create a holistic fire management ecosystem by establishing a unified technological ecosystem for integrated fire management and adaptive forest restoration.[23] With 46 partners from 13 European countries, the project is building up state-of-the-art high TRL products and unite them in a holistic Fire Management Ecosystem to optimise their utilisation during the prevention, detection and restoration phases of environmental disasters.
- SILVANUS launched in October 2021 and runs until March 2025. The project is developing a climate-resilient forest management platform, that combines the environmental, technical and social sciences to support authorities in managing and assessing wildfire risk. With 49 partners from the EU, Brazil, Indonesia and Australia, it is running 12 pilots in 11 countries to test the SILVANUS platform in a range of fire risk scenarios.[24]
- FIRE-RES runs from 2021 to 2025 and seeks to develop a holistic and integrated fire management strategy to address extreme wildfire events in Europe. It involves 11 living labs and 34 technological innovations related to four WFRM phases.[25]
- The FirEUrisk project preceded FIRE-RES and laid the groundwork for the Green Deal fire-related projects.[26]

All projects address multiple aspects of wildfire risk management across the prevention, preparedness, response and adaptation, and restoration phases of WFRM. Furthermore, the projects have a strong stakeholder engagement element and seek to advance the role of technology and innovation in wildfire risk management. Knowledge sharing, stakeholder engagement, and cross-border collaboration are seen as critical components of effective and integrated WFRM in Europe. The Firelogue project facilitates activities between the Innovation Actions to synthesise the results, strengthen our key insights and message towards policymakers in the WFRM context.

[23] TREEADS Project, [Online]. Available at: https://treeads-project.eu/.
[24] SILVANUS Project, [Online]. Available at: https://silvanus-project.eu/.
[25] FIRE-RES Project, [Online]. Available at: https://fire-res.eu/.
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6. Conclusion and outlook

Through this report, the Firelogue project presents detailed options for enhancing wildfire risk management in Europe. Through two expert workshops in Solsona, Spain and Nea Makri, Greece, the project facilitated cross-sectoral dialogues and collaboration among diverse experts, over five working groups; environment, societal, infrastructure, insurance, and civil protection. These dialogue formats have contributed to the refinement of the actionable recommendations aimed at enhancing WFRM policies and practices across different governance levels and policy areas. Furthermore, various online webinars among the working groups facilitated an ongoing discussion between the WG members and helped refine the recommendations.Finally, the policy coherence workshop in Brussels in November 2024 further enabled the refinement of the policy-focused recommendations from each working group.

By leveraging discussion through thematic working groups involving different expert stakeholders, including scientists, policymakers, industry, first responders, etc, the Firelogue project has sought to address the complex interdependences of wildfire risk in Europe. Following the publication of this report, the Firelogue project will continue its multi-stakeholder engagement through the final Clustering event in Brussels in May 2025. A further iteration of this report, with updated options for enhancing wildfire risk in Europe based on the further engagement with and feedback from experts and other stakeholders, will be produced in October 2025.

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