Firelogue

Fire Up the Dialogue

D.4.4 Working Group Results

Project: Cross-sector dialogue for Wildfire Risk Management

Acronym: Firelogue

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List of Abbreviations

Abbreviation	Meaning
AGIF	Agency for Integrated Rural Fire Management
CPWG	Civil Protection Working Group
CRS	Community Rating System
DG ECHO	Directorate General for European Civil Protection & Humanitarian Aid Operations
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EU	European Union
EUSF	European Union Solidarity Fund
IA	Innovation Action
IFM	Integrated Fire Management
IWFC	International Wildland Fire Conference
IWFRM	Integrated Wildfire Risk Management
IWG	Insurance Working Group
LULUCF	Land Use, Land-Use Change and Forestry
NbS	Nature-based solutions
NGO	Non-Governmental Organisation
NRL	Nature Restoration Law
RES	Renewable energy sources
SWG	Societal Working Group
TNC	The Nature Conservancy
UNCDF	United Nations Capital Development Fund
US NFIP	United States National Flood Insurance Program
WFRM	Wildfire Risk Management
WG	Working Group
WG_Environ	Environment/Ecology Working Group
WTW	Willis Towers Watson
WUI	Wildland Urban Interface

Executive Summary

This Deliverable provides an overview over the Firelogue Working Group (WG) workshop held in Solsona, Spain between 4th and 6th of July 2023. It provides an overview of the Key Notes that have been provided to set the scene (Section 3) and summarises the discussions within and across the Working Groups (WGs). During this first workshop cycle, the idea of introducing justice aspects into discussions around WFRM was introduced. While aspect on challenges, conflicts and synergies between the different stakeholders in managing wildfire risk have been discussed, also more general aspects of existing challenges and needed innovation have been discussed. The main insights per WG are described in Section 4. The Deliverable thereby builds on reports that have been produced by each Working Group to document the discussions and sketch the way forward. These reports are however only partly anonymised and are hence only used for internal documentation and further work by the WGs.

The focus of the WGs and the related discussions can be summarised as follows:

- **Environment and Ecology**: The Environment and Ecology WG aims to develop a better understanding of ecosystems' response to changing fire-prone conditions and the influence of cross-sectoral policies to landscape modulation, which are two main pillars of the environmental dimension of wildfire risk management (WFRM). The WG discusses how adaption and the management of fire resilient landscapes across the EU can be achieved in a collaborative and cost-efficient manner. At forest stand level, for instance, in depth analysis of fuel management options to provide forest structures resistant to wildfires become imperative, maximizing synergies among sectoral policies such as bio-economy or biodiversity conservation and protecting both not only forest but also society against high intensity fires.
- **Society**: The involvement of the society has increasingly become pivotal in disaster risk management. While people are often the primary targets of strategic policies, they also play a crucial role in driving and implementing these strategies at various levels, from local to European. However, the prevailing approach leans heavily on top-down communication strategies. Such strategies often overlook the importance of citizen consultation during policy formulation which can inadvertently create generational and technological divides, especially when solutions are technology-centric rather than user-centric. The Society WG hence focuses on the active involvement of citizens. In addition, it addresses an enhancement in understanding the target demographic. Policies often neglect groups like citizens with low literacy, migrants in rural areas, and individuals with disabilities. This lack of inclusivity hampers the adoption of policies, especially among crucial target groups.
- **Infrastructure**: Critical infrastructure such as transportation systems (highways, railways), communications networks (mobile phone masts), power lines (high voltage, low and high tension), Renewable Energy Sources (RES) installations (solar farms, wind turbines) and refineries provide essential life-sustaining goods and services and play an important role in the fire regime. Wildfires pose a significant threat to critical infrastructure and, vice versa, some critical infrastructure may also threaten wildlife assets, adversely acting as a source of fire. This complex relationship between wildfire and critical infrastructure highlights the importance of understanding the interdependencies and implementing effective strategies that can enhance the resilience of both assets and better mitigate fire risks is at the core of the Infrastructure WG.

- **Insurance:** The Firelogue-NATURANCE[1] Insurance Working Group (IWG) brings together representatives to deal with equitable insurance and other risk transfer options for mounting wildfire risk in Europe. In particular, the IWG focuses on two themes: i) exploring options for equitable wildfire insurance and risk transfer; and ii) insurance and risk transfer incentives and requirements for wildfire risk reduction, notably through Nature-based Solutions (NbS). 'Equity' in this context involves aspects of accessibility and affordability, including a view to the availability of safety nets for low-income households and vulnerable businesses in wildfire risk areas. As a second aspect, equity involves responsibility for reducing wildfire risks through measures, including NbS such as restoring degraded forest ecosystems with mixed forests, promoting mature tree growth, assuring sufficient hydration and other cost-effective solutions that are inspired and supported by nature.
- **Civil Protection:** The Civil Protection Working Group (CPWG) focuses on response topics and is hence involving representatives from Fire and Emergency Services; Emergency Medical Services; Police Department; Traffic Police; Armed Forces; Forestry service when they are involved in response; Responding NGOs and other specific responding bodies. It deals with aspects of (lacking) interoperability of responders at EU level, the development of new technologies for response operations and knowledge sharing and integration of lessons learnt more broadly.

Finally, the cross-links of the challenges, opportunities, synergies and conflicts of the WGs have been summarised in (Section 5). Building on a figure visualising the relations between the WGs, each connection and the topics to be considered in more integrated WFRM are described in the different sub-sections.

Overall, this Deliverable is the first of two reports that document the Working Group results. D4.5 is to follow in M36 after the second round of workshops.

[1] The WG is operated together with the Naturance project (Home - NATURANCE (naturanceproject.eu), 05.09.2023) which deals with assessing feasibility and performance of solutions built on disaster risk financing and Nature-based Solutions (NbS) investments and in which IIASA is also involved.

1 Introduction

The risk of forest fires and their management is characterised by complex interactions between human behaviour, socio-economic development, climate and vegetation resources. The interests and activities of those involved can develop synergies, but also lead to contradictions or even conflicts. Furthermore, complex governance settings raise important equity issues affecting multiple stakeholders. Thus, their respective points of view need to be considered from different perspectives to ensure that they are understood and integrated in a meaningful way. At the same time, the relevant preconditions and impacts from different WFRM perspectives need to be included in order to ensure sustainable approaches. With this in mind, Firelogue assumes that it is crucial to bring together the multitude of different WFRM stakeholders to uncover their potential synergistic and conflicting interests, goals and means of achieving these interests in order to enable holistic planning. Consequently, Firelogue has created five working groups aiming to facilitate the cross-project integration of innovative technologies, policies, strategies and governance approaches into holistic recommendations in the above policy areas and the identification of their synergies and trade-offs among different sectors and stakeholders. When it was possible, the WGs tried to respect a gender balance even if particularly response operation bodies are staffed by (ca.) 80 % of males.

The following working groups have been established:

- Environment/Ecology
- Society
- Infrastructure
- Insurance
- Civil Protection

All working groups involve the Innovation Actions (FIRE-RES, SILVANUS, TREEADS) and FirEurisk in order to acquire experts for the discussions. Experts from these projects are continuously complemented with experts from the WG leads' networks. The organisation that has been represented in the workshop are detailed at the beginning of each WG section below.

Each WG organised a digital kick-off between March and June 2023 to introduce the members to each other and prepare the physical workshop which was implemented in Solsona, Spain at the CTFC premises between 4th and 6th July 2023.

The thematic foci of the WGs as well as the overall concept of developing the working groups and the workshop concept have been described in D4.2 "Workshop Concepts and Material". The present Deliverable aims now to provide an overview over the actual implementation (Section 2) and the results of the working groups (Section 3 to 5). Section 3 provides a summary of the Keynote Speeches that were part of the programme. Section 4 summarises the discussions of the WGs while Section 5 extracts the key discussion items and visualises their interrelations.

The detailed aspects discussed in each WG and the agenda can be found in Annex I and Annex II respectively. The concept note is included in Annex III.

2 Implementation of the workshop

The overall concept of the Working Group implementation was described in D4.2 “Workshop Concepts and Material”. Building on this Deliverable, the agenda for the workshop was co-developed with the WG leads and thematic strand leaders. It is detailed in Annex II. In addition to this agenda which also included further information about directions, contacts, etc. a second “commented” version was developed which included instructions for the WG leads. Building on this joint agenda, some WGs slightly adapted the programme to allow for presentations by their participants on specific topics of interest. This tailoring to the individual needs is also slightly reflected in the (reported) discussion items. Some of the WGs received a lot of input from their participants which was also documented accordingly. Other WGs such as the very operational Civil Protection WG whose members are also well acquainted with each other did not need additional input to be aligned but entered the discussions around challenges, synergies and conflicts on their selected topics right away.

2.1 Overall agenda

The **first day** included a field trip with initial input and room for discussions on the ground.

The **second day** was dedicated to the discussion in the respective Working Groups. As illustrated in the workshop agenda (see Section below), the WGs had two dedicated focus sessions, one in the morning and one in the afternoon. Prior to the workshop and building on a working session with the Thematic Strands in January 2023 in Brussels, WG leads were asked to develop two broad ideas of topics to discuss with their WG participants. The intention behind giving some topic suggestions to the WG participants was to avoid too generic and unfocussed discussion during the workshop. The topics were chosen to be open enough to allow for a variety of ideas and viewpoints and incorporated some opportunities to overlap with other WGs. Additionally, the Thematic Strand leads gave input on feedback during the preparation phase.

The **third day** was dedicated to the cross-WG discussion with the aim to enrich the first day discussion with perspectives from other WGs. Participants were therefore mixed ensuring that each WG was represented in one of the five cross-WG groups. The WG leads presented the results of days and subsequently continued to work with one cross-WG group each.

Day 1 and Day 2 both started with Keynote speeches that were intended to set the scene and encourage discussion along the participants. These Key Notes are detailed in Section 3 below.

2.2 Field trips

To allow participants to connect the topics and discussion during the workshop with the environment it effects, two field trips were organised to explore the local forests.

In the process of organizing the workshop, emphasis was put on choosing a fitting location in which to embed and inspire the discussion around sustainable WFRM. Thus, two voluntary field trips were offered to participants to the local forest region over the course of their stay in Solsona. It provided room to ask questions to experts that were invited to speak and to see first-hand how different land/forest management strategies can have a lasting impact on the forest's development as well as its resilience in case of fire.

Figure 1: Discussions during the field trip of Day one at the Foothills of the Natural Park of Montserrat,

The first trip was made on Day 1 to the Natural Park of Montserrat, where participants were introduced to how the Fire Shepherds program[2] operated and how their work helped enhance biodiversity and promote bio-economy. By emphasising an innovative approach to traditional measures like prescribed burnings or grazing by goats and sheep, participants had the opportunity to observe how the project was working actively toward reducing the fuel loads in Catalonian forests in a sustainable way.

The second trip, a forest walk, was offered to WG members on day 2 to the forest in Cap del Pla. Here participants from the WGs Environment and Society took the chance to see different landscapes, depending on the level of forest/land management and how this affected the increase or decrease of wildfire risk, as well as the advantages and disadvantages of different approaches in general. Participants not only had the opportunity to ask more in-depth questions on different forest management strategies, but more importantly they took the chance of engaging in discussions with members of the other WG and were able to identify common issues but also ways of solving them.

Figure 2: Discussions about resilient landscapes and engagement with society in the Pre-Pyrenees countryside.

[2] https://www.fireshepherds.eu/ (19.09.2023).

3 Broader context: Keynote speeches

Several Keynote speeches were given on 5th and 6th July with the aim to put the workshop discussions into the broader context of recent developments in governing wildfire risk management. Firelogue partners Fraunhofer INT (Claudia Berchtold) and CTFC (Eduard Plana) presented some of their most recent work while invited speakers from AGIF, DG ECHO and OECD presented new reports and frameworks.

3.1 Landscape Fire Governance Framework

The Landscape Fire Governance Framework[3] that was published at the 8th International Wildland Fire Conference (IWFC) in May 2023 in Porto was presented by João Quadrado, Regional Senior officer at the Agency for Integrated Rural Fire Management (AGIF). AGIF had been organising the 8th IWFC and played an important role in developing the framework. João Quadrado stressed that "fire management requires moving from management alone to solid governance models and stakeholder engagement with clearly set roles at all value chain stages, training and qualification programmes, and strengthened international cooperation."[4]

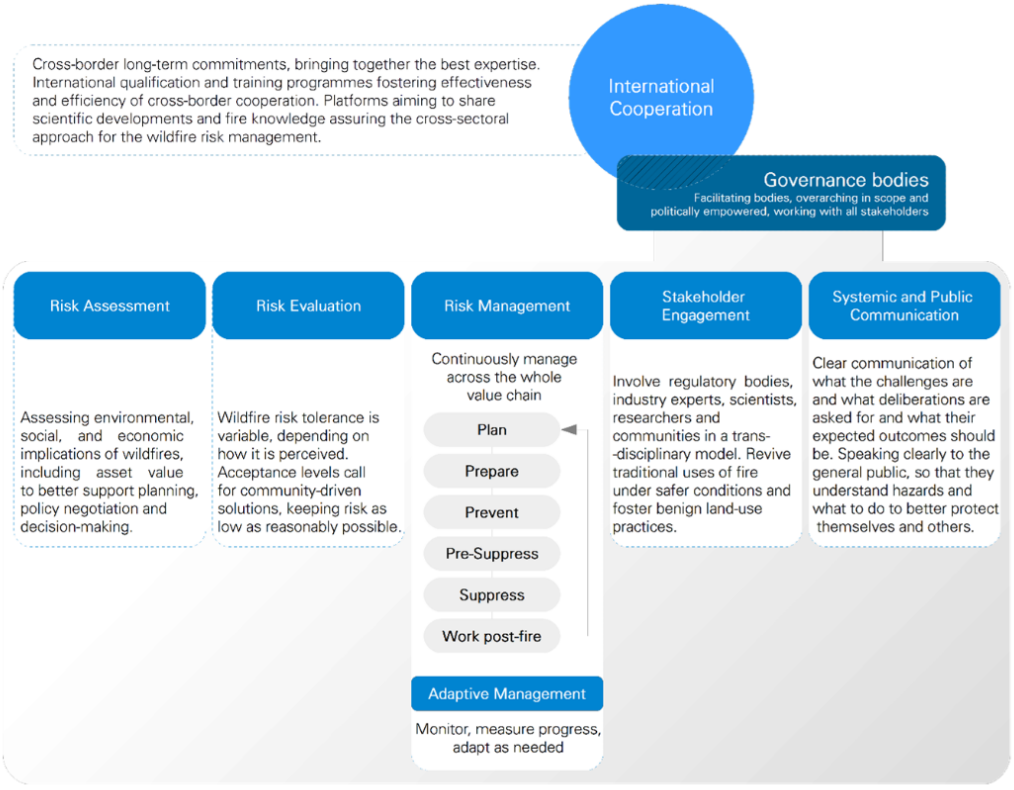

Figure 3: A summarized diagram view of a landscape fire governance continuum
Source: Landscape Fire Governance Framework, p. 3 (64df3d8c07e6565f7631b8c9_Framework AGIF - ENG V2.pdf (website-files.com))

[3] Framework (wildfire2023.pt), 4th September 2023.

[4] Landscape Fire Governance Framework, p. 2.

In addition, the 15 principles that have been suggested by the framework were underscored, namely

1) **Impact orientation** – Actions seek to obtain results for the benefit of citizens and their material, cultural and historical heritage, to safeguard their safety, their sources of livelihood and the social, environmental, and economic value of their context, while considering impacts on the longer term.
2) **Feed-forward strategies** – Risk assessment and evaluation considers uncertainty and thus requires the incorporation of multiple future scenarios.
3) **Bottom-up policies design** – The definition of public policies considers the expectations and knowledge of local communities, involving them in the decision-making processes. Policy development and strategic planning shall be holistic, addressing the fire problem at landscape level by including all relevant institutional mandates and the potential and capacity of contribution of the civil society.
4) **Progressivity in transition** – Wherever current governance models require change, the transformation of those models towards this framework is gradual, specializing the most needed skills while institutional rearrangements take place
5) **Subsidiarity** – Actions evolve according to the capabilities of each response level, activating subsequent levels whenever those immediately below have exhausted their capacity.
6) **Plural use of resources** – The commitment of the operational forces is carried out in accordance with the current conditions, with priority to suppression when necessary, and priority to prevention actions when there are no conditions for the ignition and progression of fires.
7) **Rational allocation of resources** – The use of resources and their translation into any actions seeks efficiency, avoiding the inadequacy of resources, disproportionate allocation, and poor control of expenditure. Actions comply with quantifiable and measurable objectives.
8) **Training of agents** – Agents involved in all actions hold the qualifications considered necessary to carry out the assigned missions at any time in response, technical, directing, commanding, or manoeuvring duties. The agents involved have access to the material resources necessary for a successful mission, and all the operatives have physical, medical, and psychological conditions suited to their missions, at all levels.
9) **Operational flexibility** – Operations are planned and developed according to present or foreseeable needs according to the analysis of meteorological information or foreseen circumstances, seeking to apply sufficient resources to the response and its previous movement in space and time. Operational readiness follows the foreseeable necessity rather than a set calendar.
10) **Transparency** – All procedures are auditable and performed according to established and clearly identified criteria. The motivation for performing any acts must be clearly justified and published. The performance of agents is subject to public reporting.
11) **Evaluation** – All agents and all their actions are analysed and evaluated with a view to the continuous improvement of the system, and of the agents, individually, whenever necessary. This information should feed into a lessons-learnt system.

12) **Memory** – Agents develop their activity in an evolutionary process that considers the history of the country, its institutions, and all those who have been severely or fatally affected by the phenomena they seek to avoid or mitigate.
13) **Transdisciplinary and Innovation** – Policy and strategic planning and relevant decision making shall be based on sound, multi-disciplinary, scientific knowledge and considering technological capabilities and innovation. This will include considering the revival of traditional, socio-economically sound, and environmentally benign land-use practices.
14) **Coherence** – The mandates and activities in fire management of State institutions and other stakeholders shall be coherent (harmonized) and meet the overarching national fire management policy and implementation plan. National Fire Management Plans are to be considered on all individual, institutional, and sectoral planning and activities.
15) **Coordination** – The implementation of actions under Fire Management Plans shall be monitored in a permanent basis and highly coordinated.

3.2 Wildfire Action Plan and the Wildfire Peer Review Assessment Framework

Cristina Brăilescu, Team Leader at the Directorate General for European Civil Protection & Humanitarian Aid Operations (DG ECHO), Unit B2 – Prevention and disaster risk management, presented DG ECHO's Wildfire Action Plan and the Wildfire Peer Review Assessment Framework. She pointed out that wildfires are among the top risks identified by the Member States' National Risk Assessments and also flagged as a cross-border risk.

The EU Member States have asked the European Commission to support countries on prevention in September 2022. DG ECHO hence developed the Wildfire Action Plan that encompasses capacity, knowledge and finance related measures by building among others on existing measures such as peer reviews. One of the core deliverables that have been released is the Wildfire Peer Review Assessment Framework.[5] It aims at improving risk management systems and Disaster Risk Management (DRM) capabilities but can also serve as a self-assessment tool.

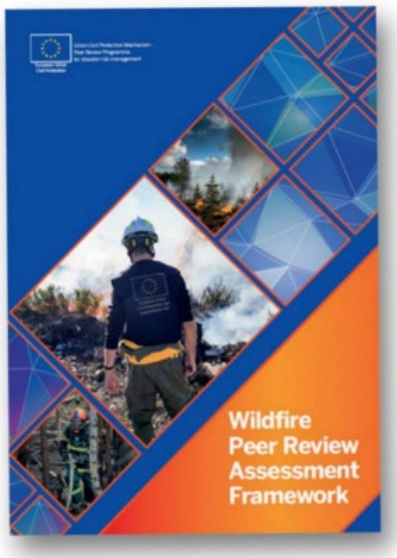

Figure 4:Wildfire Peer Review Assessment Framework, published by DG ECHO

In addition, Cristina Brăilescu stressed that more than 90% of ignitions are of human origin and a particular emphasis was hence put on raising awareness. A call for good practices was hence published in September 2022 to which 50 submissions were received. A good practice note and catalogue will be published by the end of 2023 and a call for an EU pilot to support wildfire risk awareness activities will be launched in early 2024.

Finally, the results of several wildfire prevention projects co-funded by DG ECHO such as WUITIPS (Touristic Infrastructures protection from wildland-urban interface fires)[6] or RECIPE (Reinforcing civil

[5] Wildfire_PRAF_V2.pdf (europa.eu) (19.09.2023).
[6] https://civil-protection-knowledge-network.europa.eu/projects/wuitips (07.09.2023).

protection capabilities into multi-hazard risk assessment under climate change)[7] were presented, including the video "FIRE-SMART STORIES - A journey through sustainable wildfire risk prevention"[8] resulting from the PREVAIL (Prevention Action Increases Large fire response preparedness) [9] project was recommended.

3.3 Justice dimensions towards integrated wildfire risk management

Claudia Berchtold from Fraunhofer INT and Firelogue Project Coordinator presented the reflections about the consideration of justice aspects in integrated wildfire risk management, building on a recent Firelogue publication that has been published by Nature Climate Change.[10]

Managing wildfire risks in increasingly complex governance settings raises important equity concerns; in particular, what is perceived as just in terms of outcomes and processes. The article hence developed a framework for identifying and categorising along the WFRM cycle (prevention, preparedness, response, and recovery and adaptation) crucial and generally applicable aspects of justice which should be applied in governance processes to successfully innovate integrated WFRM strategies that respond to equity concerns. The framework differentiates *distribution*, *procedural* and *restorative* justice as detailed in the figure below. These aspects can be applied to all risk management phases. For example, in the prevention phase, distributional justice relates to the distribution of costs and benefits of wildfire prevention across society. Related questions of who is responsible? who is impacted by decisions? and who pays? can also be applied to the response phase. For example, how are workload and resources distributed between career and voluntary emergency management services? *Procedural justice* includes reflections about who has a say in decision processes and who isn't. It can relate for example, to (un-)equal access to knowledge, resources and information needed to prevent wildfires and reduce individual risk during wildfire events.[11] *Restorative justice* considerations can include the provision of post-disaster technical and financial assistance to homeowners, businesses and private forest owners with an eye to the quintessential question of 'who pays'. For example, who has access to restorative financial support, such as insurance, public assistance or international aid?

[7] https://recipe.ctfc.cat/the-project/ (07.09.2023).
[8] https://www.youtube.com/watch?v=3tS1jeipLPE (07.09.2023)
[9] https://www.prevailforestfires.eu/ (07.09.2023)
[10] 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
[11] Anderson, S. E., Plantinga, A. J. & Wibbenmeyer, M. Inequality in agency response: evidence from salient wildfire events. J. Polit. 85, 625–639 (2023).

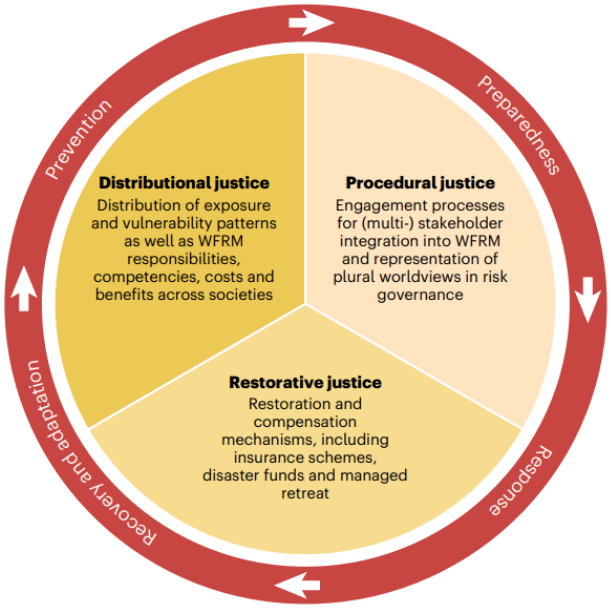

Figure 5: Aspects of distributional, procedural and restorative justice applied to the WFRM context

Source: own figure based on McCauley, D. & Hefron, R. Just transition: integrating climate, energy and environmental justice. Energy Policy 119, 1–7 (2018).

These aspects built the basis for the development of the Solsona workshop concept and should provide a means to uncovering different stakeholder perspectives and potential justice concerns in wildfire risk management with the aim to develop more integrated and holistic strategies.

3.4 Taming Wildfires in the Context of Climate Change

Ágnes Szuda, Co-author of the report "Taming Wildfires in the Context of Climate Change"[12] at the OECD Environment Directorate presented Key Findings and recommendations. The topic was introduced by pointing out the increase in wildfire risk in terms of an extension of the wildfire season, wildfire frequency and intensity. Human activities such as deforestation, peatland drainage, rural land abandonment, or the increase in wildland-urban interfaces play an important role in increasing wildfire risk in addition to the climatic drivers of wildfire risk such as changes in temperature, humidity, or wind patterns. In addition, extreme wildfires do not only pose a direct societal threat but also increase climate change by emitting

[12] Taming Wildfires in the Context of Climate Change | en | OECD (06.09.2023).

greenhouse gases and burning carbon sinks. Extreme wildfires will have impacts on biodiversity, soil, water and air quality and emissions and lead to health, problems, pre-mature death and displacement. Their impacts on economies and resulting loss and damage are already clearly visible and have amounted to USD 23 billion in economic damages in Australia (2019-2020) (see also figure below, extracted from the presentation). At the same time, extreme wildfires have shown the limits of fire suppression in containing wildfire damage.

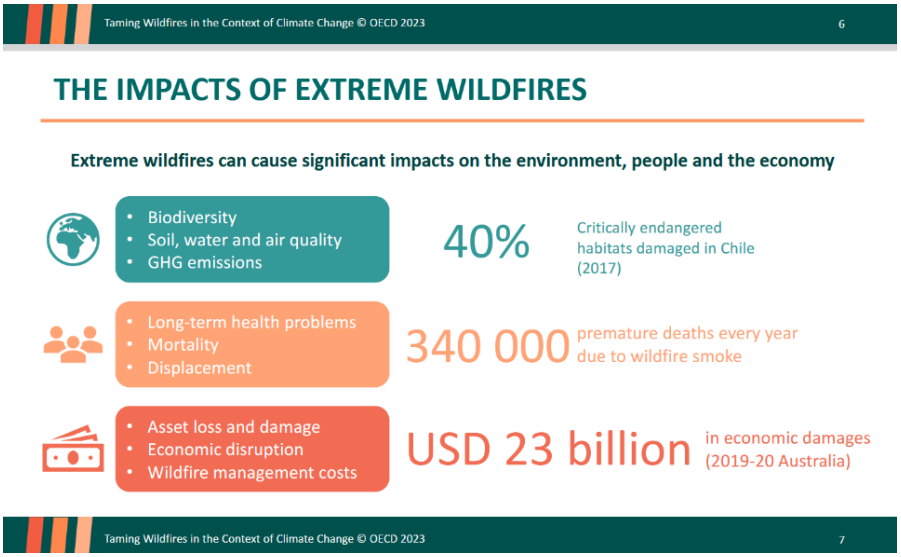

Figure 6: Impacts of extreme wildfires as resented by Ágnes Szuda, OECD.

The OECD hence also calls for a paradigm shift in managing wildfire risk, putting emphasis on prevention and adaptation.

The main measures proposed included:

- Protection and Restoration of wildland ecosystems
- Managing the Wildland-Urban Interface
- Adapt land-use and building regulations
- Improve Wildfire Risk Assessment
- Develop a whole-of-government approach
- Secure appropriate funding

3.5 Addressing policy coherence towards integrated wildfire risk management in the EU

Eduard Plana Bach from CTFC based his presentation on the policy coherence definition by the OECD which defines it as “systematic promotion of mutually reinforcing policy actions across government departments and agencies creating synergies towards achieving the agreed objectives”. An increase of coherences between different policies related to wildfire risk management such as land-use, forestry, agriculture, infrastructure development, etc. was also called upon by the DG ECHO Wildfire Prevention Action Plan, the “Sparking firesmart policies in the EU” report or the recommendation on “Adapting to a changing climate in the management of wildfires” in the report “Taming Wildfires in the Context of Climate Change” (see presentation above).

Since a range of policy fields have an impact on wildfire risk management, trade-offs and potential dysfunctions across policy fields have to be understood and reduced. However, this is a complex undertaking since at EU level the links range from the EU Strategy on Adaptation to Climate Change, to the EU Forest Strategy 2030, the Nature Restoration Law, the Common Agricultural Policy and Farm to

Form Strategy to name just a few. Several of these policies do hardly consider their cross-links with wildfire risk management as the figure below from Eduard's presentation shows.

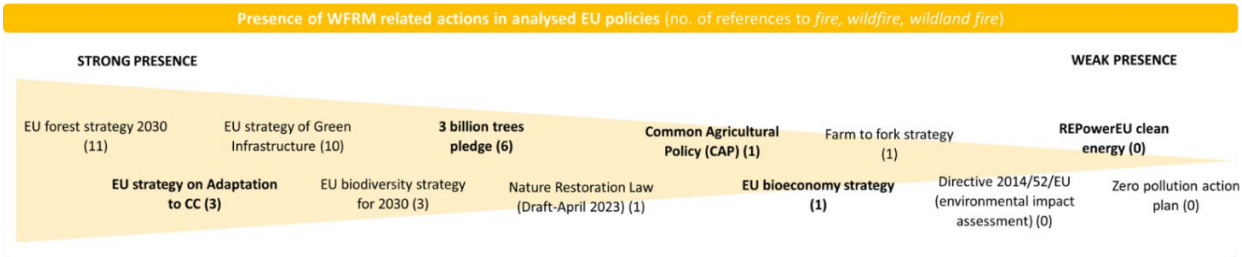

Figure 7: Policy coherence with respect to WFRM

In a more detailed analysis, the impacts of different policies on wildfire hazard, exposure and vulnerability have been analysed to suggest measures for enhancing synergies or reducing dysfunctions. For example, the REPowerEU Clean Energy strategy may lead to an increase of wind turbines in windy and high wildfire risk areas. Since malfunctioning wind turbines can ignite wildfires, it would be important to install buffer zones around the turbines. Consequently, more integrated wildfire risk management approaches need to be built on a comprehensive understanding of how different policies increase or decrease the wildfire hazard, the exposure of humans and elements at risk (such as infrastructures) and the related vulnerabilities.

Eduard concluded that "significant dysfunctions, but also potential synergies, exist across policies to move forward to efficient integrated WFRM within a common policy frame promoting a baseline for dialogue among stakeholders and engagement under a shared vision of risk responsibility."

4 Working Groups Results

The results of the working group discussions, including aspects raised during the exchanges with the other working groups (cross-WG session) are detailed in the sections below. Each sub-chapter is dedicated to one working group, specifying its scope, discussion items, main insights as well as the next steps it wants to take.

4.1 Environment/Ecology

4.1.1 Scope

The Firelogue Environmental/Ecology Working Group (WG_Environ) brings together representatives from Innovation Actions (IAs) and wildfire EU related projects, and from a broader stakeholder network. More than 15 experts are participating in the group, where 8 EU projects such as TREEADS, SILVANUS, FIRE-RES, FirESmart, RESONATE, ResAlliance, FoRISK, PyroLife and wildE, and different profiles are represented (academia, practitioners, NGOs, etc.). The participants' expertise covered areas of remote sensing, forest ecology, biodiversity, and nature conversation, among others.

The WG_Environ scope is to achieve a better understanding of ecosystems' response to changing fire-prone conditions and the influence of cross-sectoral policies to landscape modulation, which are two main pillars of the environmental dimension of wildfire risk management (WFRM). Novel knowledge and innovation actions should help managers in the current and future context of global change (i.e., considering climate change projections and the expected impacts of land use changes) to adapt and manage fire resilient landscapes across EU in a collaborative and cost-efficient manner. At forest stand level, for instance, in depth analysis of fuel management options to provide forest structures resistant to wildfires become imperative, maximizing synergies among sectoral policies such as bioeconomy or biodiversity conservation and protecting both not only forest but also society against high intensity fires.

The WG_Environ's focus lies on the necessity to better understand the changes of ecosystems due to changes in climate and what this means for a forest's resilience to wildfires. Central questions include how forest management needs to adapt to prolonged seasons of hot and dry weather and what measures can be maintained sustainable and efficiently for the years to come. Instead of approaching the topic of wildfire risk management as fight against fire, the WG tries to understand ways how living with fire can be possible in the future and how to minimize the physical damage to forests and infrastructure can be minimized.

Making the most of the opportunities the physical meeting in Solsona presented, the thematic focus for the WG_Environ was put on discussing the usefulness and feasibility of Nature based Solutions (NbS) and how these can help give an answer to the increasing demands put on forest managers. Another focus was put on exploring strategies on improving the relationship between the public and effective wildfire risk management, calling for a better understanding from both sides and cooperation in the future.

The following organisations participated in the workshop:

- University of Salamanca (USAL), Spain
- European Agroforestry Federation (EURAF), Int
- Instituto Superior de Agronomia (ISA), Portugal
- University of Vigo (UVigo), Spain
- University of Girona (UdG), Spain
- Forest Science and Technology Centre of Catalonia (CTFC), Spain
- International Institute for Applied Systems Analysis (IIASA), Austria
- Centro Euro-Mediterraneo sui Cambiamenti Climatici (CMCC), Italy

4.1.2 Main insights

1. Concepts and definitions along fire ecology and wildfire risk management

The answers from the survey show the relevance of moving forward to a common understanding of the concepts around fire ecology and wildfire risk management to be able to effectively conduct a dialogue across stakeholders. Even within a thematic group such as WG_Environ, different levels of knowledge and interpretations of common concepts used in the narrative of WFRM arise, showing the importance of having a common baseline as a previous step to move forward to cross-topics discussions exploring synergies and conflicts. A concrete example on this regard was the collaborative work conducted with the Insurance WG on Nature-Base Solutions contextualisation into wildfire disaster risk management.

A summary of some of the concepts discussed is added as follow. Due to the lack of time, it was not possible to discuss all the definitions included in the survey. The objective is to follow up the work on the survey in a specific online meeting with the WG_Environ members, including the policy (point 2) and communication (point 3) aspects.

- **Differences between IFM and IWFRM:** The deliberations surrounding *Integrated Fire Management* (IFM) and *Integrated Wildfire Risk Management* (IWFRM) highlighted that IFM is perceived as a broader framework compared to IWFRM. There emerged a noteworthy debate over the objective of IFM not being clear enough, with the concern that the term "wildfire" is not overtly mentioned within its context (in terms of emergency management). This ambiguity raised questions about whether IFM truly pertains to wildfires or extends its scope elsewhere, a sentiment that found agreement among many participants.
- **Fire Ecology and Conceptual Discussions:** The discourse on *Fire Ecology* brought to the forefront its intricate relationship with agriculture and society. Participants engaged in thought-provoking discussions, underscoring the complexity of the "natural fire regime" concept and its interpretation in high human-influenced landscapes. Notably, the necessity of updating the perception and knowledge of what constitutes a "natural" fire and its ecological implications gained significant attention. The deliberations emphasized the pivotal role of *Fire Ecology* in crafting narratives to improve social understanding of the natural role of fire in the ecosystem, embedding it into communication strategies within the broader context of fire management (e.g., promoting prescribed burn or grazing copying the natural role of fire in the ecosystems as Nature-Base Solutions for WFRM).

- **Prescribed Burnings and Landscape-Level Approach:** Within the discussions on prescribed burnings, the considerable labour intensity associated with this practice was underscored. An integrative approach combining prescribed burnings and cattle management emerged as a new path for avoiding large emissions from uncontrolled and intense wildfires. The significance of meticulous planning in selecting burn areas, particularly for optimizing regeneration in acid soil, resonated strongly. A prevailing theme highlighted the importance of shifting towards landscape-level considerations to collaboratively address trade-offs and complexities associated with fire management.
- **Fire Smart Forestry and Landscape Approach:** About *Fire Smart Forestry*, the participants advocated for the term "Fire Smart Landscape" to better encapsulate the comprehensive nature of fire management. The discussions delved into the intricate fusion of forest management practices and fire management strategies. Emphasis was placed on prioritizing landscape-level collaboration as a means to holistically address the multifaceted challenges posed by wildfires. Participants resonated with the concept of reconciling diverse interests and optimizing outcomes while acknowledging the significance of responsible practices.

2. Policy aspects

Although policy aspects of the survey were not directly addressed on the discussions, the below section summarises the discussion on two concepts with policy implications.

Nature-Based Solutions (NbS) and WFRM: The presentation during the joint session with the Insurance WG highlighted disparities in how society perceives and approaches different natural hazards. The deliberations emphasized the need to redefine the language used in fire management discourse, moving beyond the confrontational "fight against fires" rhetoric. Insights highlighted the importance of resilience and coexistence when considering the multifaceted challenges posed by wildfires. The discussions reinforced the notion that addressing fire-related issues warrants a contextual and comprehensive approach, engaging various stakeholders and accommodating local capacities.

In terms of societal challenges, the discussions underscored the importance of aligning localized goals, such as those of shepherds, with broader strategic WFRM objectives. A suggestion made was about advocating for the engagement of diverse social groups to bridge the gap between urban and rural perspectives on wildfires. The numerous definitions of NbS surfaced as a pertinent point, further accentuating the necessity of a nuanced approach. On that sense, biodiversity conservation aspect arises as a fundamental pillar of NbS definition, and cross-links between WFRM and biodiversity conservation need to be addressed accordingly, at least, under NbS narratives.

Prevention/Resilience to complement. Ignition/Suppression Focus and Development Plans: The discussions underscored a paradigm shift towards a prevention/resilience-oriented approach. The consideration of insurance models founded on hazards or risks surfaced as a potent strategy, enabling direct compensation without the intricate identification of ignition causes. It was noted that NbS should increase existing prevention strategies rather than providing a pretext for construction in fire-prone areas. Deliberations empathised the way of perceiving NbS as a supplementary tool in the broader landscape of

risk prevention. Moreover, aspects like emissions and land use are also brought into consideration, reflecting the multidimensional nature of fire management.

3. Community engagement and communication challenges on WFRM

Stakeholder Engagement and Historical Context: The significance of stakeholder engagement emerged as an essential theme, with the deliberations highlighting the need to align strategic plans with the principles of wildfire risk management. Notable examples underscored the necessity of integrating fire risk considerations across various policy domains. The discourse emphasized the importance of a robust communication strategy embedded within the policy framework.

These discussions collectively underscored the intricate interplay between ecological, social, and policy dimensions within wildfire management, focusing on the WG_Environ perspectives. The need for innovative strategies, the alignment of diverse stakeholder interests, and the cultivation of effective communication were recurrent themes that permeated the discourse, increasing the importance of addressing wildfire risks in a holistic and multidisciplinary way.

4.1.3 Next steps

Based on the discussions within the WG_Environ, the following three next steps are considered in order to guide its future action path:

Refine Integrated Fire Management (IFM) Framework and Fire Ecology/Wildfire concepts: The WG_Environ should embark on a detailed examination and refinement of the IFM framework. This involves a thorough evaluation of the broader scope attributed to IFM compared to IWFRM. To address the concerns over the clarity of IFM, the group should engage in a comprehensive debate to establish whether the term "wildfire" should be explicitly incorporated, what would mean to use the term WFRM. This step will help crystallize the essence of IFM, ensuring its alignment with wildfire-related goals and avoiding potential misconceptions. More globally, basic concepts related to Fire Ecology/Wildfire risk management could be listed such as a glossary, to establish a common baseline from which the dialogues are founded.

A specific webinar with WG_Environ members will be hosted to follow up the survey results discussion.

Advancing NbS Implementation with respect to WFRM: Building upon the discussions surrounding NbS, the WG should undertake concerted proposals to implement NbS within wildfire risk reduction strategies. This involves formulating a well-defined approach to address societal challenges posed by wildfires through NbS. Collaborative partnerships should be established with various social groups, particularly bridging the urban-rural gap in perspectives. The group should strive to develop a comprehensive framework that accommodates localized goals while aligning with strategic objectives, thereby realizing the potential of NbS as a valuable tool for addressing wildfire issues. A proper conceptual framework for NbS to WFRM should be defined, considering biodiversity conservation as a fundamental pillar.

A collaborative work with WG Insurance is carried out, aimed at defining a NbS framework for WFRM. Moreover, specific webinar to contrast fuel management for wildfire risk management and biodiversity conservation will be organised. Other policy challenges could be identified in next discussions.

Enhance Stakeholder Engagement and Communication Strategy: Recognizing the significance of stakeholder engagement and effective communication, the Working Group should focus on enhancing both aspects to foster broader understanding and ownership of wildfire management measures. A specific focus on the contribution of fuel management to disaster risk reduction will be approached. This includes the development of a robust communication strategy embedded within policy frameworks, enabling efficient dissemination of information to the public. Collaboration with communication experts and WG_Society should be prioritized to create simplified and accessible terminology, bridging the gap between academic insights and public awareness. Moreover, the group should explore avenues for engaging targeted communities, empowering them to influence policy decisions through informed perspectives and to facilitate a just transition approach.

By pursuing these next steps, the WG_Environ can contribute substantively to advancing the understanding, management, and mitigation of wildfires, addressing ecological, societal, and policy dimensions in a comprehensive manner.

4.1.4 Potential policy recommendations

The focus of potential policy recommendations should lay on public policy makers at EU, national and local levels, in order to engage local communities and policymakers. Based on the extensive discussions and insights presented, here are some potential policy recommendations that the WG_Environ could consider enhancing wildfire management and risk reduction efforts:

Clarify and Standardize Fire Management Concepts: Develop a standardized and universally accepted framework that clearly defines terms such as Integrated Fire Management (IFM) and Integrated Wildfire Risk Management (IWFRM). Ensure that the goals of IFM are explicitly linked to wildfire; this will facilitate effective communication and understanding among stakeholders and the public.

Promote NbS Implementation: Advocate for the integration of NbS into wildfire management policies and practices. Collaborate with local communities, government agencies, and relevant stakeholders to identify and prioritize areas where NbS can be effectively applied. Establish financial incentives to encourage the adoption of NbS, particularly in fire-prone regions. Develop guidelines for implementing NbS that consider local context and align with strategic objectives as well as mechanism to evaluate the results from NbS implementation.

Enhance Public Engagement and Communication: Develop a comprehensive communication strategy that simplifies scientific terminology and concepts related to wildfires. Leverage various communication channels, including social media, videos, and community workshops, to effectively disseminate information and raise public awareness. Collaborate with communication experts to create engaging and accessible materials that inform and empower communities to actively participate in wildfire prevention and management efforts.

Prioritize Prevention and Risk Mitigation: Shift the emphasis of wildfire management policies from reactive approaches to proactive prevention and risk reduction strategies. Implement regulations that restrict construction and development in fire-prone areas, ensuring that land-use planning considers wildfire risk. Explore innovative insurance models that incentivize risk reduction measures and provide direct compensation based on hazard or risk assessment, encouraging responsible land management.

Facilitate Cross-Sector Collaboration: Establish collaborative platforms that bring together experts, policymakers, researchers, and community representatives to share knowledge, best practices, and experiences related to wildfire management. Encourage interdisciplinary research and cooperation among different sectors, such as forestry, agriculture, insurance, and urban planning, to develop holistic solutions that address the multifaceted challenges of wildfires.

Leverage Technological Innovations: Invest in research and development of advanced technologies, such as remote sensing, predictive modelling, and early warning systems, to enhance wildfire detection, monitoring, and response capabilities. Integrate these technologies into fire management strategies to enable more efficient resource allocation, timely evacuation planning, and accurate risk assessment.

Support Education and Capacity Building: Establish educational programs and training initiatives that enhance the capacity of fire managers, emergency responders, and local communities to effectively prepare for and respond to wildfires. Collaboration between academic institutions, research organizations, and government agencies to develop training materials that allows individuals to have the skills and knowledge needed in emergency situations.

Incorporate Historical and Cultural Context: Recognise and respect the historical and cultural distinction of landscapes when developing wildfire management policies. Collaborate with local communities and experts to integrate traditional knowledge and practices into fire management strategies, with a holistic and sustainable approach that considers both ecological and cultural values.

Monitor and Evaluate Policy Effectiveness: Implement a robust monitoring and evaluation methodology to assess the effectiveness of wildfire management policies and strategies over time. Regularly review policy outcomes, gather feedback from stakeholders, and make necessary adjustments based on empirical data and lessons learned.

Advocate for International Cooperation: Promote international collaboration and knowledge sharing on wildfire management practices, lessons, and research. Engage in dialogues with other countries and international organizations to exchange experiences, contribute to global wildfire risk reduction efforts, and learn from successful approaches adopted in different regions.

By incorporating these policy recommendations, the WG_Environ can contribute to the development of comprehensive and effective wildfire management strategies that address ecological, societal, and policy dimensions, reducing the impact of wildfires on communities and ecosystems.

4.2 Society

4.2.1 Scope

The Firelogue's Societal Workgroup (SWG) assembled a diverse group of stakeholders, including civil society representatives, social science experts, specialists in Wildfire Risk Management (WFRM) and Disaster Risk Management (DRM), technology research professionals, and representatives from the Innovation Actions (IAs). The SWG's composition was strategically designed to encapsulate the diverse realities of Europe, ensuring a broad representation. In total, seven individual experts attended the in-person workshop in Solsona. To ensure the best possible conditions for discussion and exchange of ideas, no virtual attendants were present during the workshop.

The Societal Workgroup (SWG)'s in-person meeting primarily revolved around the critical objective of bolstering public safety and awareness. This emphasis was rooted in the recognition that well-informed citizens are better equipped to navigate the challenges posed by fire risks. Effective communication emerged as a cornerstone in this discussion. The group acknowledged that merely disseminating information isn't sufficient; the mode, medium, and message must resonate with the intended audience. The discussion underscored the need for clarity, inclusivity, precision, and adaptability in communication strategies to ensure they effectively reach and engage all segments of the population.

The following organisations participated in the workshop:

- Forest Science and Technology Centre of Catalonia (CTFC)
- Fraunhofer INT
- Hellenic Rescue Team (HRT)
- INESCTEC
- Instituto de Ciências Sociais - Universidade de Lisboa (ICS-UL)
- Instituto Superior de Agronomia (ISA)
- VOST Portugal

4.2.2 Main insights derived

The main insights derived from the SWG sessions can be summarised into the following key points:

- **Linguistic Overhaul:** There's a pressing need to refine the language surrounding fires. Clearer communication of risks and prevention strategies is essential, and this requires a departure from technical jargon to more accessible terms that resonate with the general public.
- **Resilience in a Post-COVID World:** The concept of resilience emerged as a focal point, with discussions emphasizing its multifaceted meanings across societal strata. The post-COVID-19 context has heightened the importance of understanding and communicating risks at various levels, from individual to cultural.
- **Role of Technology:** The potential of technology, especially in prevention and post-recovery phases, was highlighted. There's a need for hyper-localized communication strategies that leverage technology to reach specific communities effectively, whilst making sure that these strategies are inclusive and diverse in its nature.

- **Understanding Landscape Dynamics:** Recognizing the intricacies of the terrain and the inherent fire risks associated with different landscapes is crucial. This understanding can guide both prevention and mitigation strategies, and should be a focus of specific communication strategies.
- **Public Engagement:** Engaging the public emerged as a central theme. The importance of early pedagogical materials about fires, the need for two-way engagement, and making the public part of the narrative were underscored. **This was chosen by the group as one of the key messages: To abandon the top-down educational approach to invest in engaging with citizens for mutual benefit and knowledge growth.**
- **Funding and Policy Dynamics:** The sessions highlighted the challenges posed by current funding dynamics, which often prioritize response over prevention. A more balanced approach, informed by comprehensive information dissemination at various levels, is needed.
- **Forest's Role in Rural Development:** The significance of forests in rural development, the changing dynamics of livestock, and the evolving relationships with wildlife were discussed. The sentiments of communities feeling a loss of landscape and identity due to shifts from croplands to forests were also highlighted. Discussions on how to communicate best practices, using storytelling techniques, were had.
- **Collaborative Approaches:** The potential of collaborations, like the one between Firelogue and Silvanus, was emphasized. Such synergies can be instrumental in addressing the challenges discussed. This point highlights the importance of these meetings where synergies can be created between different projects that have the same objectives.
- **Media and Communication Strategies:** The potential of platforms like TikTok for effective communication was discussed. There's a need for academia to move beyond traditional publishing and explore innovative communication methods, including media training and community involvement.
- **Holistic Perspective:** A holistic approach that integrates economic assessments, trade-off analyses, and considers both bottom-up and top-down strategies is essential for effective fire risk management.

4.2.3 Next steps & recommendations

The Societal Working Group (SWG) identified the subjects of plain language reviews and the shift towards genuine two-way engagement between policymakers, academia, and civil society. To lay a solid foundation, the SWG will organise a new meeting - this time online - where all members of the SWG will help build a comprehensive stakeholder mapping exercise that will pinpoint key entities and individuals whose insights and interests are crucial to these subjects. Organizing focused SWG workshops will further refine the ideas, allowing for a collaborative brainstorming environment that integrates diverse perspectives.

Implementing mandatory plain language reviews for wildfire risk management across all EU member states would require a multi-faceted legislative approach. While the idea is still in its early stages, a policy recommendation could probably take the shape of a recommendation for a directive. It would set out the goal to be achieved by all member states, but would leave it up to the individual states to decide on the means of achieving it. This would allow for flexibility in implementation, considering the unique linguistic and cultural nuances of each member state.

To chart the way forward, the SWG will develop a roadmap detailing key milestones and activities. This roadmap, combined with awareness-raising initiatives, will help build momentum and support from external stakeholders. Proper documentation of all discussions and findings will be essential, ensuring transparency and providing a robust reference for future endeavours.

4.3 Infrastructure

4.3.1 Scope

The key areas of expertise within our working group are in the fields of wildfire and disaster management, civil protection, infrastructure operations, risk governance, resilience and fire engineering. The Working Group Infrastructure is composed by 17 experts who have expressed interest in following the WGs activities, while 12 participants were able to join physically (8) and remotely (4) the meeting in Solsona. Two participants were representing the Innovation Actions, FIRE-RES and SILVANUS. Half of the participants represent the scientific community, coming from research and academic institutes related to forestry, wildfire management, fire engineering and risk governance. Moreover, representatives of emergency management organizations, policy making bodies and media, have shared real cases experiences and input of operational application, while experts coming from critical infrastructure operators and industry background were able to support the WG sharing information on the actions and plans that critical entities perform and need towards protection and resilience upgrade.

Critical infrastructure is "an asset, a facility, an equipment, a network or a system, or a part thereof, which is necessary for the provision of an essential service, i.e., a service which is crucial for the maintenance of vital societal functions, economic activities, public health and safety, or the environment (Directive 2022/2557)[13]. The experience of recent disasters affecting critical service assets has provided evidence of the interdependencies between infrastructures and societal function and resilience in different dimensions (e.g., power outages in areas affected by forest fires and transport disruptions). On the other hand, the operation of inadequate or failing infrastructure has often been shown to be a driving factor for wildfires, particularly in the wildland-urban interface (WUI) (e.g., wildfires caused by power lines), but also in wildland areas (e.g., forests).

The main focus of the working group during the workshop in Solsona was to better understand the interaction between infrastructure and wildlands and to integrate wildfire risk reduction and response measures for both the infrastructure and the surrounding areas in order to improve the protection and resilience of infrastructure systems as well as wildlands and forests exposed to wildfire. The aim is to create a more robust and resilient infrastructure network to ensure the provision of services to society, to prevent fires and protect wildlands and forests, to facilitate the management of wildfires and to reduce the number of wildfires.

The following organisations participated in the workshop:

[13] DIRECTIVE (EU) 2022/2557 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 14 December 2022 on the resilience of critical entities and repealing Council Directive 2008/114/EC.

- Boise State University, Energy Policy Institute (USA)
- Cyprus Civil Defence, Deputy Director Limassol
- E-REDES, saaa)
- National Technical University of Athens, Laboratory of Heterogeneous Mixtures & Combustion Systems
- NRFC PTY LTD
- Universitat Politecnica de Catalunya
- US Fire Administration
- Wall Street Journal/Journalist/Writer

4.3.2 Main insights derived

Based on the presentations and discussions in Deep Dive I and Deep Dive II, the following main insights have been generated:

1. Integrated Approach: Recognising the interconnectedness of wildfires and critical infrastructure, the Working Group has focused on the need of developing integrated approaches that involve collaboration between local communities, infrastructure stakeholders, and wildfire management agencies. This would ensure that infrastructure planning and management strategies consider the risks and challenges posed by wildfires.

2. Risk Assessment, Modelling and Planning: The prioritisation for the development of robust risk assessment methodologies and planning tools that consider the specific vulnerabilities of critical infrastructure to wildfires has been discussed. Likewise, the implementation of stochastic fire modelling could allow as to make safe predictions of catastrophic wildfires and their spatial impact. This would involve identifying high-risk assets, assessing their exposure to wildfire hazards,–and would allow the implementation of risk-informed landscape and urban planning, as well as prioritization of wildfire risk management efforts and mitigation measures. This requires the systematic collection and availability of data, what will improve risk assessment outcomes and will allow a science-based decision-making.

3. **Resilience and Preparedness of Infrastructure:** The Working Group emphasized the importance of building resilience and preparedness in critical infrastructure to withstand and recover from wildfire events. Risk assessment at infrastructure level, including wildfire hazard, as well as resilience modelling – to be scientifically and operationally elaborated – can be important tools at the hands of the infrastructure operators.

Resilience upgrade of infrastructures could involve measures such as fuel management, infrastructure maintenance, rehabilitation and hardening, and the use of advanced technologies for early detection and prevention.

4. Policy and Regulation: The Working Group advocated for the development and implementation of policies and regulations that address the wildfire-infrastructure interface. This could include building

codes, utility mitigation plans, and measures to ensure the safety of power lines and other infrastructure assets.

More specifically, developing a comprehensive wildfire management strategy at the EU level would provide valuable insights into how to cope with wildfires and facilitate the implementation of coordinated adaptation strategies across different states.

5. Communication and Coordination: The need for effective communication and coordination between infrastructure stakeholders, first responders, and wildfire management agencies, has been recognized. The development of strategies and best practices for information sharing, emergency response coordination, and public awareness campaigns can assist towards this direction.

6. Equity and Social Considerations (Just transition) – stakeholder engagement: The Working Group highlighted the importance of addressing equity gaps in the management of wildfire risks in relation to critical infrastructure, "leaving no one behind". It should be recognised that costs and benefits are often carried unevenly and the needs, vulnerabilities and benefits of multiple actors (e.g. infrastructure operators, land owners, local community, forest and fire services) should be considered in an institutionalised stakeholder engagement process. The promotion of a just and inclusive decision-making process is highly recognised as a means for effective actions towards minimizing fire ignitions and impact to infrastructure and its service provided.

7. Research and Innovation: The Working Group highlighted the need for prioritising research efforts aiming at advancing the understanding of wildfire impacts on critical infrastructure and developing innovative solutions. This could involve exploring new modelling approaches, technologies, and materials that enhance infrastructure resilience and reduce the risk of wildfire ignition.

8. Multi-risk Governance approach: There is a high level of interconnectivity and interdependence of cross-sectorial infrastructures and several aspects of social and economic life, with numerous and occasionally conflicting interests. The last years this level has been further increased also due to the liberalisation of essential services provision and the involvement of multiple actors (i.e. a number of private, private-public companies are involved). There is furthermore evidence that the evolution of hazards recognizes no borders, leading to the urgent need for cross-border collaboration at different government levels and for different sectors. The risk is connected, what has become even more evident with the intense phenomena due to climate change, and decisive, holistic actions should be put in place by powerful multi-risk commissions which can help enhance the resilience of critical infrastructure in the face of wildfires and ensure effective coordination among different actors and sectors involved in managing these risks.

By focusing on these perspectives, the Working Group can further 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).

4.3.3 Next steps

The future steps of the Infrastructure Working Group are as follows:

- Cross Working Group Webinar.
- Second Firelogue Workshop Cycle with the other two thematic strands - Technology and Earth Observations - to be held.
- Development of a White Paper with policy recommendations for EU to improve the protection and resilience of infrastructure systems and agricultural wildlands and forests exposed to infrastructure-ignited wildfires, with the aim of reducing the socio-economic and environmental impacts of service disruption or destruction.

4.3.4 Recommendations

Wildland Infrastructure Interface – Tentative recommendations for very high fire risk situations including high wind, very low humidity, widespread droughts:

1. **Improve the resilience and protection of critical infrastructure against wildfires**:
   - through fire-resistant design, materials,
   - early warning and protection systems, and
   - regular maintenance (e.g., aging infrastructure, separation from wildland fuels, Installation and operation with the wildland fuels in mind) and fire drills.
2. **Promote landscape management practices to minimise fire travel** (from, through or towards infrastructure) and fire ladders (bottom-up approach). Protect infrastructure assets and the areas around the infrastructure by implementing fire risk management and mitigation strategies in fire-prone areas.
   - fuel management (decreases fire intensity by reducing fuel load, fuel levels and disrupting their horizontal and vertical continuity in the landscape, reduce the extent of homogeneous fuel types),
   - fuel breaks (linear strips), and
   - defensible space around infrastructure to reduce fire ignition, spread and intensity.
3. **Encourage community engagement in fire prevention and preparedness efforts** through:
   - public awareness campaigns,
   - community meetings, and
   - training programs that educate residents on fire-safe practices and evacuation procedures (e.g., establish and maintain clear emergency evacuation access routes and evacuation plans, designating assembly areas and communication protocols).
4. **Encourage collaboration and coordination among government agencies, private sector organizations, and community groups** to address the challenges posed by fire and its impact on critical infrastructure:
   - sharing resources,
   - best practices, and
   - lessons learned to develop comprehensive strategies and action plans that consider wildfire risks and incorporate strategies for prevention, preparedness and response.
5. **Foster a culture of resilience by promoting a societal shift towards embracing resilience and preparedness as a way of life.**
   - integrating fire education and preparedness into school curricula,

- organizing community events that highlight the importance of fire safety, and
- incentivizing individuals and businesses to adopt fire-resistant practices.

6. **Invest in research and technology** focused on improving early fire detection, suppression and forecasting systems:
   - advances in remote sensing technologies,
   - data analysis, and
   - stochastic modelling to assess transmission from a large set of plausible wildfires and mitigate its impact on critical infrastructure.
7. **Promote science-based decision making through improved risk assessment** at territorial and infrastructure level. This requires an institutionalized and systematic collection and availability of data, as far as ignition sources, burnt areas, severity, affected assets including infrastructure are concerned. At infrastructure level, it is indispensable to include wildfire among the hazards for which risk assessment and resilience planning need to be conducted.
8. **Support policy and regulatory measures that prioritize fire prevention, preparedness, and mitigation efforts**.
   - stricter building codes and standards to reduce structural ignition hazards,
   - zoning regulations that consider fire risks, and incentives for property owners to invest in fire-resistant infrastructure.

4.4 Insurance

4.4.1 Scope

The Firelogue-NATURANCE Insurance Working Group (IWG) brings together representatives from Innovation Actions (IAs), Firelogue & NATURANCE partners and insurance experts to exchange on equitable insurance and other risk transfer options for mounting wildfire risk in Europe. In particular, the IWG will focus on two themes: i) exploring options for equitable wildfire insurance and risk transfer; and ii) insurance and risk transfer incentives and requirements for wildfire risk reduction, notably through nature-based solutions (NBS). 'Equity' in this context involves aspects of accessibility and affordability, including with a view to the availability of safety nets for low-income households and vulnerable businesses in wildfire risk areas. As a second aspect, equity involves responsibility for reducing wildfire risks through measures, including nature-based solutions (NBS) such as restoring degraded forest ecosystems with mixed forests, promoting mature tree growth, assuring sufficient hydration and other cost-effective solutions that are inspired and supported by nature.

The in-person meeting in Solsona was the third IWG meeting overall, following a pre-launch with a roundtable on equitable wildfire risk-sharing at the "Fire Ecology across Boundaries: Connecting Science and Management" Conference in Florence, October 4-7, 2022, and an official launch at the Understanding Risk Global Forum (UR22) focus days, December 1, 2023 (in collaboration with NATURANCE (Nature for insurance, and insurance for nature.

The IWG workshop was attended by 13 in-person and 14 virtual attendees representing six major insurance companies Willis Towers Watson, Marsh McLennan, Forest Re, Swiss Re, AXA, Prudential

Financial) and one supporting consulting firm (MITIGA Solutions) as well as Spain's public Insurance Compensation Consortium (Consorcio de Compensación de Seguros). In addition, forest ecologists and biodiversity experts from CTFC, IIASA and Princeton University, and insurance experts from the World Bank, OECD, IIASA, TUD and LSE, were present at the workshop.

The inaugural in-person meeting of the IWG centred on discussions related to insurance for wildfire risk management (WFRM) and, in particular, the potential for leveraging insurance to promote the adoption of nature-based solutions (NbS) for WFRM. With a focus on Mediterranean EU countries, the ultimate aim of the workshop was to address the question: *What innovative insurance products/systems can support NbS for wildfire risk management?* To address this question, three additional questions were on the agenda: What is the current landscape of wildfire insurance in the Mediterranean and Europe, and what are the gaps in providing equitable wildfire security? What are NbS for wildfire in different landscapes (this question was addressed in a joint session with the Environment Working Group)? And, finally, how can and do insurance products support NbS? After addressing these background questions, the IWG sessions moved to discussing new ideas for wildfire insurance products and systems that can support NbS, and as such the Solsona workshop also served as an Innovation Lab as part of the NATURANCE project.

Participants had the opportunity to participate in a voluntary field trip (4th July) and in crosscutting working group meeting (6th July). The field trip demonstrated innovative approaches for reducing fuel load in Catalonia forests by thinning, prescribed burns and grazing by goats and sheep. This provoked discussion on the extent to which this approach supports biodiversity as an essential criterion for an NbS.

The following organisations participated in the workshop:

- AXA Insurance
- Euro-Mediterranean Centre for Climate Change (CMCC) and National Research Council of Italy (CNR-IBE)
- Forest Fire Research Centre of the Association for the Development of Industrial Aerodynamics (ADAI)
- Forest Science and Technology Centre of Catalonia (CTFC)
- ForestRe
- Insurance Compensation Consortium (Consorcio de Compensación de Seguros)
- International Institute for Applied Systems Analysis (IIASA)
- London School of Economics and Political Science (LSE)
- Marsh McLennan
- Mitiga Solutions
- Organisation for Economic Co-operation and Development (OECD)
- Princeton University
- Prudential Financial, Inc.
- Qatar Centre for Global Banking and Finance, King's Business School
- Swiss Re Group
- Technical University of Denmark

- University of Natural Resources and Life Sciences Vienna
- Vrije Universiteit Amsterdam
- Willis Towers Watson (WTW)
- World Bank

4.4.2 Main insights derived

Quo Vadis wildfire insurance in Europe?

- The EU wildfire property and timber insurance landscape is diverse with fully public and fully private systems and many hybrids. There is a gap in the provision of private insurance (especially high for forests), but this is partially compensated by public systems that provide ex post financing to households and businesses. The EC has set a *goal of 90% of losses from wildfires insured*; yet, this goal must be considered in the context of public support. A more apt goal may be assuring security to property owners, assets and forests managers that is considered equitable and that provides incentives for reducing risks, especially with NbS (Disaster Risk Reduction (DRR)/NbS).
- Addressing protection gaps and ensuring comprehensive coverage are essential components of building a resilient future. As wildfire risk and associated damages are increasing, coordination between insurance schemes and government is becoming more important. The most potent insurance incentive is risk-based pricing, which can render high-risk areas financially unattractive for habitation, which has advantages in reducing risks and disadvantages in terms of equity (as vulnerable populations often live in high-risk areas). Risk-based pricing is not a feature of public ex post compensation (prevalent in Italy, Greece), nor of the public Spanish system (which, however, does not yet include wildfire). As the burden from wildfires falls largely on vulnerable groups in wildfire risk zones, accounting for equity issues will be important as wildfire insurance and risk financing arrangements are expanded across Europe. The equity-efficiency trade-off in insurance pricing has been a subject of long debateMoreover, public systems can be combined with top-down regulation on DRR. Indeed, from a fiscal risk management perspective, systems with clear framework rules for public disaster relief, potentially contingent on DRR, following wildfires and other disasters may be preferable.
- Given the growing pressure from wildfires on forests in Europe, forest insurance may be an important direction of travel for enhancing resilience if, indeed, insurance can encourage DRR/NbS. From a societal perspective, it is unclear which wildfire management activities are worth undertaking so a cost-benefit framework should be developed that also includes the value of publicly owned forests.
- From an insurer insider perspective, there is an a disconnect between the motivation of insurance companies (at the highest levels) and their underwriters, many of whom are young and with little experience and training in providing incentives for NbS.

What are Nature-based Solutions for WFRM?

- There are multiple, sometimes conflicting, perspectives on what is an NbS for wildfire, each supporting the different perspectives support different WFRM objectives. Oversimplifying, the objectives can include:
  i) Protecting property, assets (including timber) and people;
  ii) Fostering economic development through, e.g., timber and other forest products, meat and milk products from grazing, and including agriculture;
  iii) Protecting and restoring biodiversity, which should not be narrowly defined as species diversity alone but should encompass the broader richness and complexity of ecosystems – an overarching criterion for NbS;
  iv) Enhancing ecosystem services, including carbon sequestration, pollination, etc.;
  v) Preserving cultural landscapes, and addressing land abandonment.
- There are many different NbS perspectives with corresponding policy paths to their achievement; however, no one concept of NbS can achieve all the objectives, i.e., there are conflicts. The two main perspectives are:
  - *The forest management perspective* promotes ''open forests' meaning fuel reduction via thinning, controlled burns and grazing, as well as planting fire-resistant vegetation, fire breaks and buffers, supporting mixed forests and forest-agriculture landscapes. It fits closely with objectives i, ii and v, and will be welcomed by those value communities embracing 'land sharing' and green growth narratives.
    - It is argued that this NbS package is particularly suited for the urban-wildland interface since it reduces wildfire risk, protects assets, and at the same time, fosters economic uses of forests (timber, animal products from goats/sheep) (objectives i and ii)
    - The question is whether this NbS strategy sufficiently promotes biodiversity and ecosystem services (objectives iii and iv) given the heavy clearing of deadwood, vegetation, etc. (it was argued that it supports a different form of biodiversity, i.e. larger animals, birds...)
    - Another conflict arises with the timber industry since this strategy encourages large trees (more resistant to fires) whereas the timber industry targets the harvesting of middle-sized trees (objective iv)
  - *The conservation perspective* promotes less managed forests with limited thinning and prescribed burns, allowing accumulation of deadwood. This corresponds to the 'land sparing' policy discourse where areas are designated for nature conservation. This NbS strategy, it is argued, is particularly suited for nature conservation areas with little urban settlements. It promotes the protection and restoration of biodiversity and ecosystem services (objectives iii and iv), an overarching criterion for NbS.
    - This NbS perspective is consistent with the still pending EU Nature Restoration legislation that includes far-reaching measures that should cover at least 20% of the EU's land and sea areas by 2030 – with binding targets. For forest ecosystems,

the proposed measures will aim at achieving an increasing trend for standing and lying deadwood, uneven aged forests, forest connectivity, abundance of common forest birds and stock of organic carbon. See: https://www.europarl.europa.eu/thinktank/en/research/advanced-search?keywords=005463

  - The forest management community is concerned about the wildfire potential of this NbS strategy especially given its spatial scope (20% of land) and fuel concentration.
  - In some cases, e.g., for addressing land abandonment, re-wilding with the reintroduction of primitive species to restore natural processes.
- It was emphasized that the above NbS strategies are not static, and as circumstances and vulnerabilities change over time, strategies and approaches may also need to evolve accordingly - navigating these transitions effectively and addressing the challenges they present is essential.
- NbS cannot thus be approached with a one-size-fits-all mentality. Indeed, there is no one NbS that fulfils all five societal objectives. Ultimately, striking a balance between allowing natural processes to self-organize and actively managing landscapes with a mix of strategies based on the specific context and proximity to urban centres was emphasized as crucial.

What is the role of insurance for addressing NbS?

- The financial and insurance industry is striving to enhance its resilience, recognizing the need to manage the underlying drivers of risk. Risk prevention and reduction measures are essential to ensure the insurability of assets. However, there is still a long way to go for the industry to fully embrace these concepts and practices.
- Quantifying the impacts and benefits of NbS offers opportunities for incorporating them into business models. To make progress, it is necessary to learn from proven approaches implemented worldwide.
- There are at least four ways that insurers can facilitate the uptake of NbS:
  - *De-risking NbS* by offering coverage that protects NbS owners against liabilities in their construction and performance, e.g., insuring liability for losses from prescribed burns.
  - *Underwriting nature* by providing coverage for natural assets, such as coral reefs, to protect them against damages caused by events like hurricanes.
  - *Incentivizing NbS:* Insurers can create incentives for the adoption of NbS by offering premium reductions or increases based on the implementation of these solutions.
  - *Divesting from nature-negative activities; investing in nature-positive activities; donating to NbS.*
- Parametric products, where the trigger for an insurance payout can be area burned and fire intensity, are becoming of strong interest to the insurance industry. Based on models, insurers can provide maps of simulated fires based on different scenarios, comparing the baseline situation with the potential impact of fuel reduction measures (forest management NbS). However, in order to encourage further investment in risk reduction, a methodology for

calculating avoided loss due to NbS activities needs to be developed for the EU, as has been done in other regions (e.g., the United States).

Innovation Lab: Insurance products for supporting NbS for WFRM

Many innovative ideas emerged from the discussions for products or activities that can support NbS for WFRM, including:

- Innovation: Develop community-based insurance products modelled after the US National Flood Insurance Program's Community Rating System, which awards households and businesses with premium reductions if their community takes DRR measures, including NbS (potential case application in Sardinia; *tbc*).
- Innovation: Reduce premiums on parametric wildfire insurance products based on NbS measures in place (the Willis Towers Watson model of the French Meadows national park showed premiums could be reduced by up to 43% with forest management NbS). *Note, unique to wildfire, the hazard (as separate from exposure and vulnerability) can be reduced with NbS*, meaning that parametric products, where the trigger is based only on the hazard, can offer incentives for risk reduction.
- Innovation: Based on the UN Capital Development Fund (UNCDF), which provides cities and other sovereigns in the developing world with affordable climate insurance with pre-arranged premiums and premium discounts for DRR, reform the mandate of the EU Solidarity Fund (that provides ex post relief to MS governments after major disasters). Indeed, given the relatively limited correlation between wildfire occurrences across different countries, there is potential for leveraging diversification and risk pooling advantages on a European Union (EU) scale. Some additional ideas for the EU Solidarity Fund.
    - Change from a compensation fund (European Union Solidarity Fund, EUSF) to an EU-backed insurance mechanism.
    - If compensation fund, require DRR and specified investments in NbS to remain a participant.
    - If insurance system, incentivize premium reductions based on investments in DRR/NbS.
- Innovation: Assure that offsets and carbon credits from investing in forests support NbS for wildfire risk management, e.g., by requiring planting of mixed forests, fire-resistant vegetation, fire breaks, and long-term maintenance measures.

4.4.3 Next steps & recommendations

Going forward, the IWG plans a practical application for the design of an insurance concept (and potentially an insurance product) in Sardinia. It should support NbS for wildfire prevention, and possibly community-based insurance. For this, collaboration with the HUT H2020 project is under discussion but whether this is feasible will depend on partner support and buy-in. Beyond this practical application, the IWG plans to organise further meetings, notably an in-person workshop in connection to the NATURANCE Innovation Lab taking place at the IIASA premises in May 2024, as well as in connection to the next FIRELOGUE cross-sectoral meeting. The Solsona participants, without exception, expressed interest to

collaborate in the development of topical policy briefs and papers. These would be developed at IIASA based on the Firelogue-NATURANCE meetings and targeted interviews.

Policy recommendations can address different scales (EU, national, regional, local) and target different actors (e.g., public policy makers, enterprises (e.g., insurance), NGOs and other civil society organizations). Our focus is primarily on public policy makers at the EU and Member State scales. Before policy recommendations can be tabled, it is essential that current policy is well understood. In our case, this includes, among many other policy documents, the EU Financial Directive, the EU taxonomy, insurance regulation, EU Biodiversity Strategy, Forest Strategy, Nature Restoration Law, and many national strategies for wildfire. Policy recommendations are typically proposed and discussed before meetings, where the participants endorse the already agreed proposals. This is the plan for the IWG, where recommendations will likely take the form of policy briefs, informed by scientific papers, meeting discussions and interviews.

Building on the insights from the Solsona discussions, we can already envisage some (still very tentative) topics for policy briefs (targeting EU and national policy makers) within the bounds of our nexus topic (insurance, NbS, wildfire), namely:

- *Closing the wildfire insurance gap:* Policy Brief with recommendations from our IWG on an EU-national 'smart' insurance system that combines both incentives for DRR/NbS and equity (solidarity). An innovative idea is to use a risk-layer approach with the EU Solidarity Fund (reformed) absorbing extreme losses (pooling risks across MSs) and PP insurance systems absorbing middle-layer losses – both with strong incentives for NbS.
- *Insurance to support NbS:* Policy Brief laying out the different concepts of NbS and how insurers can provide support. This support, especially for the conservationist perspective, will require policy reform at all scales – we need to flesh this out. How can insurers support implementation of the Nature Restoration Law?
- *Parametric wildfire insurance:* Policy brief on its unique potential to link with DRR/NbS, including the regulatory issues of such products.
- *Supporting Nbs with biodiversity offsets and carbon credits:* Policy Brief to suggest reforms to the systems in place to assure support for NbS.
- *Community-based insurance:* Policy Brief reporting on the Sardinia pilot and needed reforms at relevant scales for its implementation.
- *Public/private catastrophe insurance*: Pros and cons of different insurance models as applied to wildfire risk management.

4.5 Civil Protection

4.5.1 Scope

The Civil Protection Working Group (CPWG) focuses on response topics and is hence targeting representatives from Fire and Emergency Services; Emergency Medical Services; Police Department; Traffic Police; Armed Forces; Forestry service when they are involved in response; Responding NGOs and other specific responding bodies.

We tried to respect a balance between representatives of Green Deal Wildfire Risk Management Innovation Actions and complementing them by experts allowing a better international representation (nationalities balance). The following organisations take part to the group:

- The International Emergency Management Society (TIEMS)
- Fire department - Generalitat de Catalunya (ES)
- Escola national de bombeiros (PT)
- Autoridade nacional de emergencia e protecao civil (PT)
- Graz Fire service (AT)
- French Fire association for FirEUrisk involvement
- Safe cluster (FR)
- Formont centro alta Formazione AIB e Protezione civile (IT), as responder with a support letter to Firelogue, intended to be a kind of “liaison organisation” with the SILVANUS project
- Södertörn Fire Service (Stockholm SE), with a representation of Scandinavian area.
- Greek fire department, (GR) National HQ
- German fire services (DE) representing Germany and central Europe
- Croatian Crisis Management Association for the Balkans area
- French civil protection directorate for the Nemausus project

The CPWG will also involve additional individuals outside the core group to acquire additional expertise and broaden the scope and representation of views considered. This will involve additional responder representatives of other European civil protection bodies, or overseas responding agencies, to be associated on some specific topics or meetings, mainly remotely (inability to support travel costs).

The thematic focus of the WG is oriented towards all responding issues with a particular focus on innovation or new achievements produced by IAs. Relevant topics are thereby knowledge sharing, the use of technologies, human resources and good practices (Standard Operating Procedures (SOPs) or not).

4.5.2 Main insights derived

- The **interoperability** of response teams in **international deployments** under the Union Civil Protection Mechanisms needs to be enhanced to ensure efficient operations. However, activities to advance this are still few. FIRE-RES in implementing an Innovative Action on assess cross-national interoperability. However, actual activities to increase interoperability are still existing

with EUCPM training program by sharing (of) knowledge and lessons learned. The Firelogue CPWG will hence develop recommendations to the EU, in terms of topics to be shared and suggested methodology. To serve interoperability increasement in Europe, FIRE-RES will also provide a range of several pilot trainings (at least six) to share knowledge internationally. They will constitute, indeed, tests and suggestions for EU civil protection training program improvement.

- New **technologies** can be a great training aid and can improve decision making if the right type of reliable information is provided. Specifically plume monitoring and atmospheric vertical monitoring are promising solutions. However, several challenges with respect to technology interoperability and purchasing costs exist which may hinder their applicability. In addition, before operational use, technical field-testing will remain "the last step to bridge". Actually, IAs and Firelogue cannot provide enough in-deep testing to ensure the full compliance of these tools with operational and decision-making needs.

4.5.3 Next steps and recommendations

The CPWG aim is to issue a **White Paper** gathering all discussion items and translating them into suggesting ideas for DG ECHO, which is the responding body (in charge of civil protection actions) of the European Commission. This White Paper will be formulated by the Civil Protection Working Group which will provide the State of the Art in terms of critical gaps in the management of wildfire response management by the stakeholder groups, participating institutions in the three IAs (TREEADS, SILVANUS and FIRE-RES) and two others related projects, namely FirEURisk (H2020 project) and NEMAUSUS (DG ECHO project). The White Paper will be developed along the lines of the thematic foci of the CPWG:

- Knowledge: The part will review the Civil Protection related innovations that could be shared through UCPM Knowledge Network actions.
- Technologies developed by the IAs and with a sufficiently high TRL level (at least 5) will be described and suggested in the white paper.
- Best practices: this chapter will be oriented on two different layers:
    - the general overview on the response and incident management practices, usually named as command and control practices.
    - the terrain techniques and manoeuvres, for groups, squads, and operating teams that can be shared, compared and taught.
- Human Resources: This chapter could include aspects of recruitment and professionalism (part time or seasonal responders), volunteering and NGO statutes, abilities and insurance coverage in case that IAs develop innovative aspects.

In terms of **technical next steps**, the next meeting of the CPWG will be held end of 2023. Until then, a White Paper template needs to be developed by Firelogue and an organisation to be included in the WG

When the FIRE-RES Deliverable (4.8) on assessing interoperability will be reviewed and validated by the FIRERES quality management process, it will be shared with the CPWG and integrated in the White Paper.

5 WFRM opportunities, challenges, synergies & conflicts in a nutshell

The workshop clearly managed to reveal existing challenges but also opportunities and conflicts as well as innovations in managing wildfire risk and the multi-stakeholder relevance of most of these topics. The Firelogue team under lead of Fraunhofer INT is currently exploring a (further) synthesis of the results including a visualisation that would help the WGs, their participants as well as external stakeholders to understand these cross-connections. As a first step, several of these cross-connections are now detailed below. They build on the reports by the WG leads related to Day3 when groups were mixed and reflected the insights derived on Day 2. Figure 8 attributes a number to each cross-connection which described in the following.

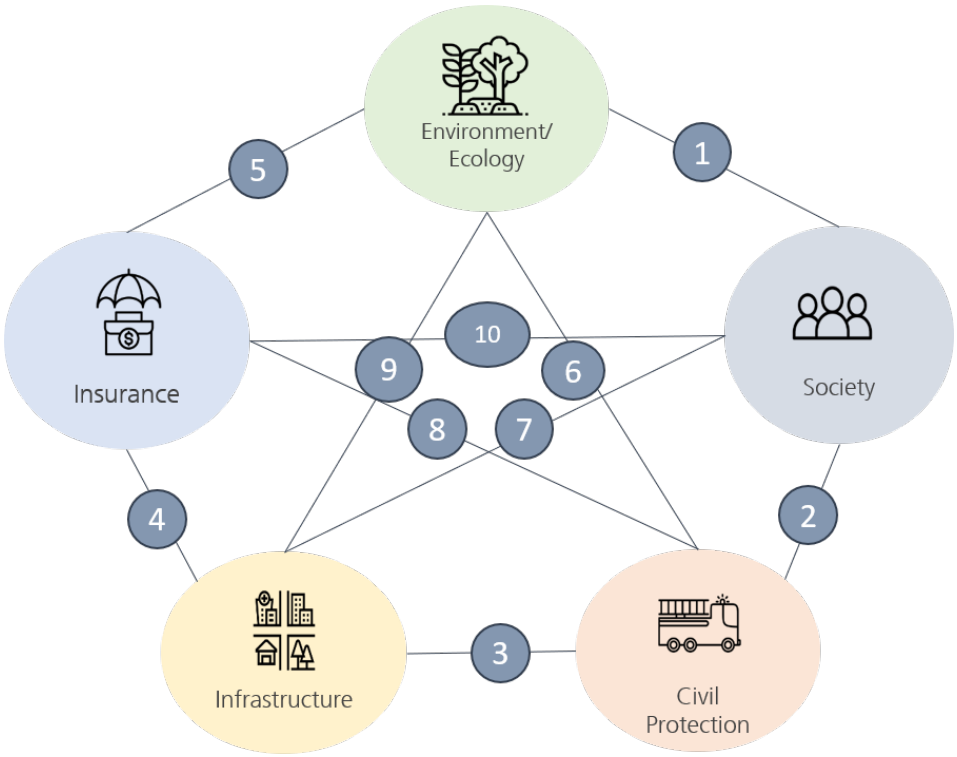

Figure 8: Cross-WG connections and multi-stakeholder WFRM aspects
Source: own figure.

1) Environment/Society

A link between the Environment and Society WGs exists in terms of the "fire narrative" and the efforts in initiating a cultural shift, changing perceptions of what is deemed positive or negative. There's a wish to consider fire as a manageable phenomenon and to communicate this message to the public incl. that "let it burn" sometimes is necessary. The role of media is also addressed, with a desire to shift from portraying fires solely as disasters to engaging and educating the public. Overall, both WGs agreed that more effort is needed in engaging the public in managing wildfire risk not only in terms of communication but also in the development of policies and strategies.

2) Society/Civil Protection

The effective communication between civil protection agencies and the society is key, specifically during the preparedness and response phases. Specific collaboration is hence needed in order to develop effective communication strategies and make adequate use of technologies, considering differential vulnerabilities and access to (digital) information. In this respect, evacuation planning as well as the communication of limitations of response operations were brought up as important topics to discuss further.

From the societal group, the issue of language used in communication about wildfire was raised. Sometimes areas facing high risk of wildfire have a high proportion of tourists in the area, who may not be able to understand warnings in the local language, and often have no warning of the risk in advance of their arrival. There can be a conflict between the tourism industry and the interest of civil protection (as tragically demonstrated in the subsequent Greek fires). It was hence suggested that:

a. Additional attempts must be made to shift the discourse on wildfire from a struggle against fire to a system where fire is managed and adapted to.
b. The language used in academic circles should also be altered in order to make it widely understandable, and academics and policymakers must show that they are listening to the needs and interests of communities and establish credibility before they can present findings or make prescriptions regarding the risks.
c. Collecting records of communication in an emergency event is also crucial for evaluating performance during a wildfire and improving lines of communication for future events.

3) Civil Protection/Infrastructure

Infrastructures should be considered more prominently in landscape planning and disaster risk management. In this respect, the collaboration between Civil Protection Authorities and Infrastructure Providers plays an important role since infrastructures can shape wildfire risk and have the potential to escalate wildfire scenarios in case of break-down. In addition, pre-emptive shutdowns have far-reaching implications for the society and subsequently civil protection authorities and should hence be closely coordinated.

Overall, it would be hence important to conduct joint risk assessments and develop management strategies. Public-private partnerships/collaboration procedures for the prioritisation for the cleaning of vegetation along infrastructures on the one hand as well as the hardening of certain infrastructures to better withstand fires on the other hand could be developed. Joint public awareness and education campaigns to inform and educate communities about wildfire risks, emergency preparedness, evacuation planning and potential infrastructure failures could be developed. Specifically, in Wildland-Urban Interfaces (WUIs) it is important to raise the awareness of infrastructure operators and to enhance regulations related to enhance prevention measures on infrastructure side and to take this interface into consideration for fuel management. Infrastructures need to be included in tactic responses to defend these peculiar areas.

Finally, potential NaTech events resulting from wildfires should be taken into consideration. For example, chemical plants, factories, oil and gas facilities could cause such disasters when impacted by a fire. Hence, appropriate prevention measures, guidance and regulations for hardening/protection of infrastructures as well as specific tactics to defend such infrastructures need to be considered.

4) Insurance/Infrastructure

The key aspect discussed between the two groups was the role of insurance in incentivizing infrastructure resilience and disaster preparedness. Expanding environmental liability to include wildfire ignition liability for infrastructures would be a significant step. By holding infrastructures accountable for their role in wildfire ignition, this measure encourages responsible practices and helps prevent wildfires caused by human activities.
At the same time, this is related to challenges of balancing the costs of insurance coverage with the risks and potential losses associated with infrastructure damage. Developing wildfire models for insurers facilitates better risk assessment. While larger reinsurers may already have these models, it would be crucial to make them accessible to smaller insurers as well. This measure enables insurers to accurately evaluate the risk of wildfires, make informed decisions and potentially expand insurance coverage to infrastructure providers.

5) Insurance/Environment

The use of Nature-based Solutions (NbSs) for managing wildfire risk and the leverage through embedding the use in insurance schemes was discussed in depth between the two WGs (see also “Main insights” above as well “Aspects discussed” in the Annex).
In addition, the question of ensuring for example the use of prescribed fires. Finding ways to address these concerns and ensure fair outcomes was a significant concern.

6) Environment/Civil Protection

A conflict exists between biodiversity (conservation) and wildfire risk reduction operations. Guidelines for protecting biodiversity have been highlighted, although it's acknowledged that some fuel and fire management techniques may not always be compatible with biodiversity conservation and/or Natura 2000 sites regulations.

A second aspect is the question of financing investments in the development of “safe” territories and business activities such as tourism. From the Civil Protection perspective, it is important that funds are not “shifted from response to prevention” but that additional resources are allocated to prevention measures. Who should pay for such activities and should/could the private sector be asked to co-fund risk reduction measures?

Collaboration is key in defining priorities for landscape management, jointly with Civil Protection forces to “clean” for example areas for safe and effective operations as also shown during the field trip on Day 1.

Finally, questions about responsibility and also liability are key in case that prevention action is forbidden, e.g., for biodiversity conservation reasons. In terms of Civil Protection, the term responsibility was reframed to "response capacity" emphasizing the idea of doing the best possible in the moment which may be limited by abovementioned restrictions on pre-suppression actions or lack of investment.

7) Society/Infrastructure

The role of community engagement and preparedness in reducing the risk of wildfires damaging critical infrastructure as well as the need for coordinated efforts between government agencies, private sector companies, and local communities to address the impact of wildfires on infrastructure were stressed. In this respect, it is important to raise societal awareness about and preparedness to service disruptions in case of an emergency (see also 2) above in this section) Society/Civil Protection above). Establishing trust with authorities is essential to receive guidance and directions for actions.

Creating public safety shelters for communities or infrastructure users and developing guidelines for their use enhances societal safety. This measure focuses on proactive measures to protect people and infrastructure during wildfires, ensuring that appropriate shelter options are available and guidelines are in place for their effective use.

8) Civil Protection/Insurance

Aspects raised between the Civil Protection and the Insurance WG related to issues of liability in the decision-making process of firefighters but also policy makers, particularly in terms of compensation and procedural justice, for example when “let it burn” strategies are applied or decisions turn out to have been wrong in the aftermath.

From the Civil Protection group, it was noted that there can be conflicts between high-level models of wildfires vs firefighters on the ground when a wildfire is burning. The group noted a need for clear rules to be followed in the case of disagreement, and a process for evaluation after such an event in order to learn for the future. In addition, aspects of liability for information providers incl. modelling tools were discussed.

The issue of insurance (and liability) for firefighters themselves was also raised, in particular in the case when they are moved into a dangerous location for example based on inaccurate modelling of the fire spread.

Finally, it was discussed that response organisations should collaborate with other organisations on preventive action to avoid losses and that the establishment of insurance schemes to compensate for losses needs to be a priority.

9) Environment/Infrastructure

In the Environment-Infrastructure exchange important questions about the definition of “Critical Infrastructure” (CI) were raised. Directive (EU) 2022/2557 defines CI as asset, a facility, equipment, a network or a system, or a part of an asset, a facility, equipment, a network or a system, which is necessary for the provision of an essential service. However, participants stressed the importance of redefining what constitutes critical infrastructure, including the consideration

of wildlife and biodiversity. The interconnectedness of all infrastructure, including natural assets, was stressed. This highlights the vulnerability of both natural and human assets due to their interdependence. Th WG suggests re-evaluating how infrastructure is categorized and labelled, along with exploring preventive measures to protect people.

In addition, the role of fuel management options as a NbS to protect critical infrastructures incl. touristic resorts has been discussed. In the broader sense it was stressed, that infrastructures should be included in pre-fire/landscape management strategies. Likewise, green energies and other infrastructure development measures can have an impact on wildfire risk (e.g., through wind turbines causing fires). It was hence called for a more detailed analysis of the cross-sector implications.

10) Insurance/Society

Aspects discussed relating to this WG interface were centred around two topics:

i. The different mechanisms of ensuring households and forests.
ii. The design of insurance products that can facilitate/leverage the application of NbS for wildfire risk reduction.

For more details see also “Main insights derived” (Section 4.4.2) and “Aspects discussed” (Annex I) of the Insurance WG.

6 Conclusion and Next Steps

The workshop in Solsona was very successful in the sense that very intense discussion about enhancing WFRM from a multi-stakeholder perspective took place as also described above in Section 5. Innovative topics such as the upscaling of nature-based solutions in managing wildfire risk through insurance schemes were discussed. Other WGs managed to discuss activities from the IAs and related challenges and opportunities. The feedback received from the participants was positive, stating that they expanded their networks, learned a lot and gained new perspectives.

The topic of justice and related synergies and conflicts was very new to the participants and its application throughout the discussions was not always easy. Hence, justice aspects have been mentioned explicitly to a limited extent although they are implicitly covered by a range of reflections related to “Who pays?”, “who is liable?”, “who should be responsible for?” that were touched by all WGs and also played a role in the cross-WG discussions. For the next round of workshops, the Firelogue team will think about how to enhance the concept and address justice aspects more explicitly.

In addition, each of the WGs has defined next steps as described in the chapters above. These steps relate to the development of Webinars to further discuss internally but also with a broader audience and to disseminate the ideas and insights that have been derived. In addition, each WG has started to think about policy recommendations that can be developed and this work will also be followed-up. A timeline for the development and release of recommendations is currently being prepared.

Overall, participants had the opportunity to get to know each other, the project and what the working groups intent to be cover the course of the next 12 months (and beyond). For the next workshop cycle, less time should hence be needed for becoming acquainted which should leave more room for advancing the envisaged topics. The next steps are described for each WG in Section 4. The next workshop will take place ideally physically in spring 2024, focusing on the Thematic Strands “Technologies” and “Earth Observation”. In order to prepare this workshop, a survey will be run across the IAs and FirEUrisk to identify relevant solutions for further discussion.

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WUITIPS Project (2023): https://civil-protection-knowledge-network.europa.eu/projects/wuitips (07.09.2023).

List of projects that have been involved in the Solsona workshop:

- FIRE-RES
- FirESmart
- FoRISK
- NATURANCE
- PyroLife
- ResAlliance
- RESONATE
- SILVANUS
- TREEADS
- wildE

Appendix

Annex I: Aspects discussed in the WGs

The WGs implemented their sessions according to the same agenda (see also Section 2 above and Annex II). However, some WGs wanted to give more room to presentations by their participants on specific inputs than other groups in which participants were already well acquainted with each other and started the discussion about challenges, synergies and justice aspects right away. These deviations are also reflected in the more extensive reports below.

Environment/Ecology

July 5th

The **first session (July 5th) from the WG_Environ** started with a round of presentations: every attendant, including the online one, presented themselves. This was followed up by the WG leads presenting the results of the Voluntary Survey that was sent to the WG_Environ participants in advance, which aimed at determining environmental and ecological concepts, topics, and dimensions of and towards integrated wildfire risk management (WFRM). The survey was organised in three parts related to concepts about fire (is there a common understanding on main concepts related to fire ecology and WFRM?), policies (exploring conflicts and synergies), and communication (challenges towards improved risk culture and awareness). During the session, the results of the 9 answers received before the workshop were described with a presentation on the screen, pausing with each topic to enable the discussion and interaction within the attendants. The following conclusions were reached with the discussion between the topics:

Regarding the differences between *Integrated Fire Management* (IFM) and *Integrated Wildfire Risk Management* (IWFRM). Among participants it was said that IFM (integrating both, the beneficial and damaging fires) is a broader concept than IWFRM, which can be included in the previous. Other opinions mentioned the advantage of making explicit the concept "risk" linked to "wildfire", which reflects better the need of moving forward to an integrated risk and emergency management. It is agreed that not a unique understanding and homogeneous use of the concepts exist.

The next presented topic was *Fire Ecology*, which was followed by discussions related to the concept. It was brought up that the concept is seen as a discipline and can be used as a communication and risk awareness tool. A participant talked about the need of updating that "natural" concept of fire, and another contributed with the thought that the expression "natural fire regime" is problematic due to the general lack of knowledge about the natural role of fire in the ecosystems or the lack of data, especially in Europe in comparison of USA, about which were the natural fire regimes in the historically human-influenced European landscapes. Related to that, it was asked generally what we understand as a "disturbance" and said that *Fire Ecology* is useful for narrative, in order to improve the capacity of ecosystems to "live with" a natural disturbance (e.g., shaping open even-aged stands adapted to recurrent and low intensity fires, and therefore "self-resistant" to all forest burnt crown-fires). A quick note was made, noting that experimental fire in laboratory is also fire ecology. Regarding the prescribed burnings, it was added that burning is costly in terms of human labour. The conversation continued with the input

on the need to plan the areas in which the prescribed burning will be carried out, adding that burning and cattle should be used in an integrative way, as both show differences in terms of carbon sequestration. Moreover, in acid soil, the burning benefits the re-growing. Besides, it was highlighted how academy is looking for evidence regarding the mentioning of fires in soil law, asking the question "how can we communicate if science doesn't show security in what it is studying?".

The next topic brought up was *Fire Smart Forestry*, which, under the opinions of part of the group, could be referred to *Fire Smart Landscape*, as it would recognize that the scope of concern extends beyond forested areas. This adjustment aims to facilitate some perspectives from diverse units, acknowledging the diverse nature of the landscape. Within the session the approach of *Fire Smart Forestry* and its adaption to the expansive scale of the territory was discussed, as it would put all the components on the same table. The group discussed how *Fire Smart Forestry* combines forest management practices with fire management strategies. Some of the key aspects of this approach include that *Fire Smart* should put emphasis on landscape level, as it would enable distinct units to collaboratively address trade-offs associated with fire management, and on the territory, because it is needed the consideration of the entire territory. Moreover, a participant highlights the importance of prioritising activities, with scale being a fundamental consideration. Regarding fire use responsibility and prohibition, a shift in the approach towards responsibility is suggested, in a way that this perspective highlights the challenges associated with imposing bans on certain activities and proposes that sense of shared responsibility could result in more constructive outcomes. The group also acknowledged how human actions significantly contribute to fires, which aligns with the previous approach, emphasizing the need to address behaviours and practices rather than attributing blame to specific elements within the landscape, such as eucalyptus trees. The potential for compensation was discussed in the context of landscape-level management, contrasting the limitations of plot-level interactions due to their top-down nature. In addition to that, the influence of public opinion on governmental decisions was noted, as sometimes it takes precedence over technical expertise. On a final note, regarding this topic, fuel reduction in strips areas were discussed, as while they are legal, at the same time are associated with high administrative costs and their use is limited.

The last concept that was talked about was NbS. First, the need of NbS for a societal challenge was highlighted, with the question of "which is the challenge related to wildfire risk reduction that NbS may contribute to?". The link with *Fire Ecology* and how forestry and grazing management can copy the natural role of fire in high-recurrent and low intensity fire regime territories was mentioned. Related to this, it was empathised how, in this regard, local goals (e.g., development of grazing with local shepherds) could be aligned with strategical objectives of wildfire risk reduction. A proposal was that NbS should engage with diverse social groups, closing the gap between urban and rural viewpoints on wildfires. Also, it was stressed the numerous definitions of NbS. It was added that rewilding could fit within NbS to address wildfire risk reduction.

With this, in the **next session**, the **WG_Environ joined the Insurance Working Group** to develop a common discussion on NbS contextualization for WFRM and discussing key synergies and potential conflicts in that regard.

The joint session with the Insurance WG started with a presentation on NbS by Eduard Plana, highlighting the prevailing notion that society is in a "war" against wildfires, drawing a contrast to how other natural

disasters are approached (e.g., we do not fight against earthquakes, why do we say that we fight against fires?). The presentation gave focus to the concepts of resilience and coexistence with natural disasters, including wildfires and the differences between fires and other hazards such as floods (e.g., risk estimation is different). Forest structure informs about the way that it will burn (e.g., crown fires or not). When considering NbS as a solution, it's essential to define the specific challenge they address (e.g., if the "solutions" working in the case of Extreme Wildfire Events as well). Wildfires are very context-dependent, demanding a comprehensive assessment that considers both the regional scale and the specific objectives of the territory, which involves addressing the appropriate level of approach, accommodating local capacities, and critically evaluating inherent values. To develop a robust strategy, it is essential to build different scenarios and analyse the potential outcomes of different solutions. This needs the establishment of a flexible framework or approach capable of adapting to the diverse nuances and variations across different regions. There is no way to avoid something to burn but we can influence how it burns and how it recovers; fire behaviour in specific places makes a difference in recovery, it is not just a matter of stopping the fire, but of influencing its behaviour. An illustrative example of an NbS is rewilding, which underscores the need for careful management to achieve optimal outcomes. To comprehensively assess the value of land affected by fires, it's crucial to go beyond immediate losses like burned wood or direct product damage; indirect costs and values also need to be factored in. For instance, in the case of a forest fire in Catalonia in 1998, compensation was only granted after a 20-year wait, highlighting the need for more efficient processes.

In the context of wildfire management, the emphasis should not be focused mainly on suppression and copying capacity, but on prevention reducing hazard and exposures. This can involve exploring insurance models based on hazard or risk, allowing for direct compensation without necessitating the identification of the ignition cause. Preventive measures, such as government regulations against construction in fire-prone areas, should be the primary strategy, with NbS serving as an additional tool rather than an excuse for building in risky zones. It is crucial to view NbS as a supplementary approach, with the ultimate objective being risk prevention rather than merely risk reduction.

Consideration must also be given to incorporating fire risk into development plans. This could involve higher insurance costs in fire-prone areas to discourage construction, including wind turbines, in those territories. Evaluating exposed elements and developing comprehensive solutions at a landscape scale is pivotal. There is a diverse range of opinions on effective strategies, such as a 25-meter strip fuel treatment around infrastructure being part of the solution or not. However, disagreements may arise due to varying stakeholder interests and their willingness to acknowledge existing risk levels; some stakeholders might be cautious about openly discussing risks, even if they're aware of them.

An additional facet is the historical "memory" a landscape holds in terms of risk (e.g., certain areas still contain unexploded bombs from World War II). In some cases, wildfires can inadvertently clear inaccessible areas, illustrating the intricate interplay between landscape history and fire dynamics.

Next, Jan Sendzimir made a presentation and expanded on various aspects that should be encompassed within NbS. They explained how biodiversity often tends to be interpreted solely as species diversity, despite encompassing a much broader scope that extends to ecosystem functioning. Highlighting the need for a holistic viewpoint, it is emphasized the significance of integrating ecosystem functions into the

understanding of biodiversity, drawing attention to the pivotal role that many biodiverse ecosystems play in carbon fixation (tension between prioritizing carbon sequestration and mitigating wildfire risks, a challenge particularly evident in regions like California), while also stressing the importance of effectively navigate transitions and address emerging challenges, as circumstances and vulnerabilities evolve over time and strategies and approaches must also adapt to them.

The speaker introduced a visual aid depicting the dichotomy between active and passive management, juxtaposed with levels of farmland utilization that is also shown below.

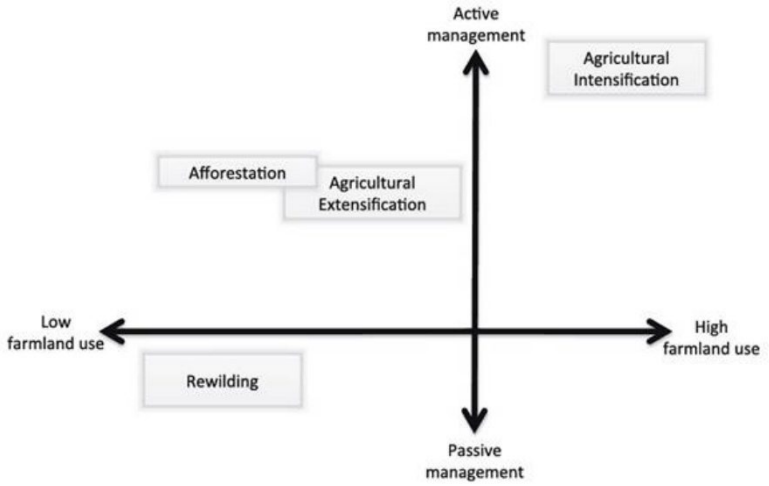


Figure 9: Active vs. passive management and the level of farmland use
Source: Navarro LM & Pereiera HM (2015), p. 5.

The graphic shed light on the potential challenges posed by agricultural expansion and vast land areas in terms of decreasing fire visibility and increasing difficulty on fire monitoring efforts.

The distinction between cultural landscapes characterized by active management and the passive approach employed in rewilding is evident. The integration of management strategies was shown to correlate with variables influencing fire risk. It was underscored the importance of community engagement, citing Burkina Faso's water management measures intertwined with its colonial history, exemplifying the need to understand the social context. The question of addressing areas with limited human presence prompted considerations about the appropriate approach. NbS inherently rely on context, encompassing the geographical location and the desired outcomes. It's noteworthy that the European Union's prioritization does not align seamlessly with biodiversity objectives. Moreover, the current state of insurance inadequately values biodiversity, especially in regions where wildfires are not considered "natural". To foster a proactive connotation, the terminology of "selective fire suppression" is suggested as a replacement for "let it burn," as the latter expression implies a more passive role.

Moreover, it was emphasized the growing recognition of the essential role of biodiversity and ecosystem services in European working landscapes. The significance of considering the cultural identity of landscapes and harnessing their potential, citing examples such as agricultural intensification's role in fire

prevention was underscored. Concerns were raised regarding abandoned farmlands lacking human presence for effective monitoring and response.

There was further exemplified ongoing rewilding initiatives and the reintroduction of primitive species to restore natural processes in European landscapes, emphasizing the need for tangible benefits beyond mere biodiversity preservation. The role of structural complexity in preventing fire spread was highlighted, particularly in countering monolithic landscapes. Jan emphasized the need for a balanced approach that allows natural processes to self-organize while actively managing landscapes.

In the afternoon, the **WG_Environ** and **WG Societal** went on a **forest walk** in Cap del Pla area, near Solsona. The field trip shows different forest landscape “shapes” according to the level of forest/land management, and the corresponding trade-off effects in terms of increase/decrease of wildfire risk. This way, challenges on WFRM at landscape level embedding traditional land management were approached. Moreover, a forest stand plot of ancient trees showing crown-fire resistant trees as an example of naturally adapted *Pinus nigra* forest to high-recurrent and low intensity fire regimes was visited, allowing to discuss the (social, technical, financial, etc.) capacity to move forward to mature forest structures as a NbS to increase fire resilience at landscape level.

During the walk, some aspects were discussed, with the insight that the forest itself could bring. First of all, it was debated if the language surrounding fire management should undergo a shift, moving from "fighting" fires centred approach and bringing up that a "just transition" approach should be adapted to community needs. Regarding the communication from academia towards general public, a simpler terminology should be used, as simplified terminology is essential on bridging the communication gap. Despite the abundance of academic papers, the information that truly reaches the public often comes in the form of tweets and videos, acting as an initial point of engagement, which is where the collaboration with communication experts becomes essential to effectively raise awareness. To address this, a specific effort is needed to enhance literacy in specific subjects, ensuring that targeted communities are well-informed; an illustrative example of this lies in Niger, where a historical understanding of colonialism's impact reshapes the local perception of measures like tree planting. The idea is for the communities to take ownership of the measures (influencing government decisions through public sentiment): the decisions come from the government but are influenced by people.
Adding to the debate, it was highlighted the mismatch and disconnection between experts, as knowledge is not implemented, as seen in cases like prescribed burning and the perception of forests. Harmonizing communication within fire-prone communities is also a challenge because there is no common understanding and messages on WFRM. Creating a unified, positive message from the scientific community is vital, although this may create resistance among the population, similar to the challenges faced during the COVID-19 pandemic. Bridging this gap between scientific insight and political agendas requires media intervention, reshaping narratives to make efficient measures more appealing to decision-makers. To reach the broad public there should be an involvement to engage local communities (e.g., at the municipal level) to foster small-scale engagement and incorporate initiatives in a smoothly way into local practices.

The discussion moved on to cultural shifts and how they are transforming rural communities into more urbanized ones, which is another example of how the society is becoming more individualistic, which, at the same time, increases the urge to find a point of agreement. Communication strategies should not merely explain, they should evoke a sense of belonging to the problem and its solution, needing a two-way communication and stakeholder engagement. While scientific results are traditionally disseminated through paper publication, science has a moral responsibility to close the gap between research outcomes and public understanding. Addressing justice-related aspects entails reconciling individual and global objectives, with serious gaming emerging as a potential tool to engage youth in comprehending intricate concepts and democratizing knowledge dissemination through accessible platforms.

July 6th

The **6th of July**, an **Environment/Ecology cross-sector working group session** was carried out, with the following participants: E-REDES Portugal (WG Infrastructure), IIASA (WG Insurance), Cote-d'Azur Firefighters (WG Civil Protection), Fire modeler/Forest Engineer (WG Infrastructure), Mitiga Solutions/FIRE-RES (WG Insurance), DTU/TREEADS (WG Insurance), TREEADS/University of Salamanca (WG Environmental/Ecology), CTFC/FIRE-RES (WG Environmental/Ecology).

The session started with a key question: "how to fit NbS and insurance to incentivize and reward wildfire risk reduction?" An example from Portugal's Electricity Provider was explained, as there was a shift from cutting all trees (except fruit-bearing) underneath power lines to reforesting in the future. Fire modelers stress the relevance of fuel load and biomass organization for fire risk assessment, emphasizing the need for fire modelers to have this crucial information; on the other hand, foresters are intrigued by shifts to bioagricultural use of space under power lines.

Next on, the topic of wind turbines was brought up following a discussion with all the participants in the session. Insights from fire fighters shed light on the intricate challenges of maintaining fire-fighting infrastructures and the need for personalized approaches. The example from Valencia was highlighted, when a fire sparked last April from a wind turbine, which raises questions about liability and insurance for such incidents. Experts highlight the insurability of wind turbines and the potential for liability concerns, prompting consideration of the broader justice aspects tied to fire-related incidents. Moreover, a key concern lies in effectively closing the gap between scientific insights and public comprehension. Regarding ignition, which is considered as a wildfires' specific problem, a justice aspect is exemplified with a case in Solsona, where legal battles ensued over an electric line's role in igniting fires (which was due to a cable malfunction), ultimately emphasizing the need for effective risk management measures. Conclusions on this issue propose parametric insurance as a faster payout mechanism, focusing on ignition prevention.
Stakeholder engagement takes centre stage as the experts emphasize the importance of aligning strategic plans with WFRM, with the example of a public consultation on a strategic sectorial development wind turbine and solar power plan for Catalonia, where wildfire did not appear in the whole document, even with fire being one of the key risks in Catalonia.

The discussion turns to the role of NbS, with the question “how do we protect our infrastructure?” and “how do we avoid infrastructure from causing fires?”, proposing this as a joint topic for infrastructure, environment/ecology, and insurance WGs, as there is also a financing and liability question that comes up. The topic ends with the talk about stakeholders, as when you engage stakeholders, the dialogue begins and a movement towards action may be more likely.

The conversation expands to encompass the preservation of traditional knowledge, which plays a pivotal role in effective wildfire management. Instances of unexploded ammunition from World War II in the South of France highlight the challenge of preserving local knowledge and managing risks. Meanwhile, the debate on natural fires is nuanced (issue with fires run as if they are natural), with concerns about extreme fires causing irreparable damage to ecosystems that insurance might not cover (e.g., biodiversity loss). Forest’ ecosystem services must be considered when dealing with fires and insurance, with the need to distinguish “good” and “bad” fires.

In relation with policies and communication, a necessity for a communication strategy embedded in the policy framework was brought up. Moreover, Nature Restoration Law (NRL) was mentioned regarding forest biodiversity indices, as it suggests 6 indices, but it does not include enough variation. There was a proposal that NRL would need to improve the indicators for biodiversity and come up with indicators for fire (and a list which serves both purposes). There is a different interest, as connectivity is good for biodiversity but “bad” for fires.

Also, it was discussed how Policy and payments under the Land Use, Land-Use Change and Forestry (LULUCF) framework encompass the consideration of carbon emissions resulting from fires. The interplay between measures concerning carbon sinks and those addressing forest fires is a crucial aspect. The submission of national energy plans and carbon targets (often shrouded in confidentiality) by countries adds to this complexity.

In summary, the discussions emphasize the intricate interplay between NbS, insurance, stakeholder engagement, and historical context in wildfire risk reduction. Bridging the gap between scientific insights and public understanding remains a central challenge, as does the need to address the complex nature of fire management while considering justice, liability, and the preservation of ecosystem services.

Society

A significant concern raised was the **literacy and awareness level of the public**. For instance, while there are efforts to educate citizens about fire safety, there remains a segment of the population, particularly the elderly, who are unaware of the risks, especially during the fire period starting 1 May. The digitalisation of state services, while beneficial, often excludes older populations who need them the most. This parallels issues in both the health and fire sectors.

The role of **technology in fire risk management** was also discussed, emphasizing the need for technology to be accessible and relevant to the target audience. The challenge lies in ensuring that technological solutions cater to all, including those in rural areas with limited connectivity or those who might not be tech-savvy.

The workshop also touched upon the importance of **language in communication**. The terminology used, such as "fire management" instead of "firefighting," can influence public perception and engagement. The need for a change in language was agreed upon, as it can foster a more inclusive narrative and shift cultural mindsets.

Another recurring theme was the challenge of **reaching diverse groups**, from tourists to migrants, and ensuring they are informed about the risks. The discussion highlighted the importance of localised solutions, understanding the target audience, and the potential role of community networks in disseminating information.

The discussions underscored the importance of effective communication, inclusivity, and the need for a multi-faceted approach to ensure public safety and awareness.

Infrastructure

Infrastructure as a driving factor in fire regime (Deep Dive I)

- How may infrastructure's malfunction, failure or misuse lead to wildfire ignition?
  Measures that infrastructure operators may take to avoid these phenomena (e.g., undergrounding of cables) or education of users for conscientious, environmentally friendly and sustainable use of infrastructure assets (e.g., road network users to avoid throwing cigarettes).
- How can risk assessment approaches and outcomes, for the forest or the Wildland Urban Interface (WUI) at risk due to the infrastructure's operation, assist short and long-term planning in forest and disaster management?
  The impact that the infrastructure can have to the evolution and management of the fire, positive (e.g. road network works as a fire break, allowing also access to the fire brigade) or negative (e.g. a refinery on the fire path) effects. Infrastructure assets can be also used as a tool for prediction and early warning: the heat of a wildfire is capable of affecting the electric current transmission and thus being used as a detector of a wildfire.
- How can the positive effects be protected and the negative be mitigated?

Impacts of Wildfire to Infrastructure (Deep Dive II)

- Wildfires can adversely affect the operation of infrastructure assets and networks exposed due to their geographic location, causing disruption of the service provided. This tendency has increased due to the expansion of human settlements and industrial activity into the wildland. Planning, training and operational procedures of infrastructure operators for anticipating response in case of extreme weather forecasting as well as in case of fire propagation in the proximity of the infrastructure, for ensuring business continuity and minimizing cascading effects.
- Protection measures following risk assessment at infrastructure level.
- The role of land management.

Common topics with other WGs and thematic strands will be investigated, such as (i) the nature-based solutions infrastructures may adopt for their protection against wildfires; (ii) the necessary societal awareness and preparedness in case of an emergency caused by service disruption; (iii) the insurance claims in case of an infrastructure-ignited fire; (iv) the impact the infrastructure service disruption may have to the response of civil protection agencies; (v) climate change projections and EU CC adaptation policies regarding infrastructures and WFRM .

Insurance

During the Solsona workshop, the Insurance Working Group discussion focussed on exploring the nexus between three topical areas: i) understanding the wildfire risk financing landscape in Europe; ii) understanding NbS for wildfire and iii) insurance to support NbS for wildfire risk management. As a result, the discussions in Solsona cumulated in an innovation lab on insurance concepts and products for supporting NbS for WFRM.

Quo vadis wildfire insurance in Europe?

In the first session, the IWG leads presented an overview of wildfire risk financing (risk transfer/sharing) in Europe, flagging that the landscape in Europe, including for wildfire, remains heterogenous with four types of approaches: i) public or PP insurance systems such as the CCS in Spain and the French CATNAT system; ii) systems with legally established ex ante government disaster relief funds, such as Austria, where the KatFonds is the primary tool for disaster risk financing and not necessarily coordinated with market-based insurance; iii) predominantly market-based systems, with the government stepping in on an ad hoc basis in case of extreme disasters, such as in Germany and Sweden; and iv) predominantly ad hoc approaches to risk financing, where insurance markets for wildfires and other hazards are relatively undeveloped, and the government acts as a quasi-insurer but with little legal guidance for compensation in place, as is the case in Italy, Greece and Portugal. For forest insurance, a similar picture emerges: its availability and use remain limited, notably due to reimbursement criteria not necessarily overlapping with needs and fuzzy forest property boundaries in countries like Greece.

Workshop participants complemented the presentation by giving examples of how differently EU member states handle wildfire insurances, saying that both the French CATNAT system and the CCS in Spain don't cover wildfire per se, since wildfires are included as fire in the basic private property insurance coverage; yet, the systems could be extended to wildfire. As a result, insuring wildfire has not emerged as an issue in Spain yet, although there are concerns about insuring losses in the future as last year crop insurance pay-out was EUR 4 Mio, which could signal serious trouble for private insurers if risk increases. However, property damage to insured properties, paid by private insurers, is not recorded separately by the Spanish Insurer's Association (which gives an indication of the relatively low level of losses). One reason for the current sustainability of the system, however, is that Spain's geography results in wildfires affecting rather empty lands with smaller villages characterised by rural exodus and many older, empty houses, and rarely the more urbanized areas, but this could change. For residential properties ca. 75% of households have property insurance, which includes fires. In Spain, forests can be privately insured but it is not compulsory and take up is limited; only 62.761 ha are insured.

In Portugal wildfire insurance is still nascent. The House Refuge Project funded by the Portuguese Foundation for Science and Technology is addressing the insurance gap with a work package that specifically addresses the potential role of the insurance sector in establishing appropriate fire management policies. The project is developing models to assess the risk of fire for houses based on the

surrounding characteristics, self-protection measures, construction materials and construction practices. The gained/generated information will be used by professionals, the government for proposing norms and also by the insurance sector. As part of this research, a questionnaire was sent to 14 insurance companies, covering 97% of the insured home market in Portugal, to gain insights into how the insurance market approaches fire risk management. Based on the responses received, certain parameters were found to play a significant role in determining the acceptance of fire risk by insurance companies. Generally, insurance companies do not insure properties exposed to high wildfire risk but admit that exceptions are made following case-by-case analyses. For the most part, wildfire risks are assessed using risk assessment models. When deciding whether exceptional risk should be accepted, criteria such as the type or size of the client's property, the relationship with the client and the ability to implement risk mitigation measures are of relevance. Surroundings that put dwellings at extreme risk (such as nearby eucalyptus trees) or construction practices that increase vulnerability (such as through the use of highly flammable materials) were deemed unacceptable by the insurance companies. The opportunity to consider NbS to reduce risks in order to enhance insurability was pointed out.

The discussion moved toward challenges the insurance industry faces in providing wildfire insurance for forests in Europe. Diversifying insurance coverage for forests is an important consideration, particularly as currently around 95% of forest plantations in the private sector remain uninsured. It is noteworthy that a significant portion of losses, approximately 90%, can be attributed to just 2% of events. One challenge for private foresters is the presence of public forests, which often receive less intensive management and can pose a risk to neighbouring private forests. Additionally, the value of biodiversity in forests is often not adequately recognized or accounted for. Further, the disconnect between the motivation of insurance companies (at the highest levels) and their underwriters, many of whom are young and with little experience and training in providing incentives for NbS creates a barrier to promoting NbS, as pension funds and other insurers have significant funds available for investment. Insurers tend to focus on the time it takes to respond to and mitigate the impact of a fire. Their approach involves analysing details and questioning where a fire may originate. However, there is a need to consider broader ecological factors and promote a more holistic approach to forest insurance that encompasses biodiversity conservation and incentivizes sustainable practices.

Wildfire is an increasingly significant cause of losses, and there are gaps in coverage in many countries. In OECD countries, wildfires have the highest overall level of insurance coverage among a ‘classic set of catastrophe risk’ with 63% of losses covered between 1990 and 2019, compared to 55% of storm losses, 29% in the case of floods and 18% in the case of earthquakes. But there are also significant gaps, such as in Greece and Portugal, where over 90% of wildfire losses are uninsured. In northern America and Australia, coverage levels for wildfires range from 65% to 75%. Insurers are exiting regions like California, where wildfires are prevalent, as they are unable to exclude properties in high-risk wildfire areas, furthermore they are also unable to differentially price wildfire risk. To the knowledge of the workshop participants, none or very few of the public partnerships or cat-risk programs across different countries ensure the availability of affordable coverage for risks deemed uninsurable in private markets. None provide coverage for wildfires, with a couple of exceptions. Certain Cantons in Switzerland have

implemented Public-Private Partnerships (PPPs) to provide coverage for wildfire risks. Another exception is the US, where a set of residual insurance arrangements that provide coverage to households and businesses exist – some of them publicly backed, with a focus on insuring low-income households. There is a need for increased cooperation between policymakers addressing climate change and insurers to address the challenges posed by wildfires. There is a suggestion that making high-risk areas financially unattractive for habitation could be a possible solution. High insurance costs make it economically unfeasible for some individuals to insure their homes in high-risk areas.

What are Nature-based Solutions for WFRM?

In the next session, the IWG joined forces with the Firelogue WG_Environ to develop a common understanding of NbS for WFRM and understand key conflicts in that regard.

The discussions started off with a presentation from the WG_Environ leads highlighting the common narrative that society is in a "war" against wildfires, contrasting it with how other natural disasters are approached. The concepts of resilience and learning to live with natural disasters, including wildfires, was emphasized. NbS are a potential way to address wildfires, tapping into the power of nature itself. However, the challenge lies in bridging the gap between different disciplines and perspectives present in the discussion, such as forest ecology, forest management, and insurance. The role of prescribed fires, aiming to replicate natural fire patterns, is seen as a tool for managing wildfires. Communication and public perception are crucial in conveying the purpose and benefits of prescribed fires. It is important to link NbS to specific problems and desired outcomes, whether it is protecting forests or safeguarding the tourist sector. Ultimately, the goal is to protect people from high-intensity fires and mitigate their potential spread in vulnerable forest areas. However, different sectors may have varying perspectives. Biodiversity, ecosystem services, resilience, and well-being are identified as integral components of NbS. Overall, the different perspectives share the focus on embracing the natural aspects of fire and incorporating them into solutions that benefit both ecological and human communities, recognizing the need for clear definitions and a shared understanding of NbS for wildfires. After that a historical perspective about the shift from natural fires to fire suppression that could be observed in Europe was shared, where the current goal is to reintroduce fire as part of the natural regime. Different fire regimes and their implications for landscape management and human settlements are acknowledged. The US has already recognized ecosystems where natural fire regimes are allowed, while some forestry practices align with incorporating natural fire patterns.

Participants added that Nature based Solutions cannot be approached with a one-size-fits-all perspective. The complexity and diversity of ecosystems must be considered when implementing such solutions. Biodiversity, for example, should not be narrowly defined as species diversity alone but should encompass the broader richness and complexity of ecosystems. Another important aspect that emerged is the conflict between securing carbon and mitigating wildfire risks. While there is a global effort to reduce carbon emissions, it becomes challenging to balance this goal with the need to prevent wildfires, which is particularly evident in regions like California. At the same time, as circumstances and vulnerabilities change over time, strategies and approaches may also need to evolve accordingly - navigating these

transitions effectively and addressing the challenges they present is essential. In Europe biodiversity and ecosystem services are increasingly seen as essential in working landscapes. Considering the cultural identity of landscapes and harnessing the potential that lies therein was flagged as important, noting for example agricultural intensification and its role in fire prevention, along with concerns about abandoned farmlands lacking human presence for monitoring and response. Examples of rewilding initiatives and the reintroduction of primitive species were used to illustrate the ongoing attempts to restore natural processes in landscapes in Europe, touching upon the motivations of local communities and highlighting the need for practical and tangible benefits rather than solely emphasizing biodiversity or pristine ecosystems. Structural complexity and its role in fire spread prevention were mentioned during the discussion, particularly as regards the importance of preventing monolithic landscapes. In areas where population decline is occurring. Ultimately, striking a balance between allowing natural processes to self-organize and actively managing landscapes, a mix of strategies based on the specific context and proximity to urban centres was emphasized as crucial.

What is the role of insurance for addressing NbS?

In the third session, the discussions addressed the role of insurance for NbS.

Nature's essential services are facing significant risks due to climate change, even as they play a crucial role in helping us adapt to climate risks. The integration of natural capital and other resilience factors into insurance and investment solutions becomes crucial. Public awareness of these issues is growing, evident through increasing reports and discussions. While there is a growing understanding of the risks, we are still in the process of comprehending the complexity of these challenges. The financial and insurance industry is striving to enhance its resilience, recognizing the need to manage the underlying drivers of risk. Risk prevention and reduction measures are essential to ensure the insurability of assets. However, there is still a long way to go for the industry to fully embrace these concepts and practices. It is important to recognize and leverage the co-benefits that arise from addressing risk drivers and trends. This involves integrating both grey and green infrastructure and developing resilience-focused insurance solutions, including community-based initiatives. Drawing from past experiences in dealing with flooding risks, we can apply lessons learned to wildfire management. Quantifying the impacts and benefits of these approaches is vital for incorporating them into business models, as emphasized in publications by organizations like the Nature Conservancy (TNC) and Marsh McLennan. To make progress, it is necessary to learn from proven approaches implemented worldwide. Additionally, addressing protection gaps and ensuring comprehensive coverage are essential components of building a resilient future.

It was added that the insurance industry plays a crucial role in promoting the adoption and implementation of Nature-based Solutions (NbS). Some examples of what insurers can do and are already doing include: *De-risking:* Insurers can help mitigate the risks associated with NbS by offering coverage that protects against losses and liabilities in their construction and performance. For instance, Forest Specialty Underwriters and Lloyd's of London were one of the first to insure prescribed burns as of 2023, reducing the financial risks associated with these practices. *Underwriting nature*: Insurers can provide

coverage for natural assets, such as coral reefs, to protect them against damages caused by events like hurricanes. Swiss Re and The Nature Conservancy (TNC) offer insurance products that have been purchased by regional governments in Mexico, providing post-disaster financing for their repair: Insurers can create *incentives for the adoption of NbS* by offering premium reductions or increases based on the implementation of these solutions. For example, TNC and Willis Towers Watson (WTW) demonstrated that ecological forestry practices in California's French Meadows area can decrease insurance premiums by up to 41% for nearby homes, encouraging the adoption of sustainable land management practices. *Divesting/Investing/donating*: Insurers can contribute to NbS by divesting from activities harmful to the environment and investing in projects that restore and protect natural ecosystems. Aviva, for instance, donated £38 million to restore Britain's rainforests, recognizing the climate benefits, flood protection, and resilience that these ecosystems provide.

One participant expanded that parametric products to support or incentivize NbS are becoming a topic of interest in the insurance industry. Some points to consider include the need for satellite data, including for historic losses. With this information, models can also take risk reduction into account and thus the effectiveness of NbS in reducing fire risks could be evaluated (as was done in the French Meadows case). Simulation models are also valuable tools for communicating risk reduction strategies to clients. Insurers can provide maps of simulated fires based on different scenarios, comparing the baseline situation with the potential impact of fuel reduction measures including thinning, changing tree diversity, prescribed burning, the growth of fire-resistant vegetation, and grazing (i.e., the forest management strategy). The model can provide visual representations of potential burn areas to help clients understand how their actions can reduce risk. Additional metrics other than area burned, wildfire intensity and forest crown damages are also produced. Several limitations of the model were also noted, including the specificity of the fuel models being calibrated to the Mediterranean context, the lack of data on firefighting measures that can be expected, and the presence of criminal ignitions, which are inherently difficult to know where they may occur. Others confirmed the importance and highlighted the high accuracy of such models in describing risk.

Innovation Lab: Insurance products for supporting NbS for WFRM

In this session, the IWG turned to identifying innovative products and approaches that insurers could develop to help reduce the risk of wildfire damage, biodiversity loss and climate change, notably with NbS. In other words, this session addressed the core question of how insurers can support NbS for wildfire risk management. By building on the three earlier sessions, this final session followed the innovation lab methodology of the NATURANCE project.

The discussion was started by one participant sharing insights around adapting community-based risk reduction strategies from the US National Flood Insurance Program (NFIP) to address wildfires. The NFIP, as the public underwriter for flood insurance in the United States, emphasizes affordability and access to flood insurance for participating communities. However, the program has incurred a significant debt. One notable aspect is the Community Rating System (CRS), which provides premium discounts to households

based on the implementation of risk reduction measures by the community. While the CRS primarily focuses on flood-related measures, there is interest in exploring its applicability to wildfire risk reduction. The integration of NbS within the CRS, such as open space preservation and natural stormwater management, highlights their potential for community-based wildfire insurance programs. The question of transferring the NFIP approach to the European Union context was also raised, emphasizing the need for tailored strategies that address the unique characteristics of wildfire risk in different regions and flagging that including wildfire perils in national CAT insurance schemes as one possible low-hanging fruit option, e.g. in France, Romania, Spain and the Netherlands.

Participants continued the innovation lab with insights from the French Meadows study in California. The study, conducted in Placer County, CA, examined the landscape-scale effect of NbS on reducing wildfire risk across 28,000 hectares. One key challenge was the translation of NbS actions into actual premium reductions, which varied between indemnity and parametric insurance approaches. For indemnity insurance, factors such as expected loss from risk models, FSIM fire models, Willis Watson Wildfire score, and considerations of uncertainty, expenses, and profit were considered. Simplified models of burned areas based on academic research played a role in assessing burn area reduction. In the case of parametric insurance, historical burn areas and severity were utilized to develop an index for the parametric product, with amended burn areas capturing the effects of risk reductions. However, it was noted that the implementation of the model may differ in practice, as there are multiple levels of novelty and complexity involved. The example of the Tahoe Donner region, where forest management has been carried out for 15 years, demonstrated the potential to present proven results to the insurance market. Nevertheless, underwriters appeared hesitant to take on the risk associated with NbS, potentially due to a lack of understanding. To translate the model for the European Union context, a suggested approach involved progressing from academic research to community uptake, product development, NbS education, and ultimately insurance market adoption.

Picking up on the point of EU financing for wildfire response measures and considerations for the future, participants delved deeper into the discussion. Historically, the EU has focused on preparedness measures such as purchasing equipment and vehicles, while neglecting the mobilization of human resources and probabilistic analysis. The creation of a probabilistic model, acknowledging the challenges compared to risks like hurricanes with view to gaining insights into future losses and determining the appropriate insurance coverage, was flagged as a way forward. The EU fire peer review assessment emphasized the need for financing, including estimating, accounting, and disclosing contingent liabilities to the public sector and critical sectors such as electricity and roads. Proactive investments in wildfire mitigation were also highlighted. However, there is a lack of quantification of avoided losses, similar to what has been done for mangroves in managing flood risks. This gap needs to be addressed to better understand the impact of wildfire management strategies. The discussion also raised the question of valuing public forests in addition to commercial forests. The UN Capital Development Fund (UNCDF) provides cities with affordable climate insurance with pre-arranged premiums, prompting the consideration of reducing premiums while risk-reduction measures are underway, even if they are not yet completed. The role of

insurers as investors was mentioned, noting that they can promote nature-positive solutions but have historically discouraged investment in activities harmful to nature.

Pre-closing the topic

In the session aimed at pre-closing the topic on Day 1, the WG gave an overwhelming positive response to the presenters, confirming sufficient interest to move the IWG forward. The idea of an innovation lab was proposed as a way to kick off further discussions and collaborations. It was emphasized that starting at the policy level is crucial, and efforts should be made to engage policymakers and relevant stakeholders. Several expressed their interest in developing policy briefs and white papers to support this endeavour. The importance of customers being willing to pay more for environmentally healthy products was highlighted as a key factor in achieving successful implementation. The development of a model for insuring goods injured from wildfire in Sardinia, including NbS considerations, is progressing, and it is expected to be ready by the beginning of next year. The focus is on creating something that is useful for users, and their input and needs were emphasized. It was also suggested that having a regulator involved could provide a valuable regulatory perspective to guide the process.

Civil Protection

Two main topics were selected for further discussions with respect to opportunities, challenges and justice aspects: Standard Operation Practices (SOPs) and new technologies.

Interoperability and SOPs

The discussion around SOPs built on the agreement that a harmonisation of procedures is needed in Europe to enhance cross-border deployment and the overall functionality of the Union Civil Protection Mechanism (UCPM) response operations. The aim is the easier deployment of resources across countries as well as to be more efficient, interoperable and quicker in action; it would be safer and eliminates miscommunication. This holds specifically true, since rescEU resources and respective deployments are increasing. The innovation would thereby not come from "inventing" something new but simply from connecting existing practices in an innovative way.

The FIRE-RES project is also working in this direction and has issued a Deliverable with a tool that can be employed between the member states to rank the interoperability efficiency during or after international help. Its Executive Summary reads as follows:

Executive summary

"Responding to Extreme Wildfire Events (EWE) often requires collaboration among responders and other stakeholders from multiple nations and multiple organizations. Different services and agencies must work together and be effective in dealing with these large incidents, trying to duplicate the level of interoperability they experience during their daily routine operations.

The need for multi-organizational cooperation becomes an increasingly pressing issue, as incidents become more and more complex, technology develops at an increasing pace, and civilian first responders hold higher expectations for standardization.

The need for interoperability extends beyond compatibility of equipment and procedures: interoperable organizations must be able to communicate with each other (Barry, 2003), understand each other, work together, and build on each other to reach common goals.

To meet these challenges, FIRE-RES Innovative Action 4.7 has been established to test an interoperability evaluation tool to assess how well multi-national, multi-organizational teams can interoperate during EWEs. This previously prototyped matrix-based tool assesses the degree of cooperation between the various first responder organizations on several layers of preparedness and response. "

However, before any respective efforts can take place, the exact scope needs to be clarified and in initial steps, the collection and sharing of practices and lessons learned should take place. The collection and sharing of practices and specifically lessons is however difficult since the latter are frequently not documented or not shared due to a reluctancy of communicating about problems/failures. The challenge could be overcome by making the documentation of lessons learned in the context of UCPM Exercises mandatory.

A process of sharing knowledge would require moderation to ensure that the information is relevant and structured in a way that allows for retrieval.

Technologies

Since the discussion of specific solutions being developed by the IAs will only take place in the next workshop cycle once a solution screening has been conducted by Firelogue WP1, this part of the workshop discussed the (co-) development of new technologies more broadly. It was stressed that it was important to involve end-user at a very early stage of the development to ensure that they are informed by experience. In addition, technologies are tools and cannot replace the actual decision-making by humans. A specific challenge might occur if the technologies contradicts the Commander's feeling/on-the ground live information. A large consensus is achieved on the pure dedication of the technologies to decision helping tools.

The following additional challenges related to technologies have been mentioned:

- Real (in situ) data is needed for decision making, rather than simulations
- Solutions which require for processing in super-computers require too much time to be applied in operations
- Interoperability of solutions is weak
- Technologies for response operations require for constant connection (reliability)
- "Office" tools and on-the-ground tools need to be differentiated

However, it was stressed that technologies can be a great training aid and can improve decision making if the right type of reliable information is provided and can be digested during operations. Specifically plume monitoring and atmospheric vertical monitoring are promising solutions.

With respect to justice aspects related to the use of technologies in response operations, the lacking liability of technology providers providing information in which operational decisions are based, was discussed. Also, the access to technologies which is very diverse across countries and regions was mentioned as an aspect of injustice. Consequently, solutions should be opensource or be at least centrally purchased.

Cross-WG perspective

From a cross-WG perspective, the need for good practices on evacuations was needed. However, the decision about whether or not to evacuate is a difficult one, also related to the local building structures, since sometimes people also become trapped on the roads during the evacuation.

Together with representatives from the insurance group, it was discussed whether past incident data could be accessed by insurers as well as how implications of response operations are attributed and could be insured. Who is liable for (unintended) consequences?

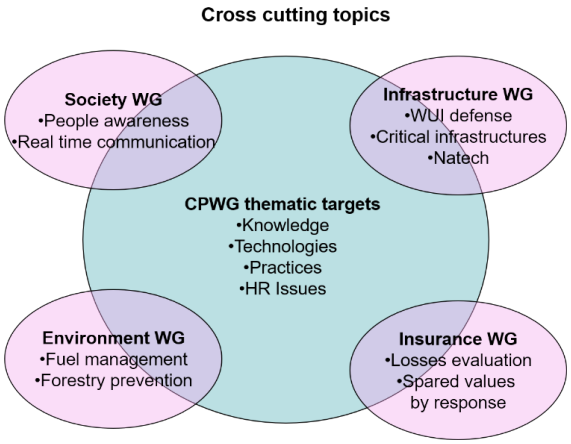


Figure 10: Cross-cutting topics of CPWG with the other Firelogue WGs

Finally, Infra WG representatives stressed the problem of wind turbines (and other infrastructure) causing fires and the challenges in putting out fires related to wind turbines. Frequently, respective fires cannot be put out due to a lack of adequate resources/machines.

Additional cross-cutting topics that have been identified are detailed in figure 7.

Annex II: Workshop Agenda

Firelogue Working Group Workshop – Detailed Agenda

Working Groups 1st workshop

4-6 July 2023 Solsona, Spain

CTFC facilities

The primary purpose of the meeting is to host the Working Groups' (Environ, Societal, Infrastructure, Insurance, and Civil Protection) 1st workshop in parallel, to discuss the different topics proposed by each WG and to have the opportunity to meet expert participants and Firelogue members at the same space and time, promoting networking and knowledge exchange. The overall idea is to engage workshop participants through a Field trip (4th July), to actively discuss wildfire risk management (WFRM) innovations and related implementation opportunities and challenges from the Working Group point of view (5th July) and to identify synergies and potential conflicts that specific WFRM measures may unfold across different stakeholder groups (6th July).
The event will be physically hosted at Forest Science and Technology Centre of Catalonia (CTFC) facilities, located in Solsona, in the pre-Pyrenees of Catalonia, Spain. Meeting links for the online participants, as well as locations for all on-side events are provided in the program below.

Tuesday 4th July 2023	
Time (CET)	**Agenda Item**
12:30	**Meeting point 1**: Plaça d'Espanya, Barcelona
13:00	**Meeting point 2**: El Prat Airport Terminal 1, (Arrivals hall, Cooofe bar, at the exit to the left) Barcelona
13:00 – 14:00	*Transfer to the visit*
14:00	**Lunch and welcome**: Restaurant Vinyanova (C/ Montserrat S/N, 08294 El Bruc, Barcelona)
14:45 – 18:00	**Field trip** (*See stop locations and recommended dress code details in Annex I. Field trip*)
18:00 – 19:00	*Arrival to Solsona, hotel check-in and accommodation*
20:30	**Social dinner** (self-paid, optional): Sant Roc Hotel (Plaça de Sant Roc, Solsona)

Wednesday 5th July 2023	
Time (CET)	**Agenda Item**
8:15	**Pick-up** at Av. del Pont, 1 (Solsona), **bus transfer** to CTFC facilities and **Registration**
8:45 – 9:45	**Introduction to the Firelogue workshop** - Welcome, *Antoni Trasobares (CTFC Director) and Eduard Plana (CTFC)* - Firelogue introduction and WG context, *Claudia Berchtold (Firelogue coordinator – Fraunhofer)* **Framing Firelogue dialogue: Governance towards integrated WFRM** - **Presentation of Landscape Fire Governance Framework (8lWFC)**. *João Quadrado. Regional Senior officer - Center. Agency for Integrated Rural Fire Management (AGIF)* - **Wildfire Action Plan and the Wildfire Peer Review Assessment Framework**. *Cristina Brăilescu. Team Leader. Directorate General for European Civil Protection & Humanitarian Aid Operations. Unit B2 – Prevention and disaster risk management* - **Justice dimensions towards integrated wildfire risk management, what does it mean?** *Claudia Berchtold. Firelogue coordinator – Fraunhofer.* Online connection here
9:45 – 10:00	**Methodology and practical issues:** Functioning of the parallel and plenary sessions. Situation of the WGs rooms. How interaction across WGs is planned. *Claudia Berchtold (Fraunhofer). Sara Nebot (CTFC)* Online connection here (same as previous)
10:00 – 10:30	*Coffee Break*
10:30 – 11:00	**Introductory WG phase** Work conducted so far/topics explored/potentially survey results **WG Insurance** online connection here (same link for entire day) **WG Infrastructure** online connection here (same link for entire day) **WG Civil Protection** online connection here (same link for entire day) **WG Environ** online connection here (same link for entire day)
11:00 – 13:00	**Discussion Deep Dive I** Deep dive into the discussion topic; room for Key Notes
13:00 – 15:30	*Lunch Landscape Break: Restaurant Cap del Pla (Carretera de Solsona, km. 13, 25283 Lladurs, Lleida)*

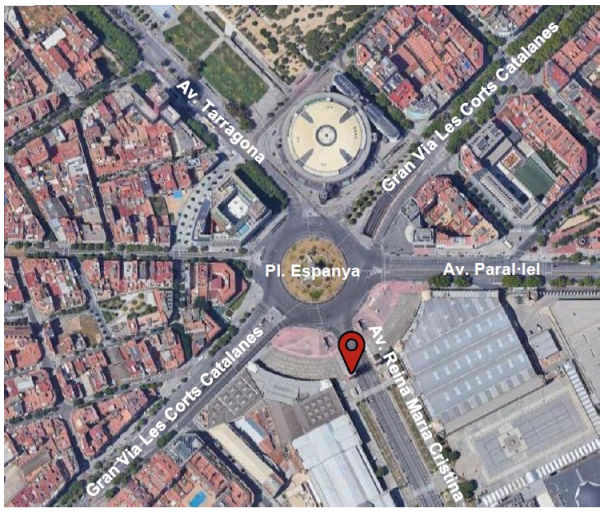
	Lunch will be served in a location close to CTFC (15min by bus), in awesome Pre-Pyrenees countryside landscape. ***WG Environ** and **WG Societal** will give continuation to the discussion in the forest (idem dress code recommendations of the day before);*
15:30 – 16:15	**Discussion Deep Dive II** Deep dive into the discussion topic; room for Key Notes
16:15 – 16:30	**Opportunities, challenges and justice aspects - individual phase** *This session should "translate" the discussion from the morning into the Just Transitions aspects related to your WFRM discussion item(s).*
16:30 – 17:00	**Opportunities, challenges and justice aspects - presentations & discussion** Building on the step before, during this session, everyone comes to the front and presents her/his notes and pins them to the respective section of the template.
17:00 - 17:20	**Cross-WG dimension** *This session should discuss the cross-WG aspects along the following aspects:*
17:20 – 17:45	**Pre-closing the topic** *This session should sketch the way forward*
17:45 – 18:00	2nd day closing & 3rd day outlook
18:00	*Transfer to Solsona*
18:45 – 20:00	*Optional: View walk to the castle Castellvell of Solsona (Meeting point and expected route)*
20:30	**Social dinner** (self-paid, optional): La Cabana d'en Geli (Ctra. de Sant Llorenç, coordinates 41.998635,1.520426, Solsona)

Thursday 6th July 2023	
Time (CET)	**Agenda Item**
8:20	**Pick-up** at Av. del Pont, 1 (Solsona) and **bus transfer** to CTFC facilities
8:45 – 9:15	**Multi-facets of integrated WFRM. The working groups perspective** (summary Day I) Joint session, online connection here
9:15 - 9:45	**Wildfire Risk Management Governance context** - **Taming Wildfires in the Context of Climate Change. Key findings and recommendations**. *Ágnes Szuda. Co-author of the report. OECD Environment Directorate.*

	- **Addressing policy coherence towards integrated wildfire risk management in the EU.** *Eduard Plana. CTFC.* Joint session, online connection here
9:45 – 10:30	**Wildfire Risk governance – Stakeholder engagement** 5 mixed WG break-out groups will be built, each led by a WG lead. Session will only be in person. The session should discuss relevant aspects on engaging stakeholders.
10:30 – 11:00	*Coffee break*
11:00 – 11:45	**Wildfire Risk governance – Stakeholder engagement** 5 mixed WG break-out groups to be continued
11:45 – 12:15	**Reconvening in WGs** Discussion of aspects added throughout the day
12:15 – 13:00	**WGs result presentation Day II** Joint Session
13:00 – 13:15	**Sum-up and closure**, *Claudia Berchtold (FhG) and Eduard Plana (CTFC)*
13:15 – 14:30	*Lunch: Camping El Solsonès (Carrer de Sant Llorenç, Km 2, 25280 Solsona)*
14:30 – 16:30	**Transfer to Barcelona** - 1st stop at the El Prat Airport Terminal 1 (estimated time of arrival 16:10) - 2nd stop at Barcelona Plaça d'Espanya (estimated time of arrival 16:30)

Locations day 1 (4th July)

Meeting point 1 (12:30h): Plaça d'Espanya, Barcelona



Meeting point 2 (13:00h): El Prat Airport Terminal 1, (Arrivals hall, Cooofe bar, at the exit to the left), Barcelona

In case of any urgent issues, please call:

- Marta Serra (CTFC) +34 679 49 57 32
- Sara Nebot (CTFC) +34 639 94 99 54

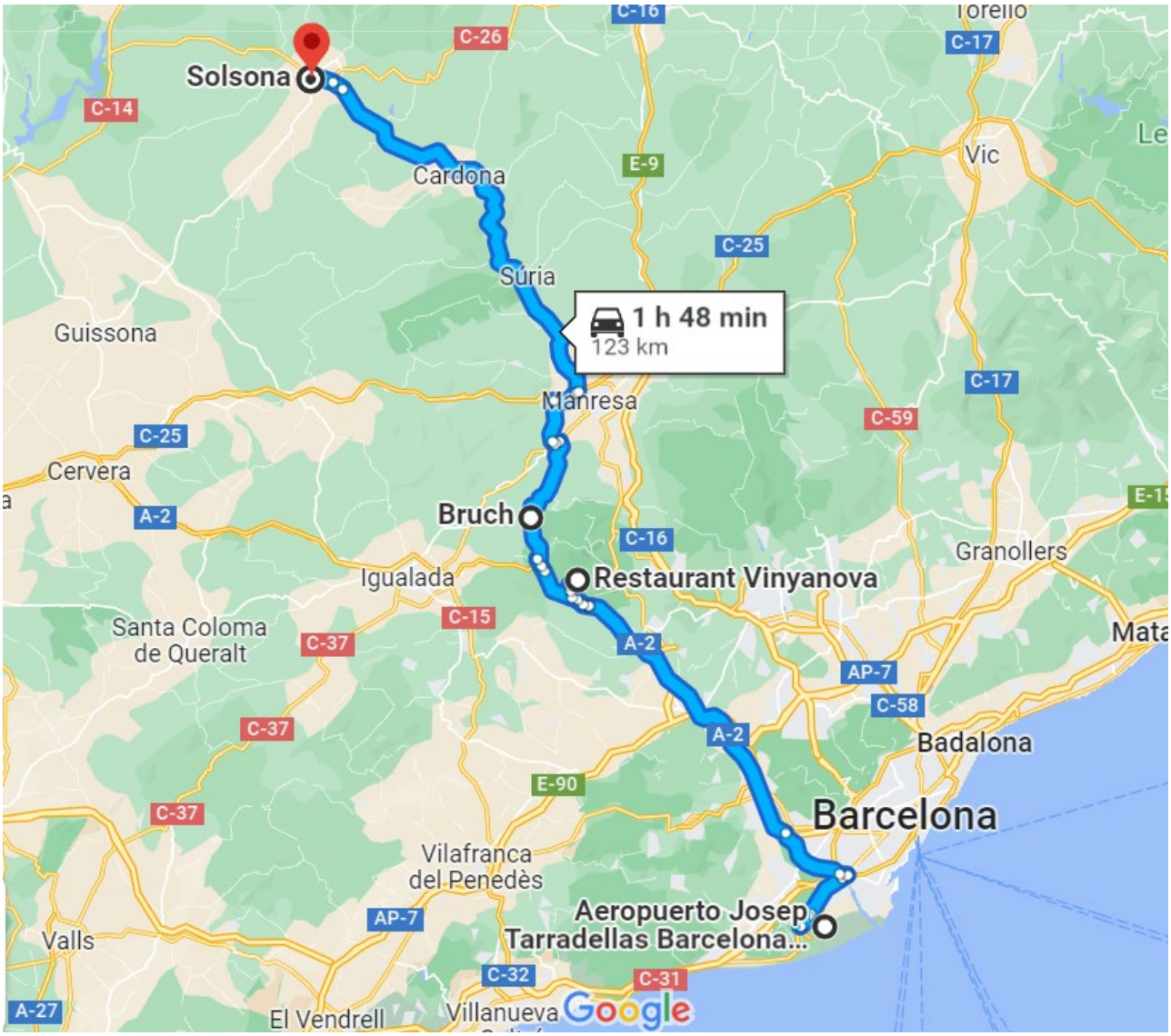
Field trip route:

Stop 1: The same for lunch and visit. 14:45h. Foothills of Natural Park of Montserrat. Introduction to the "wildfire problem" in the area. Fire prevention and risk management actions for visitors and neighbors. Interview with shepherds from Fire Flocks initiative. Location: Restaurant Vinyanova (C/ Montserrat S/N, 08294 El Bruc, Barcelona)

Stop 2: Òdena wildfire area of 2015. 17:00h (approximately). Strategic management of pre-defined wildfire events and a fire/post fire landscape vision. https://goo.gl/maps/rhhPL1ZBkkG8kKdw8

Field trip dress code and practical information:

Shoes that allow you to walk comfortably into the forest and shrublands. Distance will not be longer than 500m. Don't forget to bring sun block.
See forecast prevision (selection El Bruc in Meteoblue webpage) in the following link: https://www.meteoblue.com/es/tiempo/semana/barcelona_espa%C3%B1a_3128760


Solsona
Cardona
Súria
1 h 48 min
123 km
Manresa
Guissona
Cervera
Bruch
Restaurant Vinyanova
Igualada
Granollers
Santa Coloma
de Queralt
Vic
Badalona
Barcelona
Vilafranca
del Penedès
Aeropuerto Josep
Tarradellas Barcelona...
Valls
El Vendrell
Villanueva
Google
C-26
C-16
C-17
C-14
E-9
C-25
C-59
C-15
C-37
A-2
AP-7
C-58
E-90
C-32
C-31
A-27

Annex III: Concept note Workshop

Working Group 1st Workshop
4th – 6th July 2023
Solsona, Spain

Concept Note

Firelogue recognises the importance of bringing together the multitude of wildfire risk management (WFRM) stakeholders to uncover their different interests and needs. Only by engaging in open and constructive **dialogue** with each other **common as well as conflicting interests** can be identified and effective and holistic Wildfire Risk Management strategies can be designed.
In addition, the European Green Deal WFRM Innovation Actions and other wildfire research projects are currently developing **technical and managerial innovations** to enhance wildfire risk management across Europe. However, their impact on different stakeholder groups needs to be **contextualised**. Aiming to advance WFRM governance more generally and to better understand the implication that WFRM innovations will unfold, Firelogue aims to involve different key stakeholder groups (experts from science, policy and practice) in **five thematic Working Groups (WGs)**: Environmental/Ecology, Societal, Infrastructure, Insurance and Civil Protection.

In order to connect experts across disciplines and facilitate the respective open discussion and exchange, and to explore new opportunities to connect stakeholders across frequently isolated fields of work, Firelogue will host the first WG workshop as a joint in-person meeting at the CTFC facilities in Solsona, Spain. From 4th to 6th of July 2023, Firelogue plans to gather the five thematic Working Groups in one location and offer members the opportunity to discuss specific topics within their groups but also to facilitate exchangeacross the groups to grasp synergies and conflicts.

During the **3-day workshop**, WG-experts will focus their attention toward identifying central issues at the core of their WG topics, work toward finding possible solutions, while also continuing to learn from each other and network with other experts and members of Firelogue.
The facilities at the Forest Science and Technology Centre of Catalonia (CTFC) not only offer a place to meet in person and to discuss topics face-to-face, but also geographically places the workshop at the heart of thematter: effective WFRM, which will be highlighted by a group field-trip to El Bruc.

It is expected to have a total of (approx.) 75 participants, counting WG participants (coming from EU and non-EU countries) and Firelogue team members. A collective shuttle-bus is offered on the 4th from Barcelona (one pick-up point at 12:30 and another at 13.00 CEST) to Solsona and back to Barcelona on the 6th of July. The exact pick-up location and more details about the transfer are provided in the agenda. Additional organisational and conceptual aspects will be provided by Firelogue at a later date.

In case of questions, please contact:

For general matters and conceptual questions: Claudia Berchtold, Firelogue Project Coordinator (Claudia.berchtold@int.fraunhofer.de)

For organisational matters on the ground: Marta Serra (marta.serra@ctfc.cat) or Eduard Plana (eduard.plana@ctfc.cat), WG Environment Coordinators and CTFC Researchers


Firelogue