FIRE-RES

Innovative technologies & socio-ecological-economic solutions for fire resilient territories in Europe

D6.2 VISUAL OF INSPIRATION MAP & CATALOGUE OF INNOVATIVE SOLUTIONS

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Abstract: The Visual and Inspiration Map & Catalogue of Innovative Solutions - VIM & CIS - is a cornerstone of ST6.1.3, D6.2, seamlessly integrated into WP6, providing a visual depiction of the Living Lab (LL) actors and challenges context. Developed to support the FIRE-RES project consortium in Open Innovation initiatives. The VIM's first part introduces the Wildfire profile, LL socio-ecological context, and the Community of Wildfire Innovation (CWI), creating an interaction map that connects to the second part devoted to the CIS – a catalogue of innovative solutions. The CIS comprises two sections: the first showcase existing successful practices in each LL as inspirations for other countries, while the second outlines an integrative forest management environment for resilient landscapes. This framework is customized to address unique challenges, incorporating insights from LL voices. These components are presented in a Factsheet format designed for smooth integration into the FIRE-RES website, a vital element of the Open Innovation Campaign (OIC). This holistic and collaborative approach ensures a nuanced understanding of challenges and LL wish lists helping solution providers understand LL-specific Extreme Wildfire Event (EWE)-related challenges.

Key words: Living Lab Voices; Wildfire Challenges; Innovative solutions; Community of Wildfire innovation; Challenge Design Workshop; Factsheets; VIM & CIS

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Definitions

Challenge (in this context) [1]. refers to an external factor impacting the existing wildfire risk management system or an internal factor hindering its optimal functionality. It represents a structured description of a problem, outlining associated needs and requirements for a solution. These challenges are publicly announced, inviting proposals for potential solutions.

Challenge Design Workshop *(CDW)* The event is designed to be delivered locally, at each Living Lab, by a local facilitator, using a standardised workshop format. The goal is to enable the development of challenges by the Living Lab stakeholders based on the problems and needs identified in their context.

Community of Wildfire Innovation *(CWI)* involved stakeholders by acknowledging the unique characteristics and challenges of each region and engaging local stakeholders in both the planning and implementation processes. By involving those directly affected, fire-risk reduction strategies can be customized to address specific regional needs. This tailored approach not only enhances the probability of success but also fosters resilience in the face of wildfires.

Gaps and needs (in this context) are the required input to reach a final product.

Innovation Actions *(IA)* are a set tools, processes, and methodologies to move from current territorial risk management towards the desired sustainable/integrated fire management model and strategy. Thus, FIRE-RES IAs is conceived as building blocks and milestones to be demonstrated and deployed in the roadmap towards fire-resilient landscapes and communities.

Innovation Action responsible partners project partners that are involved in the IA activities, and are responsible for the design, implementation, and evaluation of activities.

Living Labs *(LL)* are open innovation ecosystems that operate in a territorial context (local, regional, national, or international) and integrate research and innovation processes within a public-private-citizen association[2]. LLs are the test domains to demonstrate and deploy IAs on the territory, integrating different actors, in different areas and considering all phases of the Fire Management Cycle (FMC). These LLs include a broad gradient of environments/regions across Europe: Atlantic: Aquitaine

[1] Xavier, A., Torre, A., Neves, S. (2022). Operational Handbook for OIC Kickstarting. DOI: 10.5281/zenodo.6780044

(France), Galicia (Spain), and Portugal; Northern/Boreal areas: Norway-Sweden; Central Europe: the Netherlands-Germany; Mediterranean: Catalonia, Sardinia (Italy), Greece; Eastern Europe: Bulgaria; Outermost regions: Canary Islands; International: Chile.

Living Lab Leader project partners that are responsible for the coordination of activities within the individual LLs, including coordination of stakeholder interactions within the LL, and overseeing and facilitation of the implementation of IAs related to the LLs.

Extreme Wildfire Events *(EWE)* are defined as wildfires with large-scale complex interactions between fire and atmosphere generating pyroconvective behaviour, coupling processes, that results in fast, intense, uncertain, and fast-paced changing fire behaviour.

Operational actors' stakeholders (project partners and beyond) that are involved in local activities at the level of IAs.

Open Innovation Challenge *(OIC)* aims to enhance the ability of the FIRE -RES project to provide newer and better solutions in response to stakeholders' challenges. An approach to Innovation that emphasizes collaboration with actors external to the project.

Problem owners (demand side): those that face specific problems and the likely end-users of innovations.

Strategic actors' stakeholders that are involved in the LL activities organized within WP8, through *Communities of Wildfire Innovations*. These need to be representative of the quadruple helix of innovation: academia, private sector/business/industry, public sector/administration, and civil society.

Solutions are the tools/mechanisms to fill in the gaps and needs at LL level. The proposed product, service, concept, method or technique for solving the challenge.

Solution providers (supply side): innovators, engineers, and scientists, and increasingly also citizens and associations who offer specific solutions to the problems.

Stakeholder[3]. Any group or individual who is affected by or can affect the achievement of the objectives of FIRE-RES activities in the Living Labs and its Innovation Actions - now or in the relevant future.

[3] Prokofieva, I., Górriz, E. (2022). FIRE-RES D8.1 Living Lab Guidelines. Deliverable 8.1. FIRE-RES project. 25 pages.

Abbreviations

AQ: Nouvelle-Aquitaine

BUL: Bulgaria

CAN.IS: Canary Islands

CAT: Catalonia

CIM & CIS: Visual Inspiration Map & Catalogue of Innovative Solutions

CDW: Challenge Design Workshop

CL: Chile

CTFC: Forest Science and Technology Centre of Catalonia

CWI: Community of Wildfire Innovation

D: Deliverable

EWE: Extreme Wildfire Events

FMC: Fire Management Cycle

FORESTAS: Agenzia forestale regionale de Sardinia

GAL: Galicia

GER-NL: Germany–The Netherlands

GDPR: General Data Protection Regulation

GOBCAN: Gobierno de Canarias

GR: Greece

IA: Innovation Actions

IEFC: Institut Européen de la Forêt Cultivée

IFM: Integrated Fire Management

ISA: Instituto Superior de Agronomia – University of Lisbon

ISCI: Instituto de Sistemas Complejos de Ingeniería

LL: Living Lab

NIBIO: Norwegian Institute of Bioeconomy Research

NOR-SW: Norway-Sweden

OIC: Open Innovation Campaign

POR: Portugal

SAR: Sardinia

T: Task

UAGEAN: University of the Aegean

UF: University of Forestry of Sofia

WU: Wageningen University

WP: Work Package

WUI: Wildland-Urban Interface

XUNTA: Conselleria do Medio Rural - Xunta de Galicia

1. INTRODUCTION

1.1. FIRE-RES WP6

Extreme Wildfire Events (EWE) represent a major challenge with far-reaching consequences on the global scale, posing threats to the environment, economy, and social fabric worldwide. As the limitations of conventional fire suppression strategies become increasingly apparent, there is a growing acknowledgment among practitioners, researchers and policymakers of the necessity to explore *innovative approaches*. Presently, the emphasis is moving from conventional suppression techniques to addressing the underlying causes and effects of EWEs. This shift places a strong emphasis on preventive landscape and community management, which is in line with the larger objective of guiding the European Union toward increased resilience.

FIRE-RES, a project funded under the Horizon 2020 Framework Programme of the European Commission Green Deal call H2020-LC-GD-1-1-2020[4], operates as an Innovation Action[5] with the mission to craft a comprehensive fire management strategy for effectively tackling EWE across Europe.

The project's objective is to create this holistic strategy as well as demonstrate its effectiveness through *34 Innovation Actions* (IA). These activities cover the *entire fire management spectrum*, including preparedness/prevention, detection/response, and restoration/adaptation, across 11 *Living Labs* (LLs) that mirror various European environments (including EU Outermost regions such as the Canary Islands), and even further afield in countries like Chile. FIRE-RES seeks to create a versatile and impactful solution for EWEs.

Under the leadership of the European Forest Institute (EFI), FIRE-RES WP6 endeavours to initiate the up-scale and out-scale innovative wildfire risk mitigation solutions. This goal is pursued through the establishment of strategic partnerships, facilitating connections among stakeholders in the sector, and fostering investments. Additionally, WP6 is committed to furthering *Open Innovation initiatives* and leveraging the outcomes of FIRE-RES Innovation Actions through synthesis and exploitation.

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[4] Zavratnik, V., Superina, A. and Duh, E.S. (2019), Living Labs for Rural Areas: Contextualization of Living Lab Frameworks, Concepts and Practices, Sustainability, 11, p. 3797. https://ec.europa.eu/research/participants/data/ref/h2020/other/wp/2018-2020/annexes/h2020-wp1820-annex-d-ia_en.pdf)

[5]Building a low-carbon, climate resilient future: Research and innovation in support of the European Green Deal (H2020-LC-GD-2020) (https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/lc-gd-1-1-2020)

The *Open Innovation Campaign* (OIC) provides stakeholders with a platform to present unresolved challenges that transcend their organizational confines and identify solutions within the global community of solution providers.

In the pursuit of these aims, the OIC propels initiatives to broaden the scope of solution development and expedite the process of testing and deployment. This encompasses diverse *technological, societal, and corporate* profiles by presenting *challenges and seeking solutions* from both external and previously uninvolved internal sources.

1.2. Setting the scene - co-construction process with the CWI

Humans frequently serve as the instigators of wildfires, and the key to effective fire management lies in *actively involving the society*. The objective is to transition individuals from being instigators of the predicament to assuming vital roles in its resolution (*active contributors*).

Co-construction is a *collaborative process* where diverse actors with varying profiles collectively create new knowledge. Inpractical terms, this approach entails *engaging multiple perspectives* from the start, using systems thinking to tackle complex societal challenges like wildfires. While effective, it introduces uncertainty in outcomes, highlighting the need for inclusive moderation to encourage all participants to contribute their opinions and experiences.

One of the most essential tasks for Living Lab development consists of identifying and engaging relevant stakeholders through the establishment of Communities of Wildfire Innovations. In this context, the *CWI* must embody a comprehensive understanding of the quadruple helix of the innovation system.

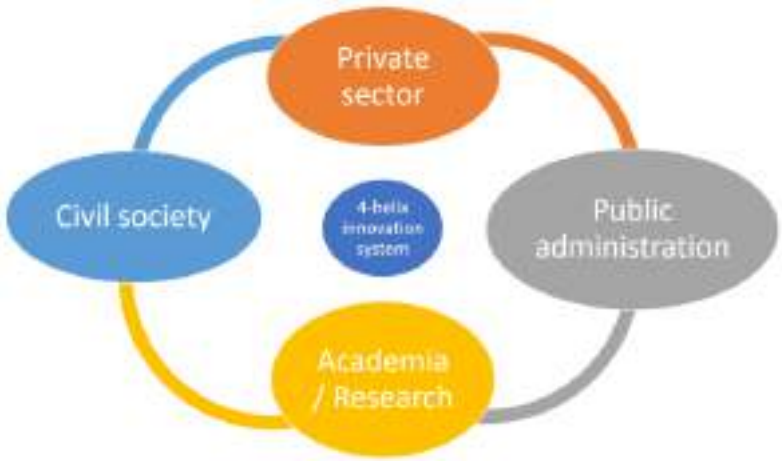


Figure 1. Quadruple helix innovation system in the Living labs.

The *Community of Wildfire Innovations* (CWI) constitutes a stakeholder panel operating at the Living Lab level, inclusive of all pertinent stakeholders exhibiting an interest in landscapes resilient to wildfires. This Community is designed to be adaptable, kicking off with the first LL meetings, and progressing throughout the project duration.

As previously noted, CWI is founded upon the principles of multi-actor approach, and hence it is important to ensure that the members of CWI go beyond the immediate groups of stakeholders (the so-called "usual suspects") that are conventionally engaged in *participatory stakeholder processes* within the region.

Figure 2. Geographical distribution of FIRE-RES 11 Living Labs

FIRE-RES innovations will be implemented in *11 Living Labs* and subsequently extended to broader scales. A Living Lab (LL) denotes an open innovation socio-ecosystem operating in a territorial context (Figure 2) —whether at the local, regional, national, or international level— and integrates research and innovation processes through a public-private-citizen association. These LLs act as experimental domains for demonstrating and implementing Innovative Actions (IAs) within the territory, bringing together diverse actors across all phases of the Fire Management Cycle (FMC).

Brief description of each LL	
Nouvelle-Aquitaine [AQ]	Features a continuous planted forest of maritime pine, with a growing Wildland-Urban Interface (WUI) and increasing settlements.
Bulgaria [BUL]	Focuses on integrating silvicultural measures for fire protection, sustainable forest management, and Natura 2000/ecosystem services conservation.
Canary Islands [CAN.IS]	Located in a remote area with specific challenges in managing wildfires, evacuations, and addressing impacts on protected areas and tourism activities.
Catalonia [CAT]	Encompasses Mediterranean and Pyrenean landscapes with recurrent wildfires and Wildland-Urban Interface (WUI) areas.
Chile [CL]	Experiences large and continuous forest plantations, extreme climatic conditions, and proximity of buildings and inhabitants to forests, with a recent Extreme Wildfire Event (EWE) in 2017.
Galicia [GAL]	Involves a critical matrix of wildland-rural interface and abandoned agricultural fields.
Germany–The Netherlands [GER-NL]	Non-traditionally fire-prone countries dealing with changing fire regimes, transboundary challenges, and expertise in flood risk management.
Greece [GR]	Characterized by Wildland-Urban Interface (WUI), recreation, and active resource management in state- and privately-owned forests, posing ever-growing fire risks.
Norway–Sweden [NOR-SW]	Faces more frequent and simultaneous wildfires requiring international aid and/or evacuations, with WUI areas at risk.
Portugal [POR]	Boasts areas of historical wildfire importance, drawing important lessons from Extreme Wildfire Events (EWEs) in 2017.
Sardinia [SAR]	Has suffered fires impacting cork forests and environmental heritage, facing specific challenges as an island.

1.2.1. Actors involved in Living Labs & Innovation Actions

FIRE-RES *Innovation Actions* encompass a spectrum of tools, processes, and methodologies aimed at progressing towards an integrated model for EWEs' management. While it is essential to engage the public and empower them as a part of the solution, it is equally crucial for government agencies, land managers, and policymakers to implement robust fire management strategies, including fire suppression, prescribed burning, and ecosystem management.

Stakeholder mapping: It entails the identification of pertinent groups crucial for the success of the Living Lab. Effective collaboration among stakeholders is vital for the successful implementation of Integrated Fire Management (IFM). By mapping the stakeholders involved in IFM, we aim to identify their interests, roles, and potential contributions to wildfire management efforts.

Stakeholders engagement plan: This initiative involves actively engage local communities and key stakeholders in fire prevention initiatives. We meticulously consider the unique needs, expectations, and potential benefits for each group. Our goal is to foster a sense of ownership and responsibility by including residents in decision-making processes, encouraging them to take proactive steps to prevent wildfires.

Provide support and resources: This involves offering informational materials, organizing training sessions, and providing technical assistance related to the Living Lab activities.

Regular updates and involvement opportunities: A system for regular updates and involvement opportunities is established to keep stakeholders well-informed about the progress and outcomes of the Living Lab. This includes sharing regular updates, success stories, and creating opportunities for their direct involvement, such as participation in workshops, field visits, or decision-making processes.

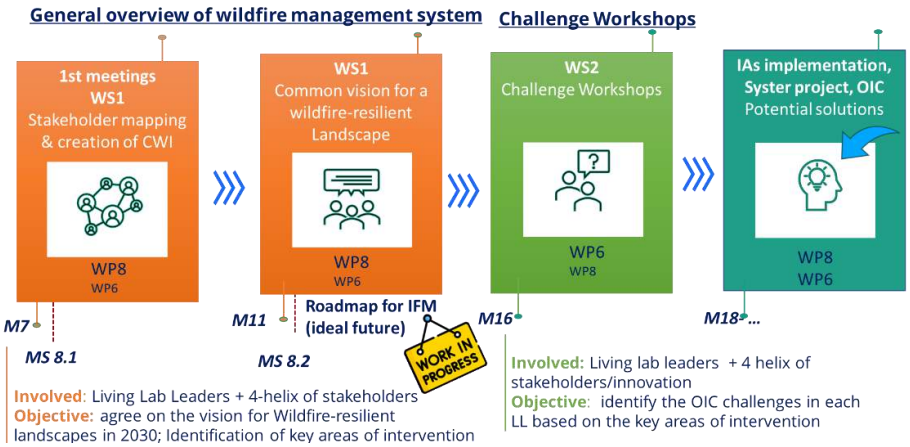


Figure 3. Steps taken over the initial 22 months of FIRE-RES to actively engage and exchange knowledge with the Community of Wildfire Innovation.

However, it is important to recognize that public engagement alone is not the sole solution to effective fire management. It should be complemented by a comprehensive approach that includes adequate resources for fire agencies, advanced technology for fire detection and suppression, research on fire behaviour and ecology, and collaboration between various stakeholders, including government agencies, communities, and environmental organizations. Combining efforts from both the public and authorities can lead to more effective fire prevention, mitigation, and response, ultimately reducing the impact of wildfires.

An informed public is less likely to misuse fire and becomes a valuable resource for fire detection.

Integrating the FIRE-RES steps and efforts delineated in Figure 3, with the intention of diminishing the frequency and mitigate the repercussions of wildfires, is aimed at foresting an environment that is sustainable and resilient to fire.

1.3. Deliverable objective and structure

Main goal:

The principal objective of the initial segment of D6.2, titled "Visual Inspiration Map" (VIM) is to facilitate Solution Seekers in visually framing innovation gaps and potential within individual or multiple LLs. It is further intended to furnish solution providers with an overview of the LL context. This involves presenting an engaging portrayal of the LL socio-ecological context, the Wildfire profile, and a description of the CWI – Wildfire Community Innovation (WP8).

The objective of the subsequent part, "Catalogue of Innovative Solutions" (CIS) is to serve as a source of inspiration for solution providers. It also compiles representative technological, entrepreneurial, and social successful practices, along with emerging LL experts/leaders, capable of addressing FIRE-RES innovation needs across different LLs.

What prevailing challenges and gaps are currently prevalent in achieving wildfire-resilient landscapes?

This second part also includes the Wishlist of each Living Lab. The Wishlist encapsulates the desired outcomes, needs, and challenges identified by each CWI Living Lab within the Challenge Design Workshop (CDW) of sub-task 6.1.2. This Wishlist is strategically structured into a specific Factsheet format for each topic under sub-task 6.1.3. Its intent is to provide guidance to solution providers in the development of innovative solutions tailored to address the distinct needs and priorities of each Living Lab.

The aim is to present the voices of each Living Lab (LL) comprehensively, resulting in a detailed catalogue encompassing all 50 original challenges. The CIS included solutions addressing the three pivotal phases of wildfire management. This

extensive coverage ensures that the catalogue offers valuable insights and illustrative examples applicable across the entire spectrum of wildfire response and mitigation efforts. It stands as a valuable resource for understanding the innovation challenges and the support rendered by the Open Innovation Campaign (OIC).

To enhance the visibility and potential success of the OIC, the FIRE-RES website now incorporates thirty Factsheets developed by the FWISE team. These Factsheets, including the initial ones (FS1 and FS2) on the Living Lab Profile and CWI description, will be linked to specific pages dedicated to each Living Lab. The third Factsheet (FS3) focuses on Living Lab voices, wishlists, and challenges, directly connected to the relevant section of the OIC page. All Factsheets are the outcomes of D6.2 "*Visual Inspiration Map & Catalogue of Innovative Solutions*".

In the development of D6.2, Subtask 6.1.3 implemented an adaptive and responsive methodology, acknowledging the distinct needs and constraints of Living Lab leaders. This involved providing clear guidelines and templates to standardize the validation process. Individual consultations were conducted, utilizing various virtual collaboration tools to facilitate effective communication. Supplementary measures were instituted to accommodate diverse schedules and ensure the inclusion of input from all Living Lab leaders.

These strategic adjustments proved indispensable in successfully delivering D6.2 within the revised schedule, thereby averting any deviations in subsequent Task 6.2.1. Ten LL leaders (all except GOBCAN) collaborated with FWISE through email, webinar co-exercises, and unique online surveys. These activities centred on ensuring the precision of D6.2 content and engaging in co-creative activities to specify the required data and validation.

This document generated two main resources:

Firstly, D6.2, which includes downloadable factsheets accessible on both the respective LL and OIC pages of the FIRE-RES website. Secondly, D6.2 was presented in document format with two main chapters, each enriched with factsheets corresponding to individual LLs. The content of this document, encompassing Factsheet #1, Factsheet #2, and Factsheet #3, was divided into four main sections:

Introduction (Section 1):

- Provides an overview of the FIRE-RES project and the WP6 framework.
- Introduces the ten Living Labs (LL) supporting the deliverable.
- Describes the general methodology behind the results.
- Outlines the process, key activities with LL leaders, and includes key support documents as Annexes.

Visual Inspiration Map (VIM) (Section 2):

- Describes the cooperation between the LLs, offering insights into collaborative efforts.
- Contextualizes the "Wildfire Context" and the "Description of the Local Community" of each LL.

Catalogue of Innovative Solutions (CIS) (Section 3):

- Showcases successful examples effective in each LL.
- CWI Challenges and Wishlist - Focuses on challenges and the Wishlist, offering insights derived from the Challenge framework and online surveys during bilateral meetings with LL leaders.
- Provides an overview of challenges and issues related to wildfires, promoting innovative solutions.

Challenges Towards Wildfire Resilient Landscapes (Section 4):

- Describes the primary challenges recognized and agreed upon after the analysis by FIRE-RES LL leaders.
- Highlights key lessons from the review of challenges and LL voices.
- Addresses the CDW and D6.2 process, containing results validated by each LL leader during T6.1.3 - Details CWI Challenges and Wishlist based on LL leaders' voices, encapsulating needs and gaps identified in Challenge frame forms (T6.1.2).

In addition to the core sections, this deliverable incorporates four annexes:

Annex I outlines the integral Living Lab (LL) context - wildfire profile and the Community of Wildfire Innovation. Annex II provides a detailed account of the original challenge frames from the Challenge Design Workshop, expressing the barriers and gaps that need to be overcome (herein, the translated English forms submitted by each LL leader). This internal report compiles information from the meetings of the Communities of Wildfire Innovations held in each FIRE-RES Living Lab.

Additionally, Annex III is designated individual surveys, each validated by the respective LL leader. Annex IV compiles a set of tables utilizing a three-step challenge approach to interpret and classify the original wildfire challenges into "objectives," "actions," and "beneficiary agents," offering a comprehensive understanding of the assessment framework.

1.4. Factsheets LL Voices - The Support Documents

The *Visual Inspiration Map and Catalogue of Innovative Solutions (VIM & CIS)* are underpinned by several Factsheets. These Factsheets are instrumental in facilitating the operationalization of the Open Innovation Challenge Campaign (ST6.2.1).

Significantly, the invaluable support from the Living Lab leaders has played a pivotal role in the conception of VIM & CIS, underscoring their contributions as central to the success of D 6.2.

In assessing the usability of the Visual Inspiration Map (VIM) approach, which includes considerations for the format of the visual content, the factsheet format is employed to guarantee a structured and easily comprehensible presentation. This format is designed to promote user engagement and exploration, thereby enriching the overall user experience.

Collaborative efforts on the layout of Factsheets have included discussions with Euromontana. The desired format, structure, and design elements for the Factsheets were explored, with the sharing of any existing templates or guidelines available. Valuable input and expertise were contributed by Euromontana, ensuring seamless alignment with the FIRE-RES project's standards and objectives.

These Factsheets have undergone validation by all LL leaders to guarantee their accuracy before being made available on the official project website. The final versions were subsequently made available to support the OIC launch. ForestWISE has taken charge of organizing online meetings, conducting surveys, delivering materials, and guiding LL leaders through the validation process.

The activation of QR codes was effectively coordinated, elucidating their purpose, and outlining their utilization on the FIRE-RES website. In-depth discussions addressed the technical aspects of QR code generation, activation, and linking to pertinent information. The collaboration with Euromontana has ensured a seamless integration of QR codes within the website.

Moreover, ongoing efforts are being made to enhance the visibility of solution providers through ongoing BoldBI Dashboard work in Task ST6.2.1. The concept involves embedding the Factsheets content into BoldBI and creating links that connect to the corresponding components on individual LLs and OIC pages. The overarching goal is to offer website visitors a more comprehensive understanding of the campaign's goals and the challenges faced.

1.5. Living Lab Leaders contribution

With regard to the first part of the Deliverable, all LL leaders has expressed input being comprehensive as possible in compiling this information, providing details on its benefits, the actors involved, the factors/past wildfire events that influenced its uptake (Factsheet#1&2), how this practice contributes to adapt to changing EWE wildfire risk. Links have been added to the relevant sources, when possible. From

the first meeting, the team has engaged directly with the various Living Lab partners and involved them in its activities.

VIM| Draft Template Email Each LL leader* received a draft template via email with key points to validate/include missing data, enabling the ForestWISE team to build the factsheets per LL. *Except for the Canarian Island.

Streamline validation process: Develop a transparent process for validating missing data and information within the Factsheet per Living Lab. Provide stakeholders with guidelines and templates to facilitate the review and validation process. Establish a deadline for completion and offer support or clarification whenever necessary.

Virtual collaboration – Online meetings: Schedule online meetings, webinars to engage with the Living Lab leaders. Utilize features like screen sharing and virtual whiteboards to facilitate the co-creative exercise, leveraging virtual collaboration tools and platforms.

CIS| 1st online working meeting: 2-hour interactive session with five LL leaders held on April 18th.

Bilateral Meetings - Coordination: Bilateral meetings with other LL leaders are being held on specific dates: Aquitaine LL on the 20th of April, Galicia LL on the 27th of April, and Bulgaria LL on May 3rd.

Preparatory work - Relevant Materials: Prior to the co-creative exercise, provide stakeholders with relevant materials, such as the missing data and the current Factsheets per Living Lab. Request their inputs and encourage them to review and validate the information in advance. This way, even if not all stakeholders can join the exercise, their contributions can still be incorporated.

Alternative modes - Asynchronous Discussions: Consider alternative modes of collaboration, such as asynchronous discussions or online collaboration platforms. This allows LL leaders to contribute at their own convenience, reducing the need for simultaneous availability.

Individual consultations – One-to-One Sessions: it was challenging to gather all the Living Lab leaders together. Individual consultations or smaller group sessions have been scheduled. This allows for focused discussions and validation of data and information with those who are available.

Clear guidelines – standardization: Provide clear guidelines and templates to standardize the validation process. Clearly communicate the expectations and criteria for validating the missing data and information in the Factsheets per Living Lab.

Follow-up and feedback loops – systematic feedback: Established a systematic follow-up process to gather feedback from LL leaders who were unable to

participate. Provide opportunities for them to share inputs, suggestions, or concerns through alternative channels, such as email or online surveys.

2. VISUAL INSPIRATION MAP

A Visual Inspiration Map (VIM) to assist solution Seekers, CWI, and other stakeholders in Integrated Fire Management by capturing best practices and visually outlining innovation gaps and potential for each Living Lab. The VIM serves to *visually represent the vision and challenges of the CWI in each LL*, contributing to the development of a wildfire-resilient landscape.

The details of the Visual Inspiration Map (VIM) will be provided in the form of a Factsheet. Ten LL leaders (all except GOBCAN) collaborated with FWISE through email, webinar co-exercises, and unique online surveys. The focus was on ensuring the accuracy of D6.2 content and engaging in co-creative activities to specify the required data and validation.

The purpose was to gain insights into the specific needs and challenges related to wildfires, facilitating the development of tailored solutions. This section was divided into three main sections and materialized in a specific factsheet format. These components covered the organization of visual content, addressing access and usability issues, and promoting collaboration and sharing. This structure enabled LL leaders to actively contribute their insights to the process.

2.1. The Wildfire profile

The first section of the Visual Inspiration Map focuses on the Wildfire context (Factsheet #1). It provides an overview of the challenges and issues related to wildfires. It includes information about the frequency and severity of wildfires in the LL regions, the land cover occupation, the socio-economic consequences, the environmental impact of wildfires, the risks to human lives and infrastructure, and any other relevant details about the fire suppression system and wildfire situation in the LL areas.

The VIM draws on material developed in MS8.1 & MS8.2. Specifically, it could be extracted from the first section of each living lab in milestone 8.2 titled “Wildfire context”. It is divided in two subsections: “Fire regime, socio-ecological context, and impacts” & “Wildfire governance”.

2.2. Community of Wildfire Innovation - A comprehensive Description

The current deliverable aims to contribute to future-oriented innovation and sustainability by providing a clear definition of the CWI. This section specifically offers an overview of the CWI in each Living Lab, focusing on identifying characteristics, success factors, and barriers (Factsheet #2). It details the objectives, scope, governance, and activities of the Living Lab, along with highlighting key stakeholders, including researchers, practitioners, forest owners, and local actors. For the convenience of solution providers, a list of clustered stakeholders has been created. Each stakeholder is accompanied by a logo to identify the various stakeholder typologies and the 4-helix of innovation:

- Asset owners and managers,
- Emergency management,
- NGOs,
- Policy and decision making,
- Private sector.

This specific Facsheet#2 builds upon Deliverable D8.1 (Prokofieva et al, 2022[6]) compiling relevant data to support Milestone MS8.1, which focuses on the "Communities of Wildfire Innovation set at each Living Lab." A concise contextualization of each Living Lab and the content discussed in those meetings is documented in Report R8.1 (Górriz-Mifsud et al, 2022[7]). gathering findings from the initial interactions with the Community of Wildfire Innovation in each Living Lab.

[6] Prokofieva, I., Górriz, E. (2022). FIRE-RES D8.1 Living Lab Guidelines. Deliverable 8.1. FIRE-RES project. 25 pages.
[7] Górriz-Mifsud E, Brunet-Navarro P, (2022). FIRE-RES R8.1 Living Lab Roadmaps. Internal Report 8.1. FIRE-RES project. 22 pages.

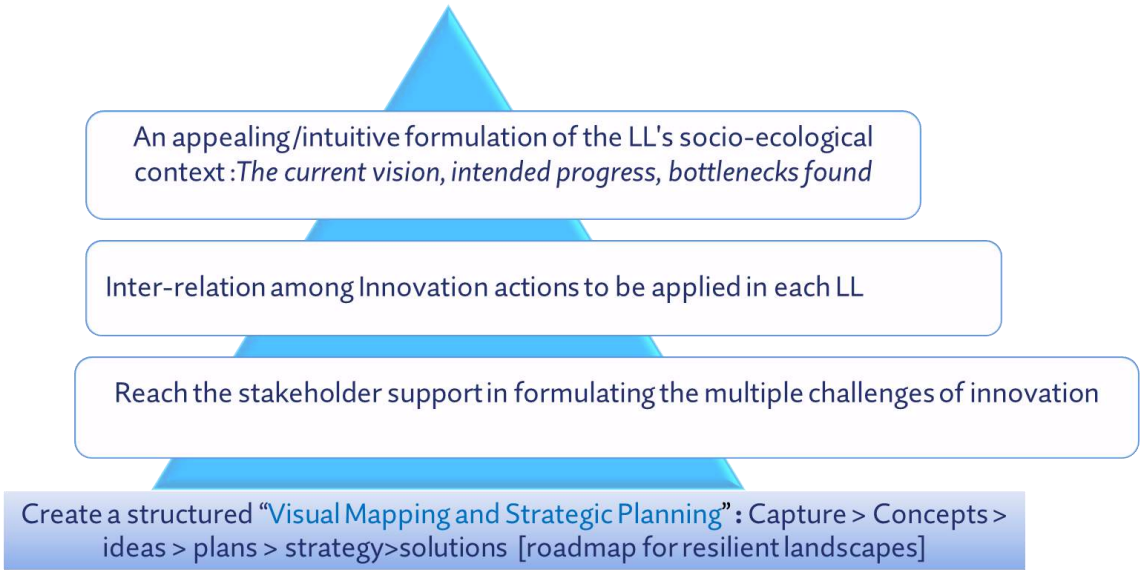


Figure 4. Visually 'maps-out' CWI ideas multi-stage achieving stakeholder support on the formulation of the multiple innovation challenges.

Visualizing CWI ideas involves outlining a method for creating a well-structured visual representation of ideas and plans (Figure 5). This process advances through stages such as capturing concepts, generating ideas, formulating plans, developing strategies, and ultimately arriving at solutions. The main objective is to craft a roadmap with a specific emphasis on building resilient landscapes. This information plays a crucial role in helping solution providers grasp the collaborative and participatory nature embedded in the Living Lab approach.

2.3. Factsheet 1 & 2: Wildfire Profile & CWI

The original contents of Living Lab leaders in Factsheets #1 and #2 are detailed in the D6.2. Annexes section, specifically in *Annex I: Living Lab leaders' contributions – Factsheets content* (Pages 108-127). The key takeaways from both Factsheet#1and #2 are summarized in Table 1.

Table 1. summary points - factsheets in a nutshell

Living Lab	Suppression system	Forest ownership (%)	CWI distribution
Nouvelle-Aquitaine	Civil Protection	10 Public 90 Private	Public sector 48% Private sector 4% Society 22% Academy / Science 26%
Bulgaria	Fire Fighting Service together with Forest Departments	86.5 Public 11 Private	Public sector 72% Private sector 7% Society 7% Academy / Science 14%
Catalonia	Catalan Fire and rescue Service (GENCAT)	24 Public 76 Private	Public sector 54% Private sector 3% Society 11% Academy / Science 32%
Chile	Ministry of Agriculture, mainly through the National Forestry Corporation (CONAF)	26 Public 74 Private	Public sector 31% Private sector 45% Society 12% Academy / Science 12%
Galicia	Galician Forest Fire Prevention and Defence Service	97 Public 3 Private	Public sector 94% Private sector 0% Society 6% Academy / Science 0%
Germany – The Netherlands	Dutch and German fire services	Germany: 52 Public 48 Private The Netherlands: 41 Public 18 Private	Public sector 58.5% Private sector 0% Society 23.5% Academy / Science 18%
Greece	Ministry of Climate Crisis and Civil Protection	83 Public 17 Private	Public sector 42% Private sector 16% Society 24% Academy / Science 18%
Norway-Sweden	Local Fire and Rescue Services	77 Public 23 Private	Public sector 39% Private sector 23% Society 15% Academy / Science 23%
Portugal	Civil Protection	16 Public 84 Private	Public sector 37% Private sector 13% Society 32% Academy / Science 18%
Sardinia	Civil Protection, Regional Forest Guards (CFVA) and FoReSTAS	33 Public 66 Private	Public sector 82% Private sector 10% Society 0% Academy / Science 8%

Moreover, the set of Factsheets are now seamlessly integrated into the Living Lab page at https://fire-res.eu/living-lab/living-lab-portugal/. A dedicated section has been added below 'Innovation Actions,' featuring two previews, each accompanied by its unique title. Upon clicking on the respective title, users are redirected to the

corresponding PDF documents, including the Visual Inspiration Map, as outlined below:

Nouvelle-Aquitaine

https://fire-res.eu/wp-content/uploads/2023/10/France-visual-inspiration-map.pdf

Bulgaria

https://fire-res.eu/wp-content/uploads/2023/10/Bulgaria-Visual-Inspiration-Map.pdf

Catalonia

https://fire-res.eu/wp-content/uploads/2023/10/Catalonia-Visual-inspiration-map.pdf

Chile

https://fire-res.eu/wp-content/uploads/2023/10/Chile-Visual-inspiration-map.pdf

Galicia

https://fire-res.eu/wp-content/uploads/2023/10/Galicia-visual-inspiration-map.pdf

Germany- The Netherlands

https://fire-res.eu/wp-content/uploads/2023/10/Germany-The-Netherlands-visual-inspiration-map.pdf

Greece

https://fire-res.eu/wp-content/uploads/2023/10/Greece-visual-inspiration-map.pdf

Norway-Sweden

https://fire-res.eu/wp-content/uploads/2023/10/Norway-Sweden-visual-inspiration-map.pdf

Portugal

https://fire-res.eu/wp-content/uploads/2023/10/Portugal-visual-inspiration-map.pdf

Sardinia

https://fire-res.eu/wp-content/uploads/2023/10/Sardinia-visual-inspiration-map.pdf

FIRE-RES

VISUAL INSPIRATION MAP

NOUVELLE-AQUITAINE - WILDFIRE PROFILE

NOUVELLE-AQUITAINE MASSIF DES LANDES DE GASCOGNE LIVING LAB

Reaching-up:

42°C
maximum temperature recorded in the summer

< 15%
relative humidity

LAND COVER

- 9% Other
- 26% Agriculture & pasture
- 65% Forest

Scots pine (*Pinus sylvestris*)

Oak tree (*Quercus sp.*)

Sweet shestnut (*Castanea sativa*)

2022

32,000 HA BURNT | **42°C RECORDED**

Mostly forest areas

In 2022, out of a universe of 1438 wildfire events bigger or equal to 1000 m², a single wildfire lasted for 6 days. It burned more than 12 k hectares, covering 7.8% in the Gironde region, with relevant impacts in valuable landscape and forests (mostly Maritime pine trees, but also deciduous).

Over 90% of these wildfires are human-induced. Causes include arson, negligence, and burning of agricultural waste.

DID YOU KNOW?

Civil Protection is responsible for the fire suppression system.

Investment in fire prevention has been increasing since the extreme wildfires (50 k ha) of 1949, that caused 87 fatalities, establishing the *Défense des Forêts Contre l'Incendie* system, reversing the pathway of decades where little expenditure was spent on wildfire management.

VISUAL INSPIRATION MAP

NOUVELLE-AQUITAINE - COMMUNITY OF WILDFIRE INNOVATION

GOVERNANCE

Nouvelle-Aquitaine Massif des Landes de Gascogne is *sui generis* in terms of forest ownership. Forests ownership distribution:

90% private landowners
10% the State and public agencies

ACTORS INVOLVED

The Nouvelle-Aquitaine community of wildfire innovations (CWI) integrates 23 members, divided into 12 strategic members and 11 operational ones. The CWI members are classified into six types and distributed over the categories of the 4-helix of innovation.

FIRE-RES involves 4 partners from Nouvelle-Aquitaine that include research and outreach institutions (IEFC and INRAe), emergency management institutions (Service Départemental d'Incendie et Sécurité - SDIS 40), and The Regional Association (ARDFCI) as the public institution.

MORE INFO

This project has received funding from the European Horizon 2020 research and innovation programme under grant agreement No 101037419

FIRE-RES

VISUAL INSPIRATION MAP

BULGARIA - WILDFIRE PROFILE

BULGARIA LIVING LAB

Reaching-up:

40°C maximum temperature recorded in the summer

< 25% relative humidity

LAND COVER

- 8% Other
- 14% Shrubland & pastures
- 47% Agriculture
- 31% Forest

35.5% Oak tree (*Quercus sp.*)

16.5% European beech (*Fagus sylvatica*)

14.8% Scots pine (*Pinus sylvestris*)

2020

10,400 HA BURNT | **41°C RECORDED**

Woodlands (5,258 ha)
Shrublands & Agriculture (5,158 ha)

In 2020, out of a universe of 3 rural fires larger than 1k ha, a single wildfire lasted 5 days. It burned close to 1.8k hectares, covering the territory of 4 villages in 2 district areas. Unfortunately, in 2021, a forest fire left three foresterse injured and two dead.

The most commonly known causes of these fires were "burning of pastures" (25.6%) and "burning of stubble" (18.7%).

DID YOU KNOW?

The Fire Fighting Service together with Forest Departments, are responsible for the fire suppression system.

The costs of protection and prevention of forest fires increase by about 10% annually (in 2022 the total expenses amount 2 000 000 euros).

VISUAL INSPIRATION MAP

BULGARIA - COMMUNITY OF WILDFIRE INNOVATION

GOVERNANCE

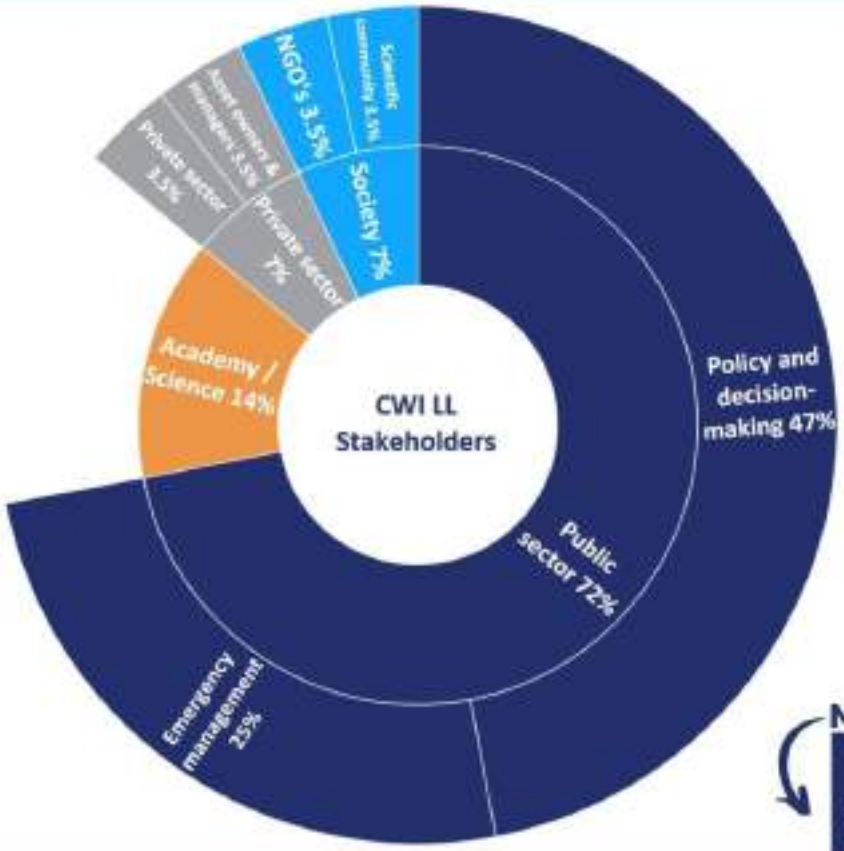
Bulgaria is *sui generis* in terms of forest ownership. Forests ownership distribution:

74.5% the State and other agencies
12% local communities
11% private landowners

ACTORS INVOLVED

The Bulgarian community of wildfire innovations (CWI) integrates 28 members, divided into 21 strategic members and 7 operational ones. The CWI members are classified into three types and distributed over the categories of the 4-helix of innovation.

FIRE-RES involves 9 national partner institutions, that include a research and outreach institutions (University of Forestry) and 8 public institutions (Executive Forest Agency, Fire Service St. Zagora, and the Southeast State Forestry Enterprise with diferent divisions).



MORE INFO

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FIRE-RES

VISUAL INSPIRATION MAP

CATALONIA - WILDFIRE PROFILE

CATALONIA LIVING LAB

Reaching-up:

43.6°C maximum temperature recorded in the summer

< 30% relative humidity

>60 km/h

LAND COVER

- 6.5% Other
- 23% Shrubland & grassland
- 29% Agricultural lands
- 41.5% Tree cover

Scots pine (*Pinus sylvestris*)

Aleppo Pine (*Pinus halepensis*)

Holm oak (*Quercus ilex*)

2012

17,922 HA BURNT | **41°C RECORDED**

Tree cover (7,749 ha)
Woodlands, shrublands & grassland (7,727 ha)
Cropland (2,897 ha)

In 2012, the most important fire, the Jonquera fire, burned 12.898 ha in a north-westerly wind situation. The fire had a main run of more than 17 km in the first 10 h with maximum peaks of propagation speeds of 7.7 km/h, affecting more than 600 vulnerable elements including the main highway that connects Spain and France.

The Jonquera fire occurred on a simultaneous emergency scenario in which firefighters prioritised the protection of citizens and let the fire burn until better conditions allowed to safe and efficient firefighting operations.

DID YOU KNOW?

The fire suppression system is mainly driven by the Catalan Fire and rescue Service (GENCAT).

Investment in wildfire prevention has been increasing during the last years reaching more than €M5.3 in 2022. Although recently the total burned area has been reduced, the speed of fires (ha burned per hour) has increased, which implies more dangerous and devasting fires.

VISUAL INSPIRATION MAP

CATALONIA - COMMUNITY OF WILDFIRE INNOVATION

GOVERNANCE

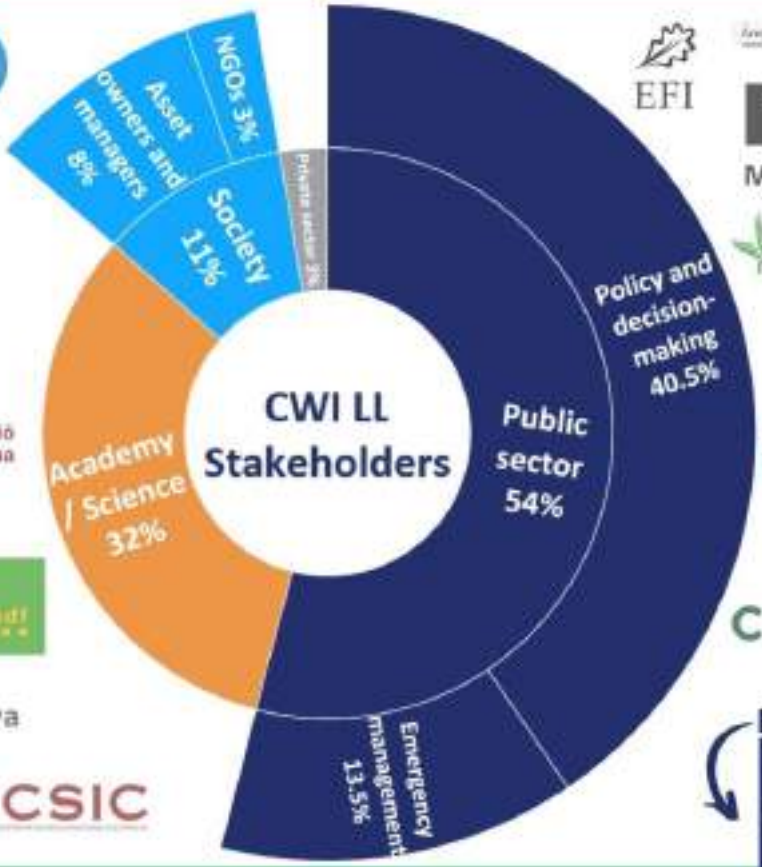
Catalonia forest ownership distribution:

76% private landowners
24% the State and public agencies

ACTORS INVOLVED

The Catalan community of wildfire innovations (CWI) integrates 37 members, divided into 19 strategic members and 18 operational ones. The CWI members are classified into six types and distributed over the categories of the 4-helix of innovation.

FIRE-RES involves 5 national partners that include research and outreach institutions (CTFC, ICGC and EFI), a private company (Mitiga Solutions S.L.) and General Directorate of Prevention, Fire Fighting and Rescue from the Department of the Interior as emergency management sector enclosing 16 representatives from these institutions.



BOSCAT
agents rurals
UPC
Diputació de Girona
Diputació Tarragona
IRTA
Diputació Barcelona
Diputació de Lleida
Generalitat de Catalunya
efadf
technosylva
AIRBUS
CSIC
EFI
Mitiga
Centre de la Propietat Forestal
ICGC
bombers
protecció civil
CTFC

MORE INFO

This project has received funding from the European Horizon 2020 research and innovation programme under grant agreement No 101037419

FIRE-RES

VISUAL INSPIRATION MAP

CHILE - WILDFIRE PROFILE

CHILE LIVING LAB

Reaching-up:

42°C
maximum temperature recorded in the summer

< 20%
relative humidity

LAND COVER

- 32% Other
- 4 % Agriculture
- 40% Shrubland & pastures
- 24% Forest

28%

Monterey pine (*Pinus radiata*)

21%

Longa beech (*Nothofagus pumilio*)

15%

Eucalyptus (*Eucalyptus sp.*)

2023

184,000 HA BURNT | **40°C RECORDED**

Woodlands (139,840 ha)
Shrublands (9,200 ha)
Agriculture (18,400 ha)
Grassland (16,560 ha)

In 2023, the impact of the summer season was severe, destroying 2450 buildings, leaving 7770 people homeless, and causing 3569 injuries. There were an unprecedented 26 deaths due to the fires.

Almost 100% of the wildfires are human-induced, 32% of which are estimated to be intentional, 65% accidental and 4% unknown.

DID YOU KNOW?

The Ministry of Agriculture, mainly through the National Forestry Corporation (CONAF), is responsible for the fire prevention and suppression system.

Investment in fire prevention has been increasing since the devastating wildfires of 2017 (467 thousand hectares), which causes 11 fatalities.

VISUAL INSPIRATION MAP

CHILE - COMMUNITY OF WILDFIRE INNOVATION

GOVERNANCE

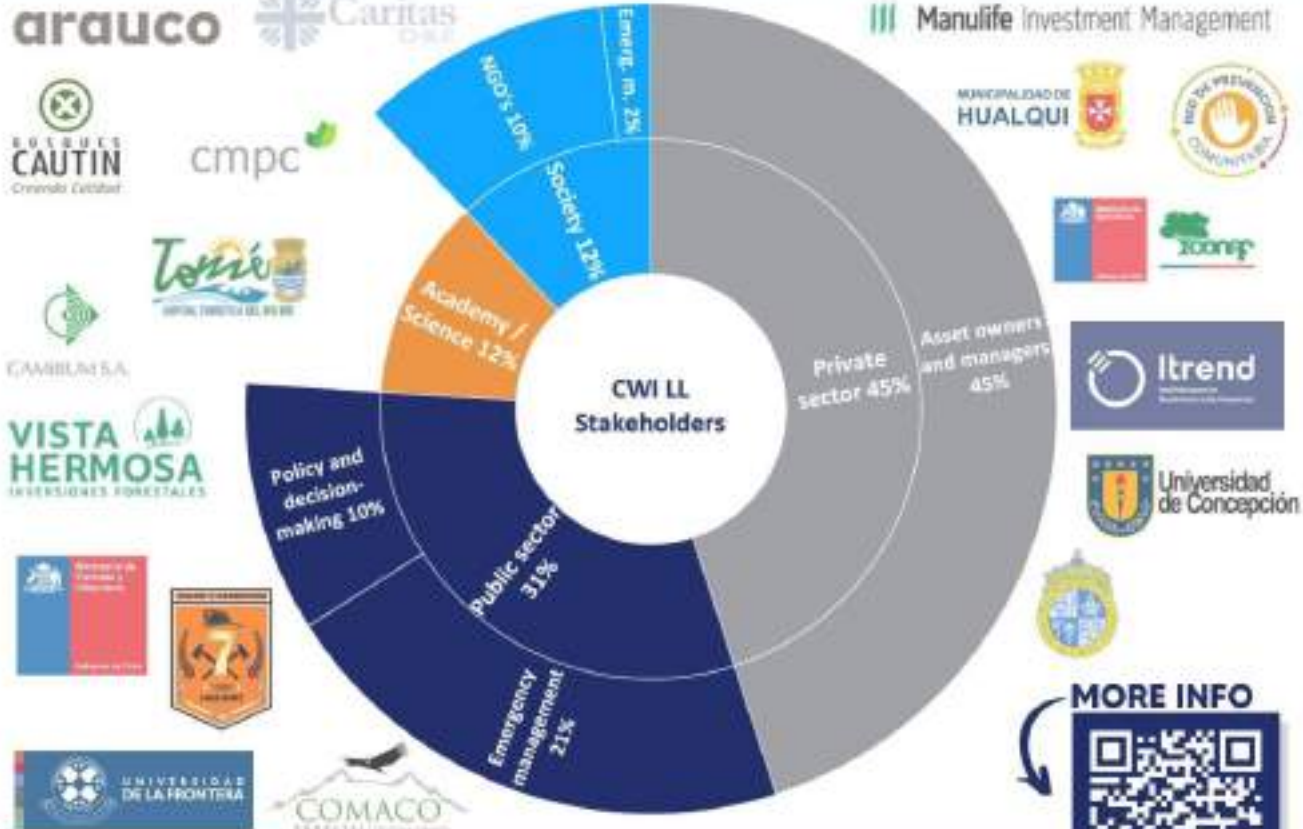
Forests ownership distribution:

74% private landowners
26% the State (Protected Wildlife Areas)

ACTORS INVOLVED

The Chilen community of wildfire innovations (CWI) integrates 42 members, divided into 34 strategic members and 8 operational ones. The CWI members are classified into six types and distributed over the categories of the 4-helix of innovation.

FIRE-RES involves 3 national partners that include research and outreach institutions (ISCI), a gremial association of Forestry Companies with 160 members (CORMA), and The National Forestry Corporation (CONAF) which is part of the Ministry of Agriculture.



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FIRE-RES

VISUAL INSPIRATION MAP

GALICIA - WILDFIRE PROFILE

GALICIA LIVING LAB

Reaching-up:

44°C maximum temperature recorded in the summer

< 20% relative humidity

LAND COVER

- 3% Other
- 28% Agriculture
- 69% Forest


39%
Pine tree (*Pinus sp*)


26%
Eucalyptus tree (*Eucalyptus sp*)


18%
Oak tree (*Quercus sp*)

2017

62,000 HA BURNT | **42°C RECORDED**

Woodlands (32,267 ha)
Shrublands (29,828 ha)
Agriculture (2,905 ha)

In 2017, a single weekend in October saw 49 thousand hectares ablaze in 125 simultaneous fires within less than 4 hours. 13 of these rural fires were larger than 1k ha, significantly impacting a prized landscape and valuable forests. These areas included mostly conifers but also deciduous broadleaves and scrub.

The most common causes of these fires were human-induced, mainely caused by arson (75%).

DID YOU KNOW?

The Galician Forest Fire Prevention and Defence Service is responsible for the fire suppression system.

Since a review in 2021 of the "Forest Plan in Galicia" prevention and extinction of forest wildfires and restoration of burnt areas have increased.

VISUAL INSPIRATION MAP

GALICIA - COMMUNITY OF WILDFIRE INNOVATION

GOVERNANCE

Galicia forest ownership distribution:

97% private landowners (30% private communal forests (MVMC)
3% public landwners

ACTORS INVOLVED

The Galician community of wildfire innovations (CWI) integrates 18 members, divided into 10 strategic members and 8 operational ones. The CWI members are classified into three types and distributed over the categories of the 4-helix of innovation.

FIRE-RES involves a national partner institution, the Consellería de Medio Rural of the Xunta de Galicia, on which all the aforementioned assets depend, with competencies in prevention, extinction and post-fire or restoration.

CONSELLERÍA DO MEDIO RURAL
DIRECCIÓN XERAL DE DEFENSA DO MONTE

MORE INFO

This project has received funding from the European Horizon 2020 research and innovation programme under grant agreement No 101037419

FIRE-RES

VISUAL INSPIRATION MAP

GERMANY-THE NETHERLANDS - WILDFIRE PROFILE

GERMANY-THE NETHERLANDS LIVING LAB

Reaching-up:

30°C maximum temperature recorded in the summer

< 82% relative humidity

LAND COVER

The Netherlands

62% Forest

55% Coniferous | 45% Broadleaves

Scots pine (*Pinus sylvestris*)

Oak tree (*Quercus* sp.)

Germany

19% Forest

54% Coniferous | 31% Broadleaves

Pine tree (*Pinus* sp.)

Spruce tree (*Picea* sp.)

2019 - 2022

1,112 HA BURNT

Cropland
Shrubland
Forest

RELEVANT MONTHS

April
May
July

Between 2017 and 2022, the Netherlands experienced 550 fires per year in average in spring and summer, the far majority of these fires is not captured by satellites. Ongoing research suggests that these statistics may significantly underestimate the number and impact of these wildfires. The future research results will serve as a crucial baseline for further investigations and informed decision-making. The most common causes of these fires were human-induced, mainly caused by accidents (22%) and deliberately (20%).

DID YOU KNOW?

The Dutch and German fire services are responsible for the fire suppression system.

Fire services are primarily trained to deal with urban fires. Investments in the preparedness to respond to landscape fires are increasing, duo to the need of more forest management tailored to forest fires and limited policy for wildfires.

VISUAL INSPIRATION MAP

GERMANY-THE NETHERLANDS - COMMUNITY OF WILDFIRE INNOVATION

GOVERNANCE

Forest ownership distribution:

The Netherlands
- 26% Dutch State Forest Service
- 18% private landowners
- 15% municipalities

Germany
- 52% Federal State
- 48% private & corporately landowners

ACTORS INVOLVED

The Germany-Netherlands community of wildfire innovations (CWI) integrates 34 members, divided into 26 strategic members and 8 operational ones. The CWI members are classified into four types and distributed over the categories of the 4-helix of innovation.

FIRE-RES involves 2 partners from Germany and The Netherlands that include a research and outreach institutions (Wageningen University), and one institution as emergency management sector (Waldbrandteam).

MORE INFO

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FIRE-RES

VISUAL INSPIRATION MAP

GREECE - WILDFIRE PROFILE

GREECE LIVING LAB

Reaching-up:

40°C maximum temperature recorded in the summer

< 20% relative humidity

LAND COVER

- 9% Agriculture
- 11% Pasture
- 25% Shrubs & woodlands
- 25% Forest

Aleppo Pine (*Pinus halepensis*)

Calabrian Pine (*Pinus brutia*)

Stone Oak (*Pinus pinea*)

2021

133,000 HA BURNT | **46°C RECORDED**

Forests (50,000 ha)
Shrubs-woodlands (36,500 ha)
Agricultural (39,000 ha)

In 2021, out of a universe of 18 wildfire events bigger than 500 ha, the mega-fire of Evia Island lasted for 9 days. It burned almost 50 k ha, affecting 15% of the island, which is the 6th largest island in the Mediterranean Sea. It had major impacts in a rich and scenic landscape with high tourism value and revenue, surrounded by valuable forests used for resin production, nomadic beekeeping and logging (mostly mature and pure *Pinus halepensis* conifer forests).
Over 90% of these wildfires are human-induced. Causes include arson, negligence, and burning of agricultural waste.

DID YOU KNOW?

The fire suppression system is mainly driven by the Ministry of Climate Crisis and Civil Protection

Investment in fire prevention has been increasing and new laws have been introduced since the devastating extreme wildfire events of Mati, Attica, in 2018 in the Athens suburbs and Evia Island in 2021, which caused at least 105 fatalities, of which 102 from the Mati fire, and economic losses.

VISUAL INSPIRATION MAP

GREECE - COMMUNITY OF WILDFIRE INNOVATION

GOVERNANCE

Greece has a complex and heavily fragmented land tenure system in terms of forest land ownership. :

74% State and other agencies
9% local government bodies & communities
7% private landowners
10% other landowners

ACTORS INVOLVED

The Greece community of wildfire innovations (CWI) integrates 38 members, divided into 5 strategic members and 26 operational ones. The CWI members are classified into five types and distributed over the categories of the 4-helix of innovation.

FIRE-RES involves 2 national partners that include research and outreach institutions (the University of the Aegean and the National Observatory of Athens), enclosing 7 representatives from these institutions.

MORE INFO

This project has received funding from the European Horizon 2020 research and innovation programme under grant agreement No 101037419

FIRE-RES

VISUAL INSPIRATION MAP

NORWAY-SWEDEN - WILDFIRE PROFILE

NORWAY-SWEDEN LIVING LAB

Reaching-up:

30°C
maximum temperature recorded in the summer

< 20%
relative humidity

LAND COVER

27% Shrubland, pastures, coastal heathland & others

23% Agriculture

50% Forest


Norway spruce (*Picea abies*)


Scots pine (*Pinus sylvestris*)


Birch tree (*Betula pendula*)

2018

25,000 HA BURNT | **35°C RECORDED**

Forest areas

In 2018, the most severe wildfire season in modern history occurred in Sweden, with several large fires and 25k ha of forest land affected, following a period of hot and dry weather conditions. Similar conditions existed in Norway at that time, but even with a record number of wildfires there, the burnt area was not comparable to the one in Sweden.

The most common causes of these fires include sparks caused by trains, forestry machinery and lightning strikes.

DID YOU KNOW?

The local Fire and Rescue Services are responsible for the fire suppression system.

Prescribed burning activities have been increasing, mainly motivated by maintaining fires as an ecologically important disturbance.

VISUAL INSPIRATION MAP

NORWAY-SWEDEN - COMMUNITY OF WILDFIRE INNOVATION

GOVERNANCE

Norway-Sweden forest ownership distribution:

77% private landowners (27% of which are managed by industrial companies or cooperatives)
23% the State and public agencies

ACTORS INVOLVED

The Norway-Sweden community of wildfire innovations (CWI) integrates 13 members, divided into 8 strategic members and 5 operational ones. The CWI members are classified into six types and distributed over the categories of the 4-helix of innovation.

FIRE-RES involves 4 partners from Norway and Sweden that include research and outreach institutions (the Norwegian Institute of Bioeconomy Research), emergency management institutions (the Midt-Hedmark Fire and Rescue; and the Service Södertörn Fire and Rescue Service), and The Norwegian Directorate for Civil Protection as public institution.

dsb Norwegian Directorate for Civil Protection

Södertörns brandförsvarsförbund

NIBIO

MORE INFO

This project has received funding from the European Horizon 2020 research and innovation programme under grant agreement No 101037419

FIRE-RES

VISUAL INSPIRATION MAP

PORTUGAL - WILDFIRE PROFILE

PORTUGUESE LIVING LAB

Reaching-up:

40°C maximum temperature recorded in the summer

< 20% relative humidity

LAND COVER

- 16% Other
- 19% Shrubland & grassland
- 26% Agriculture
- 39% Forest

26% **Eucalyptus** (*Eucalyptus globulus*)

22% **Cork oak** (*Quercus suber*)

22% **Maritime pine** (*Pinus pinaster*)

2022

110,000 HA BURNT | **47°C RECORDED**

Forest & Woodlands (54,801 ha)
Shrublands (44,114 ha)
Agriculture (11,092 ha)

In 2022, out of a universe of 17 rural fires larger than 1k ha, a single fire lasted for 14 days and burned close to 25k ha, covering 70% of the Serra da Estrela Natural Park, with relevant impacts in valuable landscapes and forests (mostly conifers, but also deciduous broadleaves).

The most common causes of these fires were intentional (arson, 28%) and negligence use of fire (19%).

DID YOU KNOW?

Civil Protection is responsible for the fire suppression system.

Investment in fire prevention has been increasing since the extreme wildfires of 2017, that caused 117 fatalities where most of the expenditure until that year (80%) was spent on suppression.

VISUAL INSPIRATION MAP

PORTUGAL - COMMUNITY OF WILDFIRE INNOVATION

GOVERNANCE

Portugal is *sui generis* in terms of forest ownership. Forests ownership distribution:

84% private landowners
14% local communities (known as "baldios")
2% the State and other agencies

ACTORS INVOLVED

The Portuguese community of wildfire innovations (CWI) integrates 91 members, divided into 44 strategic members and 47 operational ones. The CWI members are classified into six types and distributed over the categories of the 4-helix of innovation.

FIRE-RES involves 5 national partners that include research and outreach institutions (ForestWISE, ISA and INESCTEC), an emergency management institution (ANEPC) and the National School of Firefighters (ENB) as well as a third party, a Forest Owners Association (AFVS), enclosing 16 representatives from these institutions.

This project has received funding from the European Horizon 2020 research and innovation programme under grant agreement No 101037419

FIRE-RES

VISUAL INSPIRATION MAP

SARDINIA- WILDFIRE PROFILE

SARDINIA LIVING LAB

Reaching-up:

>36°C mean maximum temperature recorded in summer

< 6% relative humidity

LAND COVER

- 8% Other
- 38% Agriculture & pastures
- 28% Woodland
- 26% Forest

Holm oak (*Quercus ilex*)

Cork oak (*Quercus suber*)

Downy Oak (*Quercus pubescens*)

2022

9,545 HA BURNT | **43°C RECORDED**

Forests (1,140 ha)
Pastures (2,086 ha)
Arable land (5,265 ha)

2022 has been less tragic than 2021, which recorded the highest value of burnt area of the last 23 years, considering the sum of all burnt surfaces each year. Out of 1438 wildfire events ≥ to 1000 m², a single wildfire lasted 6 days. It burned > 12k hectares of the Montiferru historical region (Central-western part of Sardinia), with relevant impacts in valuable landscapes and forests (mostly cork oak trees, but also broadleaves).

Over 95% of these fires were caused by human activity, making anthropogenic factors the leading cause.

DID YOU KNOW?

Civil Protection, Regional Forest Guards (CFVA) and FoReSTAS are responsible for the fire suppression system.

Investment in fire prevention has been increasing since the devastating extreme wildfire events of the Montiferru historical region in 2021. Since this fire, penalties have been increasingly enforced for private individuals or institutions.

VISUAL INSPIRATION MAP

SARDINIA - COMMUNITY OF WILDFIRE INNOVATION

GOVERNANCE

Sardinia forests ownership distribution:

33% public property (regional or local communities)

66% private landowners

ACTORS INVOLVED

Sardinia's community of wildfire innovations (CWI) integrates 15 members, divided into 5 strategic members and 10 operational ones. The CWI members are classified into six types and distributed over the categories of the 4-helix of innovation.

FIRE-RES involves 3 national partners that include a public institution (FoReSTAS Agency), a scientific institution (the Italian National Research Council- Institute of BioEconomy – Sesto Fiorentino headquarters), and N.O.S. – Associazione Nucleo Operativo Soccorsi, a Third party for the Italian partner's side.

Consiglio Nazionale delle Ricerche
Istituto per la BioEconomia

MORE INFO

This project has received funding from the European Horizon 2020 research and innovation programme under grant agreement No 101037419

3. CATALOGUE OF INNOVATIVE SOLUTIONS

The "Catalogue of Innovative Solutions" (CIS) serves dual purposes (Figure 6):

I. It aims to compile relevant technological, social, and corporate innovation needs with the potential to address FIRE-RES innovation challenges in various Living Labs;

II. The CIS is being created to inspire and assist solution providers in addressing challenges identified across all Living Labs related to integrated forest management (IFM) phases.

Figure 5. Catalogue of Innovative Solution purposes connecting challenges & solutions to Integrate other solutions not covered by FIRE-RES Innovation actions.

To achieve the outlined objectives, a webinar and bilateral meetings were arranged with Living Lab (LL) leaders during T6.1.3. The purpose of these interactions was initially to spotlight the "*one best thing that works well*" in each phase of the integrated forest management, focusing on social, corporate, and technology-oriented solutions. In this sense, the primary goal of the CIS is to serve as an inspirational resource for solution providers by showcasing successful examples within each Living Lab (LL), aiming to present a diverse array of effective practices.

The second objective is to curate a comprehensive catalogue consisting of *key-challenges,* highlighting notable needs from each Living Lab. The goal is to ensure representation across all three wildfire management phases within the catalogue.

Identifying and understanding challenges: The CIS also serves as a tool to provide a valuable reference for solution providers. It offers tangible illustrations of obstacles in real Living Lab scenarios, categorized from general keywords to specific challenges. This categorization aids navigation, enabling solution providers to

pinpoint challenges aligning with their expertise. With providers contributing diverse approaches from various knowledge domains, the trust established through regular interaction manages inherent conflict and competition dynamics.

In summary, information for this global objective was collected based on the first part of the report, "Visual Inspiration Map," the outcomes of the "Challenge Design workshop" with observations from "challenge frame forms," and the individual questionnaires to build a Catalogue of innovative Solutions - overlaps & synergies.

3.1. Integrated Fire Management: New Vision

3.1.1. Social context matters

Severe wildfire seasons and fire disasters can legitimately be seen as opportunities to change fire management policies, including new or improved paradigms and reform of organizations, moving the Inertia in Suppression-Centered to Fire Management Policies under prevention actions. One-size fits all responses to wildfire and fire exclusion are still quite dominant and undermine the sustainable coexistence of humans with fire (Moritz et al. 2014). Political and social perceptions, expectations and pressures limit the options available to fire management organizations and increase their risk aversion towards sound practices that diverge from the full-suppression model (Calkin et al. 2015).

Integrated Fire Management (IFM) recognizes the need to ensure that wildfires serve a greater good than the harm they cause. By understanding the range of impacts associated with wildland fires and implementing proactive approaches, such as ecological restoration, fire prevention, and sustainable land management, IFM aims to maximize the benefits while minimizing the negative consequences of wildfires.

More open-minded, balanced, or nuanced policies are sometimes officially adopted. However, operationalization is often insufficient because of various socioeconomic, organizational, and cultural obstacles (Stephens and Ruth, 2005).

Through *collaboration among stakeholders* and the application of innovative strategies, IFM can lead to more resilient ecosystems, reduced risks to human life and property, and sustainable land management practice. Long term strategies on fire prevention (scientific research) already show how to develop this new vision (Figure 7).

The views on fire management and governance have become more comprehensive and holistic in recent years (which is incorporated in Table 1). This has been achieved mainly by balancing the positive and negative aspects of fire within multiple societal and environmental contexts and in the framework of the concept of coupled human and natural systems (Steelman 2016).

Figure 6. Integrated Forest Management Concept and its dimensions within the Fire Risk Cycle phases (Rego et al, 1998)

Operational challenges to reach that vision in the ambits of the different risk management phases: a series of actions that includes fire awareness activities, fire prevention activities, prescribed burning, resource sharing and co-ordination, fire detection, fire suppression, fire damage rehabilitation and research at local, provincial, and national levels to create a sustainable and well-balanced environment, reduce unwanted wildfire damage, and promote the beneficial use of fire.

3.2. Best Practices in wildfire risk prevention

3.2.1. Webinar with several LL leaders

Living Lab leaders identified, listed, and described any interesting or innovative practices that you would like to be highlighted on specific wildfire risk reduction practices. This included any practice related to the above themes (Figure 7), such as:

- wildfire hazard and risk assessment,
- wildfire risk communication,
- financing for wildfire management,
- structural or organizational wildfire prevention measures, or
- strengthening of resilience during post-fire recovery and rehabilitation.

In addition, any practices that highlight how lessons learned are incorporated in wildfire risk management reforms would be of interest. This can include existing

policies and practices, governance mechanisms (agencies, co-ordination mechanisms, etc.), or any relevant reforms (either proposed or implemented).

The mean question was crafted to identify current practices and ongoing discussions, aiming to spotlight *best practices across all stages of integrated forest management* (from hazard identification to emergency preparedness and response).

To accomplish this goal, In the scope of Subtask 6.1.3, a webinar and bilateral meetings with LL leaders (March /April 2023) were organized. One of the purposes of these interactions was on highlighting "*1 best thing that works well*" for each phase of integrated forest management. These solutions were categorized into social, corporate, and technology-oriented approaches.

3.2.2. Showing existing successful practices

The inputs collecting from an online VIM & CIM working session with LL leaders, employing a co-creative exercise with MIRO (Figure 8), and through bilateral meetings between LL leaders and key persons within each LL were compiled into a set of tables – *Table 2 to Table 12,* one for each LL (Section 3, pages 49 -67).

Figure 7. Key solutions per typologies: technological, societal and corporative.

Additionally, certain LL leaders contributed logos and links showcasing the most representative solutions already implemented in their respective country/region or LL area.

Across all Living Lab (LL) contributions, several effective practices emerge showcasing a commitment to sustainable wildfire management:

Value rural land: Recognition of rural land for its ecological, economic, and cultural significance, emphasizing that only valued land receives proper attention and

management. This approach fosters responsible land stewardship by encouraging investment for the benefit of present and future generations.

Integrate Traditional Fuel Management: Enhance community safety and reduce wildfire risk by incorporating traditional approaches to fuel management, safeguarding residents, and their properties. This practice safeguards residents and their properties through time-tested methods.

Community Engagement and Education: Actively promoting knowledge-sharing within communities, Living Labs integrate traditional practices related to land management and fire prevention, fostering a collaborative approach and empowering residents with valuable insights.

Behavioural Change and Efficient Risk Management: Living Labs have implemented strategies to motivate behavioral change regarding fire use and ensure efficient risk management; critical for effective wildfire prevention and mitigation.

Active Coordination Mechanisms: Maintain active coordination mechanisms involving stakeholders at all relevant scales, including local actors. This ensures effective decision-making in wildfire management through collaboration and shared responsibility.

Impact-Oriented Actions: The commitment to impact-oriented actions is evident, with a focus on seeking results for the benefit of citizens and the preservation of material, cultural, and historical heritage.

Science-Driven Policy and Planning: Living Labs base policy, strategic planning, and decisions on sound multidisciplinary scientific knowledge. This includes consideration of technological capabilities, innovation, and a revival of traditional, socio-economically solid, and environmentally benign land-use practices.

Long-Term Compromises: actively establish long-term compromises between national, regional, and local governments, agencies, and private stakeholders. This promotes the integration of complementary activities in a multifunctional landscape, ensuring sustainability in wildfire management practices.

Internationally Accepted Guidelines: contribute to the development of internationally accepted guidelines on rural fire management. This enhances cooperation between countries in emergencies, facilitates mutual assistance, and promotes the spread of good practices among adopters of such guidelines.

Table 2. Current Practices in Integrated Fire Management: Living Lab Nouvelle-Aquitaine

	1 thing related to integrated fire management that works well Nouvelle-Aquitaine LL						
	Communication strategies	Management practices	Funding	Decision support tools	Fire analysis products	Operational dynamics	Other
Corporative	Analysis of the fire situation, how it is developing and the methods for addressing the increasing risk are presented in documents for informing those people responsible for protecting the forest from fires: https://www.pompiers.fr/sites/default/files/GAYA/220915_retex_fnspf_feux_de_forets_et_despaces_naturels_2022_vf.pdf	Straightforward advice to forest owners and managers on the ways to reduce fire risk in forests. https://www.dfci-aquitaine.fr/wp-content/uploads/2017/12/DFCI-Aquitaine_Guide-bonnes-pratiques_2016.pdf There is a range of practical advice available at https://www.dfci-aquitaine.fr/documentations?cat=Gestion+forestier%C3%A8re&type=&public=&date=	There is an annual tax on all forest owners to cover the cost of the fire control system in Aquitaine: https://www.dfci-aquitaine.fr/qui-sommes-nous/fonctionnement			SDIS and COZ are responsible for raising the alarm for a fire and for organizing and ccordinating fire fighting. The organisation is responsible to the local prefecture and the local mayors. https://fr.wikipedia.org/wiki/Service_d%C3%A9partemental_d%27incendie_et_de_secours	

	1 thing related to integrated fire management that works well Nouvelle-Aquitaine LL						
	Communication strategies	Management practices	Funding	Decision support tools	Fire analysis products	Operational dynamics	Other
Technological				Fire fighters use the PROMOTHEUS fire spread model and evaluate its effectiveness after each fire: https://firegrowthmodel.ca/pages/prometheus_overview_e.html	https://meteofrance.com/meteo-des-forets - fires risk map at national level	Drones are used equipped with cameras including a thermal camera for assessing the most intense parts of a fire and for coordinating fire fighters on the ground: https://www.leparisien.fr/high-tech/nouvelle-aquitaine-ce-drone-pompier-lutte-contre-les-retours-de-feu-01-06-2018-7747380.php https://www.sudouest.fr/lot-et-garonne/pont-du-casse/les-drones-au-service-des-sapeurs-pompiers-8804263.php	

	1 thing related to integrated fire management that works well Nouvelle-Aquitaine LL						
	Communication strategies	Management practices	Funding	Decision support tools	Fire analysis products	Operational dynamics	Other
Societal	There is a range of practical advice available at https://www.dfci-aquitaine.fr/documentations?cat=Gestion+forest%C3%A8re&type=&public=&date= SMS alerts to communities https://www.gouvernement.fr/actualite/fr-alert-comment-ca-marche Speaking interactive terminal at local level : https://www.sudouest.fr/gironde/lege-cap-ferret/des-bornes-communicantes-pour-prevenir-les-incendies-de-foret-a-lege-cap-ferret-15470834.php						

Table 3. Current Practices in Integrated Fire Management: Living Lab Bulgaria

	1 thing related to integrated fire management that works well in Bulgaria LL						
	Communication strategies	Management practices	Funding	Decision support tools	Fire analysis products	Operational dynamics	Other
Corporative	Engaging a partnership on the forest fire problem - WP1	Adopting a plan for new approaches to fuel control, through controlled burning, sylvo-pastoral systems, and traditional felling - WP 2			Increasing understanding of Adaptive Management for Resilient Landscapes - WP1		
Technological		Attention to fuel in forests and vulnerable points - WP1		Development of a GIS-based information system for LL - WP2	Analysis of the situation with the problem of forest fires from different directions - prepared report - WP6		
Societal	Formation of CWI stakeholders - WP6		Engaging municipalities in creating sustainable (resilent) landscapes - WP6				

Table 4. Current Practices in Integrated Fire Management: Living Lab Catalonia

	1 thing related to integrated fire management that works well in Catalonia LL						
	Communication strategies	Management practices	Funding	Decision support tools	Fire analysis products	Operational dynamics	Other
Corporative		Prescribed fires https://interior.gencat.cat/en/arees_dactuacio/bombers/foc-forestal/programa-de-cremes-prescrites/index.html https://interior.gencat.cat/ca/serveis/informacio-geografica/bases-cartografiques/cremes-prescrites-dels-bombers/ https://analisi.transparenciacatalunya.cat/Medi-Ambient/Cremes-Prescrites-Bombers-Catalunya-1998-2015/k2qh-v6rz				Backfires https://portaljuridic.gencat.cat/ca/document-del-pjur/?documentId=405282	
Technological							
Societal							

Table 5.Current Practices in Integrated Fire Management: Living Lab Chile

	1 thing related to integrated fire management that works well in Chile LL						
	Communication strategies	Management practices	Funding	Decision support tools	Fire analysis products	Operational dynamics	Other
Corporative		Firebreaks, protection barriers. Preventive forestry.			Information produced in a regular based by institutions such as the forest service and the civil protection regarding wildfires perimeters, wildfire behaviour... Regular use by the academia to produce knowledge & innovation	Fire management departments in some key stakeholders (industry). COGRID gestión de emergencias público-privado	
Technological		Experience of cooperation between researchers and stakeholders facilitating the implementation of innovations		Fire growth simulators (Tecnosylva) and Cell2Fire+Kitral.		Platforms to simulate fire spread in real time	
Societal	Educational workshops in schools, roadside operations, door-to-door, participation in fairs. Community prevention network	Ongoing efforts for the Integration of fire and forest management practices. Some experience on Collaborative landscape management				Support to fire sappers' brigades in forest owners' association and integration with activities by other agencies	

Table 6. Current Practices in Integrated Fire Management: Living Lab Galicia

	1 thing related to integrated fire management that works well in Galicia LL						
	Communication strategies	Management practices	Funding	Decision support tools	Fire analysis products	Operational dynamics	Other
Corporative				Joint training between the inhabitants of the model village of Trelle and forest firefighters. Development of evacuation and/or confinement protocols.	Active participation of the Technical Support Unit in fire analysis.	Execution of fuel reduction works in the vicinity of the model village of Trelle.	Development of new tools to enable forest fire services to extinguish forest fires more effectively & safely.
Techno-logical					Incorporation of support tools for forest fire analysis in the Xeocode		
Societal		Neighbourhood association of the Aldea Modelo de Trelle actively participate in the training workshops given by the Forest Fire Prevention and Extinction Service of the Consellería do Medio Rural.					

Table 7.Current Practices in Integrated Fire Management: Living Lab Germany-Netherlands

	1 thing related to integrated fire management that works well in Germany-Netherlands LL						
	Communication strategies	Management practices	Funding	Decision support tools	Fire analysis products	Operational dynamics	Other
Corporative		Training course design in progress: "Integrated Living with Fire", oriented to policy making, land management, emergency services, and other fields.		Data collection and analysis of wildfires in the Netherlands is being conducted in collaboration with other partners.			Ongoing research on resilient landscapes, current wildfire statistics, education needs, and risk governance are among the topics being studied. The outputs and research papers will provide a baseline for future studies within the LL action area.
Technological							
Societal	Ongoing development and implementation of serious games as tools for research and social intervention is being conducted with the purpose of evaluating and raising wildfire societal awareness. Responding to media requests on the wildfire season.	First National stakeholder meeting on wildfires in the Netherlands, were portfolio holders and experts on wildfires from about 20 organizations participated.	Preparation of a Germany-Netherlands interregional wildfire management proposal with a range of stakeholders and societal actors.	Mapping of the main stakeholders, their resources, dynamics, and interactions in IFM within the LL action area is currently in progress and will serve as a baseline.			

Table 8.Current Practices in Integrated Fire Management: Living Lab Greece

	1 thing related to integrated fire management that works well in Greece LL						
	Communication strategies	Management practices	Funding	Decision support tools	Fire analysis products	Operational dynamics	Other
Corporative	WWF and other NGOs are in the forefront of providing information regarding nature protection, wildfire prevention and much more	Corporated and private forests belonging to cooperations are well managed for both pre-fire protection and timber retrieval. But they are small in size. Good example: Sani Beach hotel in Kassandra	Funding and corporative opportunities arise from the large demand for fuelwood and pellet in Greece. This can collaboratively fund fuel management projects (private funds, government and cooperations)	There are multiple Research and Technological companies that can provide solutions regarding early detection, GIS/RS and more	Lots of Universities and small-medium scale companies offed fire analysis services post-fire - especially those related to the forestry sector		Many skilful private companies that can work well and fast for post-fire mitigation if funding is secured.
Technological	Citizens are very active and dynamic for exchanging information (and disinformation-fake news) during the wildfire season in social media		Funding for technological solutions and research has been increased by the government since 2007 - but the outcomes are not integrated in the fire management system and remain a boutique projects	The Fire Service has a well-developed DSS system called Engage - provides fleet tracking, post-fire event registration and communication tools	Some efforts to install sensors (cameras) to various locations to overcome the lack of personnel for working fire lookout towers	A well-developed network of weather stations from National Observatory of Athens	A very large and modern fleet of aerial firefighting means

Societal	A very simple to understand fire ignition hazard index that politicians, fire managements agencies and the society are actively using and get information	Unofficial use of prescribed fires by farmers and livestock breeders - but not inside forests. Only in Agricultural lands and grasslands	Project Antinero provides adequate funding for fuel treatments for the next two fire seasons (3 in total)	The new call facility names 112 will provide early warning during a fire event and will notify citizens for evacuation. In place since 2021		Strong involvement of volunteer organizations in firefighting and logistics during fires.	A large number of young people that studied forestry related sciences can potentially contribute to improve our fire management and become the future firefighters or foresters (700 students per year)

Table 9.Current Practices in Integrated Fire Management: Living Lab Norway-Sweden

	1 thing related to integrated fire management that works well in Norway-Sweden LL						
	Communication strategies	Management practices	Funding	Decision support tools	Fire analysis products	Operational dynamics	Other
Corporative							Established system for insurance of private productive forest against wildfire (Norway). In some municipalities: Formalized agreements between fire & rescue services and forest operation companies on how to act and cooperate in the case of a fire incident.

Technological					Testing operational system for detection of lightning strikes and model likely ignition locations (Sweden). Warnings from the system go directly to the alarm central. Fire weather index: Established monitoring/modelling and communication to the public (by the national Meteorological institutes).		
Societal	Communication and information to the public on fire danger, and how to act responsible (not starting a fire).	Prescribe burning in: 1) costal heathland (Norway), and 2) selected locations in protected areas (Sweden).				Organization of volunteers or part-time fire fighters (reserve) (Norway, Sweden).	

Table 10. Current Practices in Integrated Fire Management: Living Lab Portugal

	1 thing related to integrated fire management that works well in Portugal LL						
	Communication strategies	Management practices	Funding	Decision support tools	Fire analysis products	Operational dynamics	Other
Corporative		Forest owners' associations as entities responsible for ZIFs management. Prescribed burning activities involving the forest service and the national school of firefighters & Natura 2000 areas.			Information produced in a regular based by institutions such as the forest service and the civil protection regarding wildfires perimeters, wildfire behavior,... Regular use by the academia to produce knowledge and innovation.	Fire management departments in some key stakeholders (industry, muncipalities,..)	
Technological		Alternative forest models https://alterfor-project.eu/		Decision support tools https://www.bioecosys.com/		Platforms to simulate fire spread in real time	

		Experience of cooperation between researchers and stakeholders facilitating the implementation of innovations		Fire simulators, Ecosystem simulators, management planning modules, GUI			
Societal	Ongoing development of Education and outreach platforms	Ongoing efforts for the Integration of fire and forest management practices	Some experience of development of tools to attract payments for ecosystem services crowdfunding, namely wildfire prevention https://www.bioecosys.com/ and https://nobel.boku.ac.at/			Support to fire sappers brigades in forest owners association and integration with activities by other agencies	
		Some experience on Collaborative landscape management	To support joint management planning, communication strategies			Ongoing institutional reform to enhance operational dynamics multiple scales (AGIF, ANEPC, Fre fighters forest service, municipalities,...)	

Table 11. Current Practices in Integrated Fire Management: Living Lab Sardinia

	1 thing related to integrated fire management that works well in Sardinia LL						
	Communication strategies	Management practices	Funding	Decision support tools	Fire analysis products	Operational dynamics	Other
Corporative	Networks among public and private institutions involved in IFM and related EU projects are collaborating.		Several European projects funds research and societal challenges towards fire risk culture (FIRE-RES, ResAlliance, others) communication (SILVANUS), and previsional and/or preventive activities (FIRE-RES).	Civil Protection & Scientific support of Regional and national Agencies provide products such as Maps of Fire Risk, Fuel load, weather index useful to support prevision and behaviour of possible fires.		Volunteers in firefighting. Over 7000 people involved among structured and volunteers in the Fire Suppression's Machine.	
Technological		Preventive silviculture actions, as experienced in Sardinia LLs, coupled by prescribed burning in public forests could look like a technological management practice!					A very large and modern fleet of aerial firefighting means.

		Prescribed burning practice has been integrated in Regional Fire Prevention Plan.					
Societal	Engagement of students in Fire risk educational paths. The interest of artist and filmmakers to EWE in Sardinia produced in latest two years several web documentaries on EWE topics, making raising awareness on the topic.	After the Montiferru's EWE in 2021 several people's association had birth and others funded initiative to restore and help farms damaged by fire.					

3.3. Exploring CWI Challenges

3.3.1. Challenge Design Workshop – overview

The *Challenge Design Workshops* (CDW) play a pivotal role in the FIRE-RES project, serving as locally delivered events at each Living Lab. Led by local facilitators, these workshops follow a standardized format to empower Living Lab stakeholders in developing challenges rooted in their unique contexts. The workshop's output is a structured document— *the Challenge Submission form* —which encapsulates the identified problems and needs.

In parallel, the organization of CDW with the Community of Wildfire Innovation (CWI) is undertaken to socialize *Open Innovation* and create *Challenge Frames* for the most relevant EWE-related challenges at the Living Lab level.

To ensure alignment of WP6 and WP8 objectives across different Living Labs, the CDW unfolded in two distinct parts: The first part included a keynote presentation introducing the *Open Innovation Challenge* (OIC), the workshop structure, and essential information. In the second part, the workshop dynamic harnessed the knowledge and expertise of participants through exercises and frameworks, refining challenges to specifically address identified problems and needs. To assist participants, a *Challenge Design Workshop Workbook*, containing details, support documents, and frameworks, was provided (Figure 8.) These workshops have proven instrumental in shaping meaningful challenges that align with the unique realities of each Living Lab.

Figure 8. Challenge Design Workshop (CDW) support documents: Workbook Challenge Design Workshop, Challenge Tree and challenge frame.

3.3.2. Living Labs Challenge Owners

The CDW serves as a comprehensive mechanism for collecting, analyzing, and evaluating the contributions of the Living Labs (LLs) as outputs. Its methodologies are tailored to the context of each LL, concentrating on provided challenge descriptions and reflecting CWI members' opinions. Subsequently, the CDW generates challenge proposals from multiple Living Labs, *encompassing the desired outcomes, needs, and Wishlist* identified within the scope of subtask 6.1.2.

These challenges are intricately linked to the wildfire context, providing a thorough understanding of the specific issues faced within each LL. The contextualization extends to stakeholder involvement, highlighting key participants, their roles, and contributions, as detailed in the Factsheet#1 &#2 section.

Moreover, LL leaders expressed their perspectives, capturing their voices on needs and gaps through the *Challenge frame forms* (ST6.1.2), offering a channel to receive primary wildfire-related challenges from each Living Lab. It serves to receive the primary wildfire-related challenges from each Living Lab. WP6 team subsequently translated the innovation needs discerned from the Living Labs into *challenges for the OIC*. Despite considerable overlaps in innovation needs, variations in scope and formulation emerged across the different Living Labs.

3.3.3. Collection of Challenge Proposals

All Living Labs were invited to organise Challenge Design Workshops locally to identify and generate challenges relevant to their community. This process resulted in the production of *50 Challenge Proposals* (Figure 9), categorized across the three phases of EWE management (see Figure 10). Most of these challenges, addressing crucial needs, are focus on *prevention & preparedness (44%)*, with the remaining solutions required for the response and restoration phases distributed at 29% and 27%, respectively.

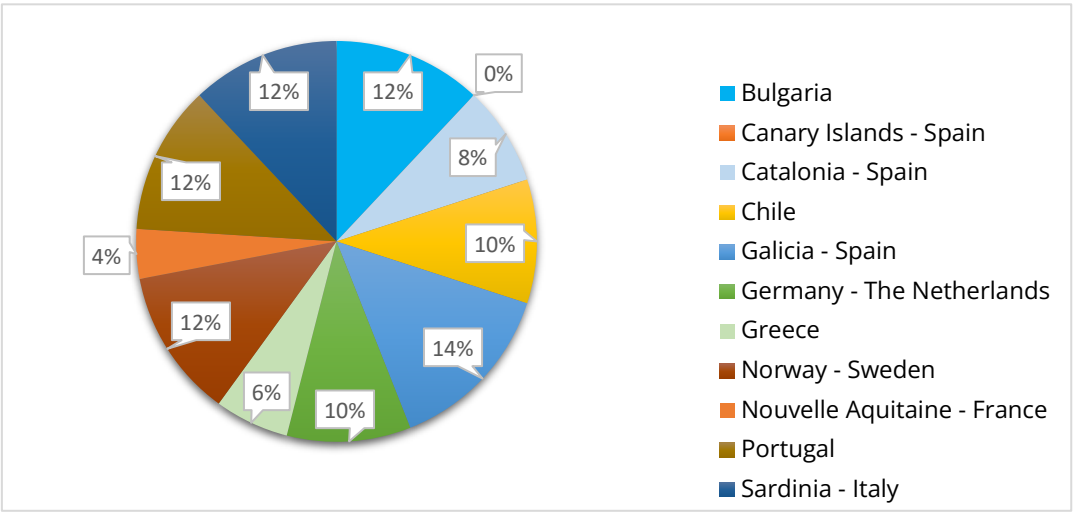

Figure 9. Contribution of challenges addressed by Living Labs

The original translated Challenge content is compiled in D6.2 Annexes for consultation, specifically *Annex II. Submitted Challenges Frame Forms – CDW* (pages 128 -234).

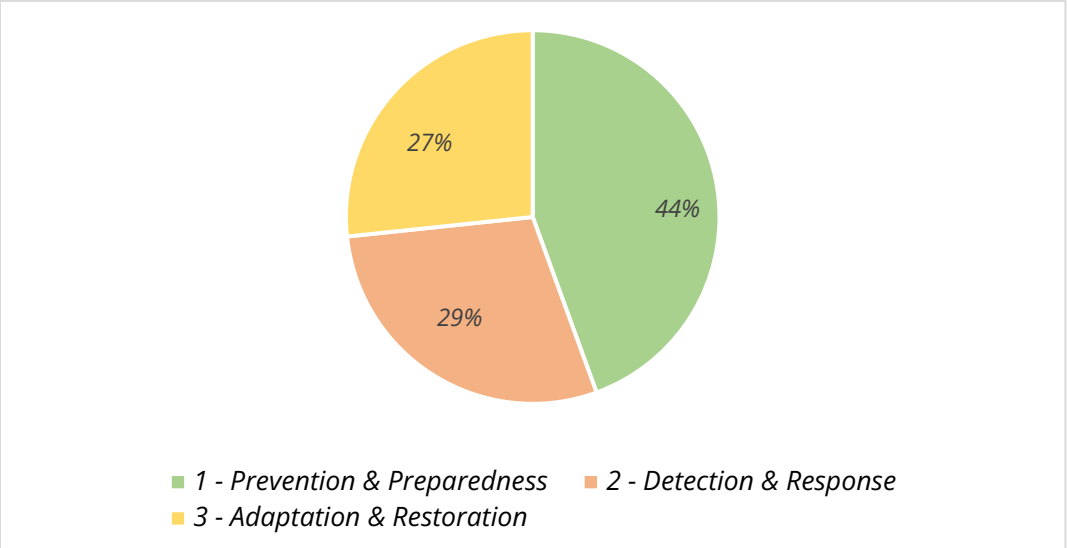

Figure 10. Distribution of the proposed challenges according to the Fire Management Phases.

Analysis of the 50 challenges led to their *categorization into 7 themes and 17 specific challenges*. These have been made available online to contribute to the Open Innovation Campaign (OIC) for Seeking Innovative Solutions for Extreme Wildfires. Explore them at: https://fire-res.eu/open-innovation-challenge/

3.4. Unique personal surveys – LL Voices

The survey was developed as part of the ongoing Challenge task on "missing practices, persisting challenges and gaps". It supports the development of a *Wishlist of Living Labs* to evaluate the extent to which LL/region/countries' current wildfire management arrangements are fit for the challenges posed on wildfire risk.

The questions were designed to:

- ✓ Facilitate a quick review of the challenges contents;
- ✓ Support detailed analysis of the challenges faced by Living Labs in managing wildfires effectively;
- ✓ Generation of keywords – "*Key-Challenges*" extracting the key terms and phrases that succinctly represent the significant challenges providing clarity in communication and documentation;
- ✓ Identification of common themes among the challenges, allowing for a comprehensive understanding of overarching issues

In essence, the questionnaire serves as a valuable tool for systematically exploring, categorizing, and deriving insights from the challenges intrinsic to wildfire management across different Living Lab contexts. This crucial information has been documented in the D6.2 report, forming an integral part of the D6.2 Annexes. Specifically, the comprehensive results stemming from an online personal survey, validated by each Living Lab leader, are presented in *Annex III: Unique Personnel Survey – Challenges List* (pages 240-249).

The survey is structured in two parts: the first one provides an overview of the enabling environment integrative forest management towards resilient landscapes, whereas the second part focuses on identifying specific innovative practices that can serve as an inspiration for other countries.

The survey aimed at LL leaders to validate our effort in classifying the original challenges (*Annex II. Submitted Challenges Frame Forms – CDW* - pages 24 -136). This process involved a transition from general keywords to specific challenges organized by "*objectives*" at the 1st level, "*actions*" facilitating the achievement of objectives at the 2nd level and "*beneficiary agents*" at the 3rd level, for each of the Integrated Fire Management (IFM) phases, as outlined in the information provided in D6.2 Annexes - *Annex IV. Key needs and solutions per IFM Phases & typologies* (pages 250 -258).

The *three-step Challenges approach classification* was crucial in enabling solution providers to navigate effectively through the Catalogue of Innovative Solutions tool. This allows them to identify specific challenges aligned with their solutions, streamlining the proposal of potential solutions for submission in the OIC (ST6.2.1).

The mind maps in the following Factsheet#3 provides a consolidated overview of the components of IFM (*Grand challenges*) and a common framework for discussing and organising efforts around IFM challenges/priorities towards resilient landscapes in 2030.

The outcomes not only contribute to the OIC campaign but will also be published online, offering valuable support for the broader community engaged in integrated fire management.

3.5. Factsheet 3: Living Lab Challenges

Challenges towards wildfire resilient landscapes - The Factsheet#3 provides an overview of IFM, its key principles, and the benefits it offers in terms of reducing fire damage and maintaining cost-effective wildland fire programs. These key lessons contribute to building more resilient communities and ecosystems in the face of wildfire challenges. A particular emphasis and orientation of the structured "*challenges LL voices*" proposed lies on objectives, actions (i.e measures that can be taken to accomplish the objectives) and beneficiary actors.

The outcomes of D6.2 are uploaded on the official FIRE-RES website to provide broader visibility. The 3rd Factsheet emphasizes Living Lab voices, wishlist, and challenges, aiming for a direct connection to the relevant section of the OIC page

https://fire-res.eu/open-innovation-challenge/the-challenges/ . This aligns with the principle that a complementary description of each LL's specificities, challenges, and wishes could assist OIC applicants in better understanding how their solutions align with the actual needs of the LLs.

Nouvelle-Aquitaine

https://fire-res.eu/wp-content/uploads/2023/10/France-challenges-and-wishlist.pdf

Bulgaria

https://fire-res.eu/wp-content/uploads/2023/10/Bulgaria-Challenges-and-wishlist.pdf

Catalonia

https://fire-res.eu/wp-content/uploads/2023/10/Catalonia-Challenges-and-wishlist.pdf

Chile

https://fire-res.eu/wp-content/uploads/2023/10/Chile-challenges-and-wishlist.pdf

Galicia

https://fire-res.eu/wp-content/uploads/2023/10/Galicia-challenges-and-wishlist.pdf

Germany- The Netherlands

https://fire-res.eu/wp-content/uploads/2023/10/Germany-The-Netherlands-Challenges-and-wishlist.pdf

Greece

https://fire-res.eu/wp-content/uploads/2023/10/Germany-The-Netherlands-Challenges-and-wishlist.pdf

Norway-Sweden

https://fire-res.eu/wp-content/uploads/2023/10/Norway-Sweden-challenges-and-wishlist.pdf

Portugal

https://fire-res.eu/wp-content/uploads/2023/10/Portugal-Challenges-and-wishlist.pdf

Sardinia https://fire-res.eu/wp-content/uploads/2023/10/Sardinia-challenges-and-wishlist.pdf

FIRE-RES

LIVING LAB CHALLENGES
NOUVELLE-AQUITAINE

INTEGRATED CHALLENGES STRATEGY

Integrated Fire Management (IFM) seeks to harness the ecological benefits of wildfires while minimising the damage they can cause to communities, infrastructure, and natural resources.

The views on fire management and governance have evolved towards a more comprehensive and holistic approach. As a result, IFM integrates the entire fire cycle and its different components of 1) Prevention & Preparedness; 2) Detection & Response; 3) Adaptation & Restoration.

Through collaboration among stakeholders and adopting a proactive approach and innovative strategies, IFM can lead to long-term resilient ecosystems, reduced risks to human life and property, and sustainable land management practice.

LIVING LAB VOICES - WISHLIST

Mobilise resources for effective action
- WUI assessment and management
- Reduce fuel loads and ignition risk at the WUI

Risk communication and awareness
- An efficient and up-to-date tool informing citizens of daily fire risk
- Communicating daily risks to tourists and floating population

Collaborative and participatory approaches in wildfire risk management
- Innovative tools to enforce fuel reduction at WUI and around other infrastructure

WHAT NEEDS TO BE OVERCOME?

CHALLENGES

	OBJECTIVES	ACTIONS	BENEFICIARIES
Prevention & preparedness	Ensure proper application	Legal fuel treatments	Owners (Private & public)
	Reduce fuel biomass inside WUI	Enhance risk perception	Urban & rural communities
Detection & response	Efficient & up-to-date tool	Communication strategies	Society
	Enhance fire risk culture	Communication strategies	Society

This project has received funding from the European Horizon 2020 research and innovation programme under grant agreement No 101037419

FIRE-RES

LIVING LAB CHALLENGES
BULGARIA

INTEGRATED CHALLENGES STRATEGY

Integrated Fire Management (IFM) seeks to harness the ecological benefits of wildfires while minimising the damage they can cause to communities, infrastructure, and natural resources.

The views on fire management and governance have evolved towards a more comprehensive and holistic approach, recognizing that it requires a multifaceted strategy linking the entire fire cycle and its components:

1) Prevention & Preparedness; 2) Detection & Response; 3) Adaptation & Restoration.

LIVING LAB VOICES - WISHLIST

Training and education for targeted stakeholders

- Training in the use of fire behaviour models and modern equipment
- Capacity building for targeted stakeholders (policy makers and media)
- Improved knowledge transfer across countries

Understanding the risk

- Efficient fuel management and effective treatments & identification of vulnerable areas

Empowering action at community at landscape levels

- Increase prevention capacities in remote rural areas
- Empowering stakeholders (municipalities) for resilient landscapes

Risk communication and awareness

- Approaches, methods and tools to insert wildfire risk education in schools

WHAT NEEDS TO BE OVERCOME?

	OBJECTIVES	ACTIONS	BENEFICIARIES
Prevention & preparedness	Address wildfire risk	Approaches & tools improvement	Society
	Construction of resilience landscapes	International transferring knowledge	Society
	Fire protection equipment	European/national funding	Fire end users
	Sustainable management planning	Municipality landscape GIS systems	Decision makers | Fire end users
	Improve risk areas accessibility	Planning fund/invests	All the actors
	Institutions' rights/obligations	New regulations	Decision makers
	Updated GIS platforms	Municipality training	Decision makers
	Risk awareness	Educational activities/campaign	Society
	Constant fire season assessment	Design a monitoring system	All the actors

FIRE-RES

LIVING LAB CHALLENGES
BULGARIA

INTEGRATED CHALLENGES STRATEGY

Through collaboration among stakeholders and adopting a proactive approach and innovative strategies, IFM can lead to long-term resilient ecosystems, reduced risks to human life and property, and sustainable land management practice. These key principles contribute to building more resilient communities and ecosystems in the face of wildfire challenges.

LIVING LAB VOICES - WISHLIST

Safe and improved early attack and suppression

- Integral support for Voluntary Fire brigades
- Increase response capacities in remote rural areas
- Approaches and tools to assess and manage the risk posed by rural and urban infrastructures

WHAT NEEDS TO BE OVERCOME?

	OBJECTIVES	ACTIONS	BENEFICIARIES
Detection & response	Innovative technical equipment	Informative & permanent campaign	All the actors
	Services/equipment during fire season	Risk assessment framework	Fire end users
	Improved first attack	Monitoring forecasting modelling	Decision makers | Fire end users
	Expert training	Streamlined system	Fire end users
	Fire risk monitoring & management	Improve digital technologies	Decision makers | Fire end users
	Integral support & motivation	Creation of municipality fire brigades	Fire end users
	Increase prevention & response	Rights/responsibility of stakeholder	Society

FIRE-RES

LIVING LAB CHALLENGES
BULGARIA

INTEGRATED CHALLENGES STRATEGY

Mapping the stakeholders involved in IFM helps identify their interests, roles, and potential contributions to wildfire management efforts. However, it should be complemented by a comprehensive approach that includes adequate resources for fire agencies, advanced technology for fire detection and suppression, research on fire behaviour and ecology. Also, collaboration between stakeholders, including government agencies, communities, and environmental organisations.

LIVING LAB VOICES - WISHLIST

Smarter post-fire restoration and recovery

- Integrated Fire Management: embedding long-term resilience if post-fire management
- Information systems for compiling information on restoration actions

Risk communication and awareness

- Risk communication to the general public to gain support

WHAT NEEDS TO BE OVERCOME?

	OBJECTIVES	ACTIONS	BENEFICIARIES
Restoration & adaptation	Monitoring & reporting funds	System to compile restoration efforts	All the actors
	Long term resilience in post-fire actions	Integrated fire management	All the actors
	Empowering stakeholders for resilient landscapes	Municipality regulatory framework changes	Decision makers
	Capacity building for targeted stakeholders	National/international funded projects	Policy makers and media
	Risk awareness education actions	Approaches methods & tools	Children's audience
	Improve field personnel skills	Certified training	Rural communities

CHALLENGES

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FIRE-RES

LIVING LAB CHALLENGES
CATALONIA

INTEGRATED CHALLENGES STRATEGY

Integrated Fire Management (IFM) seeks to harness the ecological benefits of wildfires while minimising the damage they can cause to communities, infrastructure, and natural resources.

The views on fire management and governance have evolved towards a more comprehensive and holistic approach. As a result, IFM integrates the entire fire cycle and its different components of 1) Prevention & Preparedness; 2) Detection & Response; 3) Adaptation & Restoration.

Through collaboration among stakeholders and adopting a proactive approach and innovative strategies, IFM can lead to long-term resilient ecosystems, reduced risks to human life and property, and sustainable land management practice.

LIVING LAB VOICES - WISHLIST

Mobilise resources for effective action
- Efficient forest fuel management and effective treatments
- Approaches and decision support tools to identify priority areas for fuel management
- Business models and revenue streams for fuel management

Coherent multiactor wildfire governance
- Realtime and update data and information exchange platform
- Multiactor collaboration (via platforms)
- Wildfire information sharing platform for prevention, response and restoration

Understanding the risk
- Tools for improved risk assessment & decision support tools fuel management
- Fire behavior modelling of Extreme Wildfire Events

WHAT NEEDS TO BE OVERCOME?

FIRE-RES

LIVING LAB CHALLENGES
CATALONIA

INTEGRATED CHALLENGES STRATEGY

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These key principles contribute to building more resilient communities and ecosystems in the face of wildfire challenges.

LIVING LAB VOICES - WISHLIST

Integrated forest management towards EWEs' firefighter safety

- Decision support tools for Response & Efficient and secure Incident Management

Smarter post-fire restoration and recovery

- Tools for Knowledge-Based Decision Making in restoration
- Integrated Fire Management: embedding long-term resilience if post-fire management

Education and awareness for targeted stakeholders

- Risk communication and education for rural and urban communities

	OBJECTIVES	ACTIONS	BENEFICIARIES
Detection & response	Predicting fire evolution	Technological improvement	Fire fighters
	Facilitate decision-making	Technological improvement	Fire fighters
	Wildfire monitoring	Effective tools	Fire end users
	Awareness and education	Communication strategies	Urban and rural communities
Restoration & adaptation	Increase landscape resilience	Decision support tool upgrade	All the actors
	Socio-economic and ecological planning	Decision support tool upgrade	All the actors
	Improve response capacity	Decision support tool upgrade	All the actors

CHALLENGES

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FIRE-RES

LIVING LAB CHALLENGES
CHILE

INTEGRATED CHALLENGES STRATEGY

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LIVING LAB VOICES - WISHLIST

Coherent multiactor wildfire Governance

- Prevention policies and Multiactor collaboration (via platforms)
- Benefits of preventive measures sharing via platform
- Overview of wildfire management strategies and update policies

Education and awareness for targeted stakeholders

- Risk communication strategies and education campaigns
- Educational awareness for the public
- Capacity building for targeted stakeholders (policy makers and media)

WHAT NEEDS TO BE OVERCOME?

FIRE-RES

LIVING LAB CHALLENGES
CHILE

INTEGRATED CHALLENGES STRATEGY

Through collaboration among stakeholders and adopting a proactive approach and innovative strategies, IFM can lead to long-term resilient ecosystems, reduced risks to human life and property, and sustainable land management practice. These key principles contribute to building more resilient communities and ecosystems in the face of wildfire challenges.

LIVING LAB VOICES - WISHLIST

Mobilise resources for effective action

- Legal forest fuel management and effective treatments
- Approaches and decision support tools to public and private active management

Safe and improved early attack and suppression

- Decision support tools for response
- Efficient protection structure and incident management

WHAT NEEDS TO BE OVERCOME?

	OBJECTIVES	ACTIONS	BENEFICIARIES
Detection & response	Prevention measures implemented	Management at a landscape scale	All the actors
	Public-private active forest management	Legal management guidelines	All the actors
	Efficient protection structure	Efficient and low-cost machinery	Private SME owners
	Unified planning & technical fire analysis	Strategic & tactical command	Decision makers
	Forest fire management in accordance with Disaster Risk Management	Improve public policies	Decision makers
	National Plan for Prevention and Control of Forest Fires	Policies laws establishments	Decision makers

FIRE-RES

LIVING LAB CHALLENGES
CHILE

INTEGRATED CHALLENGES STRATEGY

Mapping the stakeholders involved in IFM helps identify their interests, roles, and potential contributions to wildfire management efforts. However, it should be complemented by a comprehensive approach that includes adequate resources for fire agencies, advanced technology for fire detection and suppression, research on fire behaviour and ecology. Also, collaboration between stakeholders, including government agencies, communities, and environmental organisations.

LIVING LAB VOICES - WISHLIST

Smarter post-fire restoration and recovery

- Tools for functional decision making restoration
- Strategic Fire Planning: embedding executive restoration plans

WHAT NEEDS TO BE OVERCOME?

	OBJECTIVES	ACTIONS	BENEFICIARIES
Restoration & adaptation	Functional decision-making restoration	Ecosystem knowledge & scientific information	All the actors
	Strategic fire planning	Detailed administrative plans	All the actors
	Execute restoration plans	Stable financing	Decision makers

CHALLENGES

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FIRE-RES

LIVING LAB CHALLENGES
GALICIA

INTEGRATED CHALLENGES STRATEGY

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LIVING LAB VOICES - WISHLIST

Mobilise resources for effective action

- Training for technical fire in extreme real live conditions
- Training for response to infrequent extreme wildfire events in real-time conditions

Understanding the risk

- Tools for improved risk assessment

WHAT NEEDS TO BE OVERCOME?

OBJECTIVES	ACTIONS	BENEFICIARIES
Prevention & preparedness	Technical fire training & certification	Funding	Fire end users
	Safety rural/urban interface environment	Creation of scenarios for training/real simulation	Fire end users
	Testing equipment/ training in a real environment	Pre-designed fuel plots	Fire end users
	Properly fire management	Effective regulations & sanctions	Landowners

FIRE-RES

LIVING LAB CHALLENGES
GALICIA

INTEGRATED CHALLENGES STRATEGY

Through collaboration among stakeholders and adopting a proactive approach and innovative strategies, IFM can lead to long-term resilient ecosystems, reduced risks to human life and property, and sustainable land management practice. These key principles contribute to building more resilient communities and ecosystems in the face of wildfire challenges.

LIVING LAB VOICES - WISHLIST

Safe and improved early attack and suppression

- Decision support tools for response
- Efficient and secure incident management
- Increase the safety, efficiency and operational awareness of forest firefighters during emergencies
- Safe and efficient night suppression

WHAT NEEDS TO BE OVERCOME?

	OBJECTIVES	ACTIONS	BENEFICIARIES
Detection & response	New generation of Personal Protective Equipment	Design a new tool (smart glasses)	Fire end users
	Safety of the operatives	Integrate photoluminescence into hoses	Fire end users
	Avoid material losses	Integrate photoluminescence into hoses	Fire end users
	Optimise the water in fire-engines	Built-in water-cooling system (4°C)	Fire end users

FIRE-RES

LIVING LAB CHALLENGES
GALICIA

INTEGRATED CHALLENGES STRATEGY

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LIVING LAB VOICES - WISHLIST

Smarter post-fire restoration and recovery

- Methods and tools to assess and address post-fire hydrological risks
- Real time forecast of post-fire hydrological risk
- Handheld or remote sensors to assess wildfire severity, related risks and restoration needs
- New solutions to determine post-fire restoration priorities

WHAT NEEDS TO BE OVERCOME?

OBJECTIVES	ACTIONS	BENEFICIARIES
Restoration & adaptation		
Implement erosion awareness system	Reliable data methods/models	Post-fire teams
Assessment of field-fire severity	Improvement of sensors	Post-fire teams
Runoff & flood awareness	Dynamic forecasting system	Post-fire teams

CHALLENGES

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FIRE-RES

LIVING LAB CHALLENGES
GERMANY-THE NETHERLANDS

INTEGRATED CHALLENGES STRATEGY

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LIVING LAB VOICES - WISHLIST

WUI monitoring and management
- Risk assessment and management at the WUI & Risk communication at the WUI

Coherent multiactor wildfire governance
- Overview of wildfire management strategies and policies in Natura 2000 areas
- Training for: targeted stakeholders; IFM; prescribed burning and technical fire

Risk Communication and awareness
- Science society interface for awareness for the public & participatory risk assessment
- Innovative tools for awareness raising as serious games
- Collaborative & participatory approaches in risk communication
- Tools and approaches for co-creation of risk communication strategies

WHAT NEEDS TO BE OVERCOME?

CHALLENGES	OBJECTIVES	ACTIONS	BENEFICIARIES
Prevention & preparedness	Public participatory engagement	Game-based learning approach	Society
	Nature-fire risk awareness	Risk communication approach	Society
	Multilayer safety system	National action plan	Society
	Nature-fire risk culture	Risk communication approach	Homeowners
	WUI assessment / management	Implement WUI tools	Homeowners
	Societal awareness	Risk communication strategies	Society
	Enhance specialized IFM knowledge	Wildfire management training	All the actors
	Wildfire management strategies	New wildfire regulations/policies	Decision makers

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FIRE-RES

LIVING LAB CHALLENGES
GREECE

INTEGRATED CHALLENGES STRATEGY

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LIVING LAB VOICES - WISHLIST

Understanding the risk
- Efficient forest fuel management and effective treatments
- Tools for improved risk assessment

Mobilise resources for effective action
- Tools to design, maintain, construct, finance and monitor forest roads
- Improve assessment for ignitions

WHAT NEEDS TO BE OVERCOME?

	OBJECTIVES	ACTIONS	BENEFICIARIES
Prevention & preparedness	Forest road management actions	Accurate forest network database	Fire end users
	Effective fuel management measures	Information campaigns	Stakeholders and society
	Annual fire prevention plans	Forestry crews creation	All the actors
	Awareness and education	Programs/strategies development	Society
	Fuel and management cost reduction	Agroforestry practices enhancement	Rural communities
	Electricity network cleaning	Development of programs	Rural communities
	Prescribed burning implementation	Legislative regulation	Decision makers

FIRE-RES

LIVING LAB CHALLENGES
GREECE

INTEGRATED CHALLENGES STRATEGY

Through collaboration among stakeholders and adopting a proactive approach and innovative strategies, IFM can lead to long-term resilient ecosystems, reduced risks to human life and property, and sustainable land management practice. These key principles contribute to building more resilient communities and ecosystems in the face of wildfire challenges.

LIVING LAB VOICES - WISHLIST

Safe and improved early attack and suppression

- Guaranty accessibility for initial attack
- Training for initial attack
- Decision support tools for early attack

WHAT NEEDS TO BE OVERCOME?

	OBJECTIVES	ACTIONS	BENEFICIARIES
Detection & response	Online and Real-time cartographic	Fire front tools upgrade	Fire end users
	Up-to-date a meteorological station	Fire station improvement	Decision makers
	Network of meteorological stations	Greek operational system connection	Fire end users
	Enhance knowledge/ skills	New technologies training	Fire end users
	Increase suppression efficiencies	Development of systematised methodologies	Fire end users
	Accurate spatial fire indices	Greek operational system linkage	Fire end users

FIRE-RES

LIVING LAB CHALLENGES
GREECE

INTEGRATED CHALLENGES STRATEGY

Mapping the stakeholders involved in IFM helps identify their interests, roles, and potential contributions to wildfire management efforts. However, it should be complemented by a comprehensive approach that includes adequate resources for fire agencies, advanced technology for fire detection and suppression, research on fire behaviour and ecology. Also, collaboration between stakeholders, including government agencies, communities, and environmental organisations.

LIVING LAB VOICES - WISHLIST

Smarter post-fire restoration and recovery

- New solutions to determine post-fire restoration priorities
- Integrated Fire Management: embedding long-term resilience if post-fire management
- Decision support tools for "smart" forest fire restoration
- Empowering and supporting civil society post-fire restoration efforts
- Long-term monitoring of restored areas
- Methods and tools to assess and address post-fire hydrological risks

WHAT NEEDS TO BE OVERCOME?

	OBJECTIVES	ACTIONS	BENEFICIARIES
Restoration & adaptation	Monitoring fire and ecological effects	Technological improvement	All the actors
	Measures/practices improvement	Financial support	Actors impacted by wildfires
	Erosion and flood protection	Silvicultural pos-fire adaptations	All the actors
	Reforestations in WUI areas	Silvicultural pos-fire instructions	All the actors
	Fire smart urban planning	Fire-resilient protocol	Urban and rural communities
	Fire severity common protocol	EFFIS linkage	Decision makers

CHALLENGES

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FIRE-RES

LIVING LAB CHALLENGES
NORWAY-SWEDEN

INTEGRATED CHALLENGES STRATEGY

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LIVING LAB VOICES - WISHLIST

Coherent multiactor wildfire governance
- National wildfire dialogue & aligning visions across stakeholders
- Full government ownership (cross department collaboration)

Mobilise resources for effective action
- Training for response & strategies for prevention of EWE in Nordic countries

Training and education for targeted stakeholders
- Capacity building for targeted stakeholders (policy makers and media)
- A mechanism for cross national knowledge sharing

WHAT NEEDS TO BE OVERCOME?

	OBJECTIVES	ACTIONS	BENEFICIARIES
Prevention & preparedness	Reduce the WF risk	Safety culture improvement	All the actors
	Continuous identification of risks	Mutual training platform	Aviation industry
	Risk awareness	Mutual training platform	Stakeholders
	Public health & safety	Legal and economic actions	All the actors
	WF risk assessment	Legal and economic actions	Decision makers
	Secure assets & infrastructure	Legal and economic actions	Society
	Update/coupling vegetation & weather data	Unique platform database	All the actors
	Wildfire risk alert	Fire severity/behaviour assessment	Fire end users
	Dissemination of new behaviours/practices	Communication strategies	Society

FIRE-RES

LIVING LAB CHALLENGES
NORWAY-SWEDEN

INTEGRATED CHALLENGES STRATEGY

Through collaboration among stakeholders and adopting a proactive approach and innovative strategies, IFM can lead to long-term resilient ecosystems, reduced risks to human life and property, and sustainable land management practice. These key principles contribute to building more resilient communities and ecosystems in the face of wildfire challenges.

LIVING LAB VOICES - WISHLIST

Mobilise resources for effective action

- Establishment and implementation of a mutual training platform for stakeholders for EWE suppression

Safe and improved early attack and suppression

- Increase the safety, efficiency, and operational awareness of Forest Firefighters during emergencies
- Training for response

WHAT NEEDS TO BE OVERCOME?

FIRE-RES

LIVING LAB CHALLENGES
NORWAY-SWEDEN

INTEGRATED CHALLENGES STRATEGY

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LIVING LAB VOICES - WISHLIST

Smarter post-fire restoration and recovery

- Overview of plans and frameworks to deal with type 3 wildfires
- Capacity building for targeted stakeholders (policy makers and media)
- National wildfire dialogue

WHAT NEEDS TO BE OVERCOME?

OBJECTIVES	ACTIONS	BENEFICIARIES
Restoration & adaptation		
Exchange knowledge/plans & regulations	Benchmarking country analysis	Decision makers | Fire end users
Creation strategic & tactical plans	Financial incentives	Decision makers | Fire end users
Local-level understanding	Coorporate decision making	All the actors
Wildfire types assessment	Define criteria for wildfires types	Decision makers | Fire end users

CHALLENGES

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FIRE-RES

LIVING LAB CHALLENGES
PORTUGAL

INTEGRATED CHALLENGES STRATEGY

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Through collaboration among stakeholders and adopting a proactive approach and innovative strategies, IFM can lead to long-term resilient ecosystems, reduced risks to human life and property, and sustainable land management practice.

LIVING LAB VOICES - WISHLIST

Mobilise resources for effective action
- New funding mechanism for vegetation management in depopulated areas
- Financing wildfire prevention

Empowering action at community and landscape levels
- Reversing land abandonment through socioeconomic activation
- Empowering stakeholders in resilient landscapes

Coherent multiactor wildfire governance
- Overcoming land fragmentation for resilient landscapes
- Vegetation (fuel) management at landscape level in fragmented ownerships

WHAT NEEDS TO BE OVERCOME?

	OBJECTIVES	ACTIONS	BENEFICIARIES
Prevention & preparedness	Increase Investment	Effective technical & economic model	Public
	Attract Investment	Forest properties policies	Private owners
	Best practices	Communication strategies	Private owners
	Fuel management awareness	Communication strategies	Society
	Prescribed burnings acceptance	Communication strategies	Rural communities
	Involvement 4-helix	Communication strategies	All the actors
	Property appreciation	Policy investment return	Property owners
	Resilient territory	Management at a landscape scale	All the actors
	Production of ecosystem goods/services	Efficient mechanism	Property owners

FIRE-RES

LIVING LAB CHALLENGES
PORTUGAL

INTEGRATED CHALLENGES STRATEGY

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These key principles contribute to building more resilient communities and ecosystems in the face of wildfire challenges.

LIVING LAB VOICES - WISHLIST

Understanding the risk
- Monitoring, forecast and modelling for decision support
- Collection of real-time data for improve modelling of extreme wildfire behaviour

Safe and improved early attack and suppression
- Modelling of fire behaviour of extreme wildfire events

Smarter post-fire restoration and recovery
- Scaling up restoration efforts in rural areas

	OBJECTIVES	ACTIONS	BENEFICIARIES
Detection & response	Realistic fire behavior	Software improvement	Fire end users
	Real-time fire evolution	Software improvement	Fire end users
	Improve communication	Communication strategies	All the actors
Restoration & adaptation	Control invasive plants	Post-fire actions	Multidisciplinary team
	Enhance skills	Certified training	Post-fire teams
	Ecosystem services profitability	Increase certification	Forest actors
	Ecosystem services value	Market services	Forest actors
	Development rural territories	Bio-businesses creation	Urban and rural communities
	Attract people to rural territories	Socio economically viable	Urban and rural communities

CHALLENGES

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FIRE-RES

LIVING LAB CHALLENGES
SARDINIA

INTEGRATED CHALLENGES STRATEGY

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Through collaboration among stakeholders and adopting a proactive approach and innovative strategies, IFM can lead to long-term resilient ecosystems, reduced risks to human life and property, and sustainable land management practice.

LIVING LAB VOICES - WISHLIST

Collaborative and participatory approaches in wildfire risk management
- Multiactor collaboration through platforms
- Toolkit for embedding wildfire risk in land planning

Coherent multiactor wildfire governance
- Full government ownership (cross department collaboration)

Risk communication and awareness
- Risk communication for policy makers

Mobilise resources for effective action
- Reversing land abandonment through socio-economic activation

WHAT NEEDS TO BE OVERCOME?

Monte Arci -Usellus

	OBJECTIVES	ACTIONS	BENEFICIARIES
Prevention & preparedness	Successful practices	Communication/ dissemination strategies	All the actors
	Active forest management	Local/regional funding measures	All the actors
	Multifunctional farming	Bioeconomic improvement	Rural communities
	Knowledge/expertise in the firefighting sector	Training new generation	Fire end users

FIRE-RES

LIVING LAB CHALLENGES
SARDINIA

INTEGRATED CHALLENGES STRATEGY

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These key principles contribute to building more resilient communities and ecosystems in the face of wildfire challenges.

LIVING LAB VOICES - WISHLIST

Understanding the risk
- Tools to asses risk in Natura 2000 network

Safe and improved early attack and suppression
- Training for response & new funding mechanims for post fire resilient restoration

Smarter post-fire restoration and recovery
- Integrated Fire Management: embedding long term resilience if post-fire management
- Decision support tools for "smart" forest fire restoration

Monte Arci -Usellus

	OBJECTIVES	ACTIONS	BENEFICIARIES
Detection & response	Environmental education projects	Finding financial resources	All the actors
	Firefighters adequate training	Increase financial resources	Fire end users
	Appropriated equipment	Increase financial resources	Fire end users
	Benchmarking experts' group	Define training contents	Fire end users
Restoration & adaptation	Functional restoration	Increase multifunctionality of activities	All the actors
	Update forest sector rules	Detailed administrative plans	All the actors
	Sustainable forest planning	Multi-disciplinary working group	All the actors
	Promote active citizenship	Participatory approaches	All the actors
	Restoring & recovering action	Local financial instruments	All the actors

CHALLENGES

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FIRE-RES

LIVING LAB CHALLENGES
SARDINIA

INTEGRATED CHALLENGES STRATEGY

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Through collaboration among stakeholders and the application of proactive approaches and innovative strategies, IFM can lead to more and long-term resilient ecosystems, reduced risks to human life and property, and sustainable land management practice.

LIVING LAB VOICES - WISHLIST

Collaborative and Participatory approaches in wildfire risk management
- Multiactor collaboration through platforms
- Toolkit for embedding wildfire risk in land planning

Coherent multiactor wildfire Governance
- Full government ownership (Cross department collaboration)

Risk Communication and awareness
- Risk communication for policy makers

WHAT NEEDS TO BE OVERCOME?

Porto Conte-Alghero

	OBJECTIVES	ACTIONS	BENEFICIARIES
Prevention & preparedness	Land planning instruments	Integration of plans	All the actors
	Enhance risk perception/prevention	Exchange institutional/ administrative culture	Decision makers
	Integration of risk	Major communication activities	All the actors
	Implement change in legal/sectorial policies	Land policies & governance improvement	Decision makers

4. CHALLENGES TOWARDS WILDFIRE RESILIENT LANDSCAPES

4.1. Wildfire challenges: What needs to be overcome?

Arriving at this stage with the knowhow gather during the CWI and LL leaders exchange knowledge it is interesting to observe *that similar concerns and problems emerge across different challenges, indicating common themes that underlie the difficulties faced.* Additionally, identifying common reasons for these problems can help in understanding their root causes.

The *preliminary overarching challenge themes* (Table 12) can serve as a starting point for analysing and addressing the specific difficulties Living Labs are facing in FIRE-RES Project. By identifying and categorizing these challenges, we can develop targeted strategies and solutions to overcome them by i) promoting smoother collaboration and progress within the Community of Wildfire Innovations, and ii) launch the Open innovation challenge can be a valuable approach to contribute ideas, expertise, and solutions to overcome these challenges' themes and drive innovation.

The *Open Call activity* of the Open Innovation Campaign aims to enhance the ability of the FIRE-RES project to provide newer and better solutions in response to the stakeholders' challenges. The ability to communicate these challenges to the world community and external stakeholders and being able to leverage the innovativeness available is expected to provide a wider and richer scope of innovative solutions.

In this sense, the *solution providers* are expected to contribute to solve the following completely or partially:

- *National forest fire risk reduction strategies and risk-informed decision-making* emerging from collaboration with key stakeholders, in compliance with the policy objectives set out in the EU forest strategy and relevant EU policies;
- *Improved coherence between EU Policies' objectives and national legislative frameworks* defining structural measures and operational activities regarding forest and communities' protection from fire;
- *More disaster-resilience communities* through increased awareness and preparedness of populations at risk and a common culture of risk;
- *Increased a knowledge exchange*, sharing and access through open access platforms.
- *Innovation, harmonisation, and exchange on methods* of consistently recording and measuring wildfires and coherent collection of data;

- *Common framework for wildfire* firefighting modules, training, exercises, incident management and command.

The following table provides an overview of the *Key-challenges* for the development of the bottlenecks as emerged during the Challenge Design Workshop' CWI events and the bilateral meetings.

Table 12. Overview of the Challenges determining the development of the LLs mentioned by CWI expert in the CDW discussion or in the surveys.

Challenges/priorities scope	Nouvelle Aquitaine – France	Bulgaria	Catalonia – Spain	Chile	Galicia – Spain	Germany - The Netherlands	Greece	Norway – Sweden	Lousã ,Vale de Sousa - Portugal	Sardinia – Italy
Collaborative and Participatory approaches in wildfire risk management	✓		✓	✓		✓				✓
Coherent multiactor wildfire Governance			✓	✓		✓		✓	✓	✓
Efficient fuel management and effective treatments	✓	✓	✓				✓	✓	✓	
Empowering action at community and landscape levels		✓		✓	✓				✓	
Monitoring, forecast and modeling for decision support			✓	✓			✓	✓	✓	✓
Safe and improved early attach and suppression		✓	✓	✓	✓		✓	✓	✓	✓
smarter post-fire restoration and recovery		✓	✓	✓	✓		✓	✓	✓	✓
Risk communication and awareness	✓	✓	✓	✓		✓				✓
Training and education for targeted stakeholders		✓				✓		✓		

The symbol ✓ indicates that the statement was done or supported by the CWI/LL expert.

4.2. Wildfire Challenges - Key Lessons

Reviewing the challenges associated with wildfires provides valuable lessons that can inform future approaches to wildfire management. These *key lessons* from the review of Wildfire Challenges contribute to building more resilient communities and ecosystems in the face of wildfire challenges.

High Levels of Public Awareness	
Understanding:	*Implication:*
There is a crucial requirement for a significant level of awareness among the public regarding wildfires.	People need to be well-informed and alert about the risks and preventive measures related to wildfires.

Holistic and Integrated Approach	
Understanding:	*Implication:*
Dealing with the challenges of wildfires requires a comprehensive and integrated strategy.	It is not just about firefighting; it involves considering various aspects and factors in a coordinated manner to effectively manage the risks

Public-Private Partnerships	
Understanding:	*Implication:*
Collaborations between the public and private sectors are vital for effective wildfire management	Both sectors need to work together, possibly sharing resources and knowledge, to enhance the overall approach to handling wildfires.

Significance of State Resources	
Understanding:	*Implication:*
State resources play a crucial role in supporting Integrated Fire Management.	Adequate resources from the government are necessary to ensure a well-rounded and effective approach to managing wildfires.

Regional Approach and Resource Pooling	
Understanding:	*Implication:*
A regional perspective is essential, enabling resources to be aligned with specific threats, and resources need to be shared.	Instead of isolated efforts, collaborating at a regional level allows for a more efficient distribution of resources based on the specific challenges faced by different areas

In summary, these key lessons highlight the importance of informed communities, a comprehensive strategy, collaborations between public and private entities, adequate state resources, and a regional perspective to effectively address the challenges posed by wildfires. By emphasizing preparedness, adopting integrated fire management strategies, engaging communities, leveraging technology and data integration, and considering climate change impacts, stakeholders can enhance their capacity to mitigate the impacts of wildfires, protect lives and property, and promote sustainable land management practices.

4.3. Potential solution - IA contributions

In the initial project year, Living Lab leaders and CWI members identified specific gaps, as outlined in Deliverable 6.2, including areas within social science that could be addressed by IAs within the project.

This section emphasizes that *FIRE-RES Innovation Actions* are designed to tackle existing challenges outlined in previous D6.2 sections and bridge knowledge gaps. The contributions of FIRE-RES IAs extend to creating fire-resilient landscapes and addressing challenges and knowledge gaps in various aspects of fire management, including prescribe burning, traditional burning, and wildfire use. Insights on Ecology and Landscape management, Economic aspects of resilient landscapes, and Governance and risk awareness perspectives were identified through two technical workshops in 2022 (WP1). The corresponding innovation actions to address these challenges are presented in Deliverable 1.1. Castellnou, M. et al. (2022).

REFERENCES

Building a low-carbon, climate resilient future: Research and innovation in support of the European Green Deal (H2020-LC-GD-2020) (https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/lc-gd-1-1-2020)

Calkin, D.E., Thompson, M.P. & Finney, M.A. Negative consequences of positive feedbacks in US wildfire management. For. Ecosyst. 2, 9 (2015). https://doi.org/10.1186/s40663-015-0033-8

Castellnou, M., Nebot, E., Estivill, L., Miralles, M.,Rosell, M. Valor, T., Casals, P., Duane, A., Piqué, M., Górriz-Midfsud, E., Coll, LI., Serra, M., Plana, E., Colaço, C., Sequeira, C., Skulska, I., Moran, P. (2022). FIRE-RES Transfer of lessons Learned on Extreme Wildfire Events to Key Stakeholders. Deliverable D1.1. FIRE-RES Project 119 pages. Doi: https://doi.org/735811

Molina, J. R., González-Cabán, A., & Rodríguez y Silva, F. (2019). Potential Effects of Climate Change on Fire Behavior, Economic Susceptibility and Suppression Costs in Mediterranean Ecosystems: Córdoba Province, Spain. In *Forests* (Vol. 10, Issue 8). https://doi.org/10.3390/f10080679

Prokofieva, I., Górriz, E. (2022). FIRE-RES D8.1 Living Lab Guidelines. Deliverable 8.1. FIRE-RES project. 25 pages.

Scott L. Stephens, Lawrence W. Ruth (2005). Federal Forest-Fire Policy In The United States, 15, 532 -542, Ecological Appications, https://doi.org/10.1890/04-0545

Steelman, T. (2016) U.S. wildfire governance as social-ecological problem, Vol. 21, No. 4 Ecology and Society, 14 pages, https://www.jstor.org/stable/26270036

Xavier, A., Torre, A., Neves, S. (2022). Operational Handbook for OIC Kickstarting. Deliverable D6.1. FIRE-RES Project 30 pages.

DOI: 10.5281/zenodo.6780044

Zavratnik, V., Superina, A. and Duh, E.S. (2019), Living Labs for Rural Areas: Contextualization of Living Lab Frameworks, Concepts and Practices, Sustainability, 11, p. 3797. https://ec.europa.eu/research/participants/data/ref/h2020/other/wp/2018-2020/annexes/h2020-wp1820-annex-d-ia_en.pdf)

FIRE-RES
Innovative technologies & socio-ecological-economic solutions for fire resilient territories in Europe

D6.2. Annexes

Annex I. Living Lab leaders' contributions – Factsheets content

Annex II. Submitted Challenges Frame Forms – CDW

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Nouvelle-Aquitaine

Factsheet #1

Wildfire Profile – Nouvelle-Aquitaine

Nouvelle-Aquitaine is a region in the southwest of France, covering an area of 8.4 million hectares with many types of landscapes, from mountains to coastal plains. The forested area covers 34.5 % of the Nouvelle-Aquitaine region, mainly *Pinus pinaster*, *Quercus sp.,* and *Castanea sativa*., covering 65% of the region's total forested area. Together with agricultural and pasture areas (51.5%), 86% of the regional territory is susceptible to rural fires. At the France level, the Landes de Gascogne forest in Nouvelle-Aquitaine is ranked among the top 3 forest areas regarding the number of fires, with mostly forest (65%), but also agriculture (26%), and 9% of other categories (moors, wasteland, non-interpreted areas, etc - CNPF Forest des Landes, 2012). Nouvelle-Aquitaine is a distinctively fire-prone region in Europe, mainly because of its extensive areas of young plantations planted in 2009. Each year in Aquitaine, an average of 1 600 fires are recorded for 1 800 ha burnt. The climate is also favourable to fast fuel build-up, reaching temperatures over 42°C in summer and relative humidity values below 15% (DFCI, 2022).

In 2022 with a maximum temperature recorded of 42.4°C in July, only in two months, the total burnt area amounts to 32 000 hectares of the surface occupied mostly by forest area, being the 2nd highest value of the burnt area, since 1949. From a universe of 1438 wildfire events bigger or equal to 1000 m^2, a single wildfire lasted for 6 days. It burned more than 12k hectares, covering 7.8% in the Gironde region, with relevant impacts in a prized landscape and in valuable forests (mostly Maritime pine trees, but also deciduous).

The most common causes of these fires were humans (>90%). Civil Protection mainly drives the fire suppression system in Nouvelle-Aquitaine. Higher investment in fire prevention has been increasing since the devastating wildfires of 1949 (50 000 ha), which caused at least 87 fatalities, establishing the DFCI (Défense des Forêts Contre l'Incendie) system led by forest owners (https://www.dfci-aquitaine.fr/) to maintain preventions infrastructures distinct from the firefighting organization led by civil protection (SDIS), reversing the pathway of decades where little expenditure was spent on wildfire management.

Factsheet #2

Community of Wildfire Innovation – Nouvelle-Aquitaine

Nouvelle-Aquitaine Massif des Landes de Gascogne is *sui generis* in terms of forest ownership, encompassing private landowners (90%), the forest service (ONF) manages for State and local communities the 10% of public forest.

In Nouvelle-Aquitaine, more than 250 000 owners of more than 1 hectare manage 2.2 million hectares. On average, the private forest land size is 9 hectares.

Figure 11 - Size repartition of private ownership in Nouvelle-Aquitaine in 1999

Under the Fire-RES project, France has a Living Lab located in the Nouvelle-Aquitaine region with 988 000 hectares. The Nouvelle-Aquitaine region represents the main fire-prone area at the French National level due to climate and young maritime pines presence.

The Nouvelle-Aquitaine community of wildfire innovations (CWI) integrates 23 members, divided into 12 strategic members and 11 operational ones. FIRE RES involves one partner institution in the public sector (Regional Association - ARDFCI), one in the private sector (MISSO), two in the scientific sector (IEFC and INRAe), and one institution as an emergency management institution (Service Départemental d'Incendie et Sécurité - SDIS 40), enclosing 12 representatives of those institutions. The CWI members are classified into five types: policy and decision-making (26%), emergency management (13%), asset owners and managers (26%), scientific community (26%), and NGO's (9%), and are distributed over the categories of the 4-helix of innovation.

Bulgaria

Factsheet #1

Wildfire Profile – Bulgaria

Bulgaria is a South-Eastern European country located on the Balkan peninsula and covers a continental area of more than 11 million hectares with several types of landscapes. The forested area covers 1/3 (31.0 % of the Bulgarian territory), dominated by *Quercus* sp. (35.5%), *Fagus sylvatica* (16.5%), and *Pinus sylvestris* (14.8%) which encompass 66.8 % of the total forest area. Together with agricultural areas (46.64 %) and shrubland and pasture (13.85 %), 91.49% of the national territory is susceptible to rural fires. Bulgaria is expressed by two climatic regions, a continental climate in the north and a Mediterranean climate in the south that reaches during the summer temperatures close to 40 °C and relative humidity below 25%.

In 2020, with a maximum temperature recorded of 40.8°C in July, the total burned area amounted to 10.4 thousand hectares of the surface occupied by woodlands (5258 ha), and shrublands and agriculture lands (5158 ha), being the 3rd highest value of the burnt area, since 2012. From a universe of 3 rural fires larger than 1k ha, a single wildfire lasted 5 days. It burned close to 1.8k hectares, covering the territory of 4 villages in 2 district areas.

The most commonly known causes of these fires were "burning of pastures" (25.6%) and "burning of stubble" (18.7%). The Fire Fighting Service together with Forest Departments mainly drives the fire suppression system in Bulgaria. Higher investment in fire prevention has been increasing since the devastating wildfires of 2017 (537131 ha). On average, the costs of protection and prevention of forest fires increase by about 10% annually (for 2022 – 2.000.000 euros totally expenses). Unfortunately, in August 2021, three foresters were injured while fighting a fire, and two of them died. The previous fatality was in 2003 when a reconnaissance and firefighting helicopter went down after smoke from the fire stopped the engines. There were 5 victims.

Factsheet #2

Community of Wildfire Innovation – Bulgaria

Bulgaria is *sui generis* in terms of forest ownership, encompassing private landowners (11% of which are managed by industrial companies), local communities (12%), and mainly the State-owned with 74.5%. Large parts of forests in Bulgaria are within Natura2000 areas, so certain limitations apply in forest management activities.

Under the Fire-RES project, Bulgaria has a Living Lab located in the Stara Zagora region with 515.500 hectares. Stara Zagora region frequently suffers from fire

occurrence and the fire ignitions are natural, but also human-induced – usually fires start in agricultural lands.

The Bulgarian community of wildfire innovations (CWI) integrates 28 members, divided into 21 strategic actors and 7 operational ones. FIRE RES involves 9 partner institutions that include a research and outreach institution (University of Forestry), 8 public sector institutions, and the Regional Road Administration as well as a GIS expert. The CWI members are classified into seven types: policy and decision making (47%), emergency management (25%), scientific community (14%), asset owners and managers (3,5%), private sector (7%), society scientific community (3,5%), and NGOs (3,5%); and are distributed over the categories of the 4-helix of innovation.

Catalonia

Factsheet #1

Wildfire Profile – Catalonia

Catalonia is a region in the northeast of Spain covering an area of more than 3.2 million hectares with high heterogeneity of landscapes due to its orography. The forested area covers more than 60% of Catalonia's territory, and the tree-covered forest area is more than 40%. The main species regarding wood volume are Scots pine, Aleppo pine and Holm oak. Tree cover (35%), shrubland and grassland (29%), cropland (26%) represent a total of 90% of the territory that is susceptible to rural fires. Catalonia is a distinctively fire-prone region in Europe since it is the third region of Europe regarding forest surface, with winds above 60km/h and together with a Mediterranean humid climate favourable to fast fuel build-up, reaching average temperatures of over 40ºC in the hottest regions during summer and relative humidity averaged values below 30%.

The 2012 campaign was marked by a dry winter and spring and simultaneous fires in the Pyrenees in March. In the summer, on July 22nd, there was the most important fire, the Jonquera fire, which burned 12,898 ha in a north-westerly wind situation. The fire had a main run of more than 17 km in the first 10 h with maximum peaks of propagation speeds of 7.7 km/h, affecting more than 600 vulnerable elements (farms, countryside, rural tourism, small urban centres, etc.) including the main highway that connects Spain and France. At the same time, another fire broke out in Portbou, affecting a secondary road where cars were trapped and two people died trying to escape.

In the simultaneous emergency scenario, in order to maintain the capacity to cope with other emergencies (traffic accidents, structural fires,...) and to avoid system collapse, the decision-making process focused on ensuring the protection of citizens and letting the fire burn until the new expected fire behaviour conditions allowed for safe and efficient firefighting operations.

In recent years, in Catalonia the total burned area has been reduced, but the speed of spread of fires (hectares burned per hour) has increased, which implies more virulent fires. Which cannot be controlled in the first-place attack can become devastating fires and EWE. The fire suppression system is mainly driven by the Catalan Fire and Rescue Service (GENCAT).

Investments in wildfire prevention has been increasing during the last years reaching more than €M5.3 in 2022. Although recently the total burned area has been reduced, the speed of fires (hectares burned per hour) has increased, which implies more dangerous and devasting fires.

Factsheet #2

Community of Wildfire Innovation – Catalonia

Forests in Catalonia are mainly privately owned (76%) and the State and public agencies (24%). Under the Fire-RES project, Catalonia has a Living Lab with occupies the whole territory although specific innovative actions are implemented in specific areas. The Catalonia region represents the main fire-prone area at the Spanish National level due to its very densely populated area, with 239 inhabitants per km^2 in 2022, and its summer weather conditions.

The Catalonia community of wildfire innovations (CWI) integrates 37 members, divided into 19 strategic actors and 18 operational ones. FIRE RES involves five partner institutions with 16 representatives, three institutions in the scientific sector (Forest Science and Technology Centre of Catalonia – CTFC; Cartographic and Geodetic Institute of Catalonia - ICGC; European Forest Institute), a private company (Mitiga Solutions S.L.) and General Directorate of Prevention, Fire Fighting and Rescue from the Department of the Interior as emergency management sector. The CWI members are classified into six types: policy and decision-making (40.5%), scientific community (32%), emergency management (13.5%), asset owners and managers (8%), NGO's (3%), and private sector (3%), and are distributed over the categories of the 4-helix of innovation.

Chile

Factsheet #1

Wildfire Profile – Chile

Chile is a country located in western South America and covers a continental area of 75.7 million hectares with different types of landscapes. The forested area covers 23.8% of Chile's territory, where 81.7% corresponds to native forest, 17.27% to forestry plantations (mainly *Pinus radiata* 61% and *Eucalyptus* sp. 33%), and 0.99% to mix forest. The native first is dominated by evergreen species (25.27%) and Lenga (*Nothofagus pumilio*, 25.06%). Together with agricultural areas (4.3%) and shrublands and pastures (39.9%), 68% of the national territory is susceptible to fires. Chile is a particularly fire-prone country in South America, with hot and dry summers, reaching temperatures over 41.5°C in summer and relative humidity below 20%.

In 2023, just in LL Chile, with temperatures above 40°C in February, the total burned area amounted to 184 thousand hectares. The affected area consisted of various types of land, with forest plantations being the most heavily impacted at 76%. Native forest, scrubland, agricultural crops, and grasslands also suffered significant losses, accounting for 5%, 10%, and 9% of the burned area, respectively. The impact of this season on the country as a whole was severe, resulting in the destruction of 2.450 buildings, leaving 7.770 people homeless, and causing 3.569 injuries. There were an unprecedented 26 deaths due to the fires.

It is estimated that 99.7% of fires in Chile are human-induced, 32% of which are estimated to be intentional, 65% accidental, and 4% unknown. The Ministry of Agriculture mainly drives the fire management system in Chile through the National Forestry Corporation (CONAF). Higher investment in fire prevention has been increasing since the devastating wildfires of 2017 (467 thousand hectares), which causes 11 fatalities.

Factsheet #2

Community of Wildfire Innovation – Chile

In terms of forest ownership in Chile, 74% corresponds to private owners (distributed in large, medium and small owners, both plantations and native forests) and 26% corresponds to the State (Protected Wildlife Areas).

Under the FIRE-RES project, the Bío-bío Region will be the Chilean Living Lab. This region has more than 2.3 million hectares and has a very diverse composition and is highly vulnerable to fires. Biobio Region has an average (between 2016 and 2021) of more than 1.9 thousand fire occurrence per year, this makes it the region with the most fires in the country.

The Community of Wildfire Innovation (CWI) in Chile is composed of 42 members divided into 34 strategic actors and 8 operational ones. Of these, 28 (66%) correspond to actors related to operations (detection, control and extinction of fires), 15 (43%) represented by private forestry companies, followed by the National

Forestry Corporation (CONAF) with 7 (20%) of the actors and representatives of municipalities 3 (9%), both as public agencies, also included as operational actors are Firefighters 1 (3%). On the other hand, 7 (20%) are strategic stakeholders, including universities 3 (9%) and the Community Prevention Network (RPC). This brings together all the local agents of the 4-helix of innovation.

Galicia

Factsheet #1

Wildfire Profile – Galicia

Galicia is a region in the northeast of Spain, covering an area of 2.9 million hectares with many types of landscapes. The forested area covers almost 69% of Galicia's territory, with mainly *Eucalyptus* sp., *Pinus pinaster*, and *Quercus* sp., filling 1.405.452 hectares, 47.5% of the region's total forested area. Together with agricultural areas of 822.626 hectares (28%), 97% of this territory is susceptible to rural fires. Galicia is a distinctively fire-prone region in Spain, with topographic factors in the Southern part and the wind in the Northern favourable to fast fuel build-up. During the last decade, 2 million forest areas have burned. The region reaches temperatures of over 44.2ºC in summer and relative humidity values below 20% on specific days.

In 2017, with a maximum temperature recorded of 42ºC on the 21 of August, the total burned area amounted to 62 thousand hectares of the surface occupied by woodlands (32.267 ha), shrublands (29.828 ha), and agriculture lands (2.905 ha), being the 2nd highest value of the burnt area, since the 1990s. From a universe of 13 rural fires larger than 1k ha, in a single weekend in October, 49 thousand hectares burned in 125 simultaneous fires in less than 4 hours, with relevant impacts in a prized landscape and valuable forests, mostly conifers, but also deciduous broadleaves and scrub.

The most common causes of these fires were human-induced, mainly caused by arson 75%. Fire management in Galicia is fronted by the Galician Forest Fire Prevention and Defence Service, which oversees the actions related to the prevention and extinction of forest fires, support in emergencies in the natural and rural environment, information to the rural population, and recovery of the landscape and post-fire ecosystems. A 2021 review of the "Forest Plan in Galicia" focuses on the prevention and extinction of forest fires and the restoration of burnt areas.

Since a review in 2021 of the "Forest Plan in Galicia", the prevention and extinction of forest wildfires and the restoration of burnt areas have been increased.

Factsheet #2

Community of Wildfire Innovation – Galicia

Forest ownership in Galicia is mainly private (97%), out of which 30% belong to private communal forests (MVMC). Only 3% of the forest land is public.

Under the Fire-RES project, Galicia has a Living Lab located in the Forest District XII Miño-Arnoia, Ourense region, with 151.410 hectares, between neighbouring common and private forests. The Galicia region represents one of the main fire-

prone areas at the Spanish National level due to the presence of rather inflammable species.

The Galicia community has an average of 33 tonnes per hectare of vegetal fuel, the national average being 11 tonnes per hectare. The intentionality of forest fires in Galicia is 75%, those caused by negligence and accidents account for 5%, while 1% correspond to natural phenomena, and the remaining 19% are due to unknown causes.

The Galician community has a forest fire prevention and extinction service spread over 19 forest districts. It has 1 central, 4 provincial, and 19 district coordination centres.

The forest fire prevention and extinction service have 116 senior commanders, 385 technical extinction managers, and 2.742 forest firemen and firewomen with different categories, to which 2.149 reinforcement operatives must be added.

The Galician community of wildfire innovations (CWI) integrates 18 members, divided into 10 strategic members and 8 operational ones. FIRE-RES involves a partner institution, the Consellería de Medio Rural of the Xunta de Galicia, on which all the aforementioned assets depend, with competencies in prevention, extinction and post-fire or restoration.

Germany- The Netherlands

Factsheet #1

Wildfire Profile – Germany-The Netherlands

Germany and Netherlands are countries located in north-western Europe and cover a continental area of 35.8 and 3.7 million hectares, respectively, with many types of landscapes.

The Netherlands has a natural land cover of 586.000 ha, from which 363.801 ha is forest, 54.000 ha is heathland, 101.000 ha is semi-natural grassland, and 35.000 ha is marshland. Scots pine, and oak are the main forest species. Coniferous species occupy 55% of the forests, while broadleaves account for 45%. Around 52% of the forest area is composed of single-species forest stands, with 21% being broadleaves and 31% conifers. The landscape is highly fragmented and interspaced by a dense transportation network.

The habitat composition of Germany is predominated by forest (19.35%) and grasslands (13.98%), while heathlands and scrub represent only 6% of it. German forests are dominated by coniferous species (54% of the forested area), broad-leaved (31%), and mixed forests (13%), respectively. The most dominant tree species is spruce, covering 2.8 million hectares (25% of German forest area), mainly dominating in the southern part of Germany, followed by pine, covering 2.4 million hectares (23%) with predominant occurrences in the central and north-eastern part of the country.

Together, forest, agricultural and heathland areas in the Netherlands and in its border area with Germany, represent the landscapes most susceptible to rural fires. The Netherlands is a relativity flat country with strong winds, which strongly enable the spread of wildfires. The climate is also favourable to fast fuel build-up, with an annual rainfall of 855 mm, and in both countries, temperatures reach up to 30°C in summer and relative humidity below 82%.

According to the Global Wildfire Information System (GWIS), the Netherlands experienced 19 fires between 2019 and 2022, resulting in the burning of 1,112 hectares. These wildfires primarily occurred outside of the typical fire season, specifically in the months of March, April, August, September, and October. The majority of the affected areas consisted of croplands (92%) and shrublands (4%), while forest landscapes accounted for a mere 1.8% of the burned areas. Ongoing research led by Dr. Cathelijne Stoof at Wageningen University suggests that these statistics may significantly underestimate both the number and impact of these wildfires. Consequently, the forthcoming research results will serve as a crucial baseline for further investigations and informed decision-making.

The most common causes of these fires were human-induced, mainly caused by accidents (22%) and deliberately (20%). The Dutch and German fire services fronts fire management in the Netherlands and Germany. However, fire services are

primarily trained to deal with urban fires. At the same time, they need more preparedness to respond in case of non-urban fires, as they need more forest management tailored to forest fires and limited policy for wildfires.

Factsheet #2

Community of Wildfire Innovation – Germany-The Netherlands

Germany-The Netherlands is *sui generis* in terms of forest ownership. In the Netherlands, forest is mainly owned by the Dutch State Forest Service (26%), private owners (18), and municipalities (15%). In Germany, forest ownership relies mainly in the country of the federal state (52%) and privately and corporately owned (48%), with huge differences between federal states.

Under the Fire-RES project, Germany-The Netherlands as a Living Lab located in the transboundary area of these two countries, which includes the Netherlands area and the Lower Saxony, North Rhine and Westphalia regions from Germany.

The Germany-The Netherlands community of wildfire innovations (CWI) integrates 34 members, divided into 26 strategic members and 8 operational ones. FIRE RES involves one partner institution in the scientific sector (Wageningen University) and one institution as emergency management sector (Waldbrandteam), enclosing 5 representatives of those institutions. The CWI members are classified into four types: policy and decision-making (35%), emergency management (23.5%), asset owners and managers (23.5%), and scientific community (18%), and are distributed over the categories of the 4-helix of innovation.

Sources:

Holzwarth, Stefanie, et al. (2020). Earth Observation Based Monitoring of Forests in Germany: A Review. In Remote Sensing.

https://www.worlddata.info/europe/netherlands/climate.php

https://www.ams-institute.org/news/100-years-of-dutch-summers-the-clock-is-ticking-on-climate-change/

https://www.sciencedirect.com/science/article/pii/S0167587719301102?casa_token=Mx6Xt32uBGkAAAAA:NkavWXNQAl6PJG_weFX-nscKFPE_jnm48qRiUK6SZNbFwACZvKu1EJbig5lJ_Yq6ziAhbqeYeno

https://effis.jrc.ec.europa.eu/apps/effis.statistics/estimates/NLD

Greece

Factsheet #1

Wildfire Profile – Greece

Greece is a Mediterranean country in Southeast Europe, located on the southern tip of the Balkan Peninsula, covering an area of 13.2 million hectares and endowed with a multitude of Mediterranean-type of ecosystems, ranging from low shrubs and coniferous woodlands on coastal sites, to high-elevation conifer and broadleaf forests. Forests cover approximately 25% of Greece's territory, mainly with conifers (*Pinus halepensis, Pinus brutia, Pinus pinea, Pinus nigra, Pinus sylvestris, Picea abies* and *Abies* spp.) and broadleaves (*Quercus* spp., *Fagus sylvatica, Castanea sativa* and *Betula* spp.), at approximately 10% and 15% of the country's total forested area, respectively. Other forested areas that are dominated with broadleaved-evergreen shrubs cover approximately 25% of the country's total area. Together with broadleaved-evergreen shrubs and woodlands (25%), pasture areas (11%) and agricultural lands (9%, excluding non-burnable or difficult-to-burn lands), 70% of the national territory is susceptible to forest and rural fires. Greece is a distinctively fire-prone region in Europe, a Mediterranean-type of climate favourable to fuel build-up, reaching temperatures of over 40°C in summertime and relative humidity values below 20%.

In 2021, with a maximum temperature recorded of 46.3°C in August, the total burned area amounted to 133 thousand hectares of the land occupied by forests (50,000 ha), shrublands-woodlands (36,500 ha) and agricultural lands (39,000 ha), being one of the most significant fire season, affecting mainly the southern parts of the country (Attica, Peloponnese, Central Greece). From a set of 18 wildfire events bigger than 500 ha, the mega-fire of Evia Island lasted for 9 days. It burned almost 50,000 hectares, affecting 15% of the island, which is the sixth largest island in the Mediterranean Sea, with relevant impacts in a prized and scenic landscape with high tourism value and revenue, surrounded by valuable forests used for resin production, nomadic beekeeping and logging (mostly mature and pure *Pinus halepensis* conifer forests).

The most common causes of the wildfires were human-induced (estimated as >90% for southern Greece), mainly caused by arson, negligence and the burning of agricultural residuals. The Ministry of Climate Crisis and Civil Protection coordinates the fire suppression system through its interconnected agencies (e.g., Fire Service) in Greece. Fire prevention activities have increased (e.g., the AntiNERO program with 72-million € budget for 2022) and new laws have been introduced (e.g., legalization of "backfires" for fire suppression and administrative organisation reforms) since the devastating extreme wildfires events of Mati, Attica, in 2018 in the Athens suburbs and Evia Island in 2021, which caused at least 105 fatalities, of which 102 from the Mati fire, and country economic losses (up to 4 billion €, based on reports published by the Bank of Greece and Moody's).

Factsheet #2

Community of Wildfire Innovation – Greece

Greece has a complex and heavily fragmented land tenure system in terms of forest land ownership. The state is presumed to be the largest landowner (74%), followed by local government bodies and communities (9%), private landowners (7%), and other smaller agencies and legal entities (10%). Large chunks of forested lands are owned by individuals, especially on the islands, and no management is applied there. Only small private forests receive management, located mostly in productive parts of northern Greece. Since the national cadastre is still under development, and the preliminary results has not yet been disclosed, we cannot provide estimates of the exact area owned by each land tenure.

Under the FIRE-RES project, Greece has a Living extending over three study areas, i.e., Kassandra Peninsula (Chalkidiki) with 35,349 hectares; Lesvos Island (Aegean Sea) with 163,600 hectares; and Peloponnese (Region) with 2,140,000 hectares. These areas are characterised by wildland-urban interface (WUI), forests interspersed with agricultural lands of ever-growing fire risks.

The Greece community of wildfire innovations (CWI) integrates 38 members, divided into 12 strategic actors and 26 operational ones. FIRE-RES involves two partner institutions, including the research and outreach sector (the University of the Aegean and the National Observatory of Athens), enclosing 7 representatives from these institutions. The CWI members are classified into five types: Policy and decision-making (16%), asset owners and managers (24%), scientific community (18%), emergency management (26%) and private sector (16%), distributed over the categories of the 4-helix of innovation.

Norway-Sweden

Factsheet #1

Wildfire Profile – Norway-Sweden

Norway and Sweden are Nordic countries located in the Northern region of Europe and cover a continental area of 79 million hectares with different types of landscapes. The forested area is characterised by boreal and hemiboreal forests and alpine forests towards the north and mountain regions. It covers 50% of Norway-Sweden territory, dominated mainly by Norway spruce, Scots pine and birch. Together with agricultural areas (23%), pastures, shrublands, and coastal heathland, these constitute the landscape types susceptible to rural fires. In Norway-Sweden, fires are typically small and of low intensity. However, there have been several large wildfires in the past ten years, with the largest ones occurring in Sweden. The Nordic countries are the most forested region in Europe, and with unfavourable climate and weather conditions, extreme fire incidents in this part of Europe might be more frequent. The humid climate favours fast fuel build-up, reaching temperatures over 30°C in summer and relative humidity values below 20%.

In 2018 with 35°C as the highest temperature recorded, the most severe wildfire season in modern history occurred in Sweden, with several large fires and 25 000 ha of forest land affected. The fire activity was highest in July, following a period of extremely warm and dry weather conditions. Similar conditions existed in Norway at the time, but even with a high record number of wildfires started there, the area burnt was not comparable to the one in Sweden. This was partly attributed to favourable wind conditions during the early phase of some potentially dangerous fire incidents.

The fires in 2018 had multiple ignition sources, including sparks caused by trains, forestry machinery and lightning strikes. Fire management in Norway and Sweden is fronted by the local Fire and Rescue Services, with a general policy of suppressing all fires and minimising damage to forests, people, and infrastructure. There is, however, growing awareness and activities towards more prescribed burnings. This is mainly motivated by maintain fire as an ecologically important disturbance.

Factsheet #2

Community of Wildfire Innovation – Norway-Sweden

Norway-Sweden in terms of forest ownership, encompassing private landowners (77%, 27% of which are managed by industrial companies or cooperatives) and state and public agencies (23%).

Under the Fire-RES project, Norway-Sweden has a Living Lab with activities in the Viken and Hedmark counties located in the southeastern part of Norway, as well as activities targeting the wildfire community in the two countries as a whole. Norway-Sweden traditionally wasn't a fire-prone region, and fires in the Nordics are typically

characterised by their narrow reach. Due to this, the wildfire community is relatively small, and some activities in the Living lab encompass the wildfire community at a national level. Forest fires have historically been a common hazard in Nordic forests and play a role in developing and shaping natural vegetation.

The Norway-Sweden community of wildfire innovations (CWI) currently integrates 13 institutions, divided into 8 strategic and 5 operational actors. FIRE-RES involves 4 partners from Norway and Sweden, including one research and outreach institution (the Norwegian Institute of Bioeconomy Research), two institutions as emergency management institutions (the Midt-Hedmark Fire and Rescue; and the Service Södertörn Fire and Rescue Service), and The Norwegian Directorate for Civil Protection as the public institution. The CWI members are classified into five types: policy and decision-making (39%), private sector (15%), the scientific community (23%), emergency management (15%), and asset owners and managers (8%); and are distributed over the categories of the 4-helix of innovation.

Portugal

Factsheet #1

Wildfire Profile – Portugal

Portugal is a Mediterranean country located in the southwestern region of Europe and covers a continental area of 8.9 million hectares with different types of landscapes. The forested area covers 39% of Portuguese territory, dominated by eucalyptus (*Eucalyptus globulus* Labill.), cork oak (*Quercus suber* L.) and maritime pine (*Pinus pinaster*), which encompass 71% of the total forest area. Together with agricultural areas (26%) and shrublands and pastures (19%), 84% of the national territory is susceptible to rural fires. Portugal is a distinctively fire-prone country in Europe, with a Mediterranean humid climate favourable to fast fuel build-up, reaching temperatures over 30°C in summer and relative humidity below 20%.

In 2022, with a maximum temperature recorded of 47 ºC in July, the total burned area amounted to 110 thousand hectares of the surface occupied by woodlands (54 801 ha), shrublands (44 114 ha) and agriculture lands (11 092 ha), being the 5th highest value of the burnt area, since 2012. From a universe of 17 rural fires larger than 1k ha, a single wildfire lasted 14 days. It burned nearly 25k hectares, covering 70% of the Serra da Estrela Natural Park, with relevant impacts in a prized landscape and valuable forests (mostly conifers, but also deciduous broadleaves).

The most common causes of these fires were human-induced, mainly caused by arson (28%) and the burning of debris (19%). The Civil Protection Service mainly drives the fire suppression system in Portugal. Higher investment in fire prevention has been increasing since the devastating wildfires of 2017 (537131 ha), which caused at least 117 fatalities, reversing the pathway of decades where most of the expenditure until that year (80%) was spent on suppression.

Factsheet #2

Community of Wildfire Innovation – Portugal

Portugal is *sui generis* in terms of forest ownership, encompassing private landowners (84%), the local communities (14%, the so-called "baldios" in Portuguese) and the State and other Agencies (2%).

Under the FIRE-RES project, Portugal has a Living Lab extending over two study areas, Vale do Sousa with 14316 hectares and Serra da Lousã with 19539 hectares integrated into the Natura 2000 site area. However, both landscapes are highly vulnerable to fires. Vale do Sousa area has suffered annually from fire occurrence, while in Lousã, they occur every 2-3 years.

The Portuguese community of wildfire innovations (CWI) integrates 91 members, divided into 44 strategic actors and 47 operational ones. FIRE-RES involves 5 national partners that include research and outreach institutions (ForestWISE, ISA and

INESCTEC), an emergency management institution (ANEPC) and the National School of Firefighters (ESB), as well as a third party, a Forest Owners Association (AFVS), enclosing 16 representatives of those institutions. The CWI members are classified into six types: policy and decision-making (23%), private sector (13%), NGOs (22%), the scientific community (18%), emergency management (16%), and asset owners and managers (8%); and are distributed over the categories of the 4-helix of innovation.

Sardinia

Factsheet #1

Wildfire Profile – Sardinia

Sardinia (Italy) is an island in the western part of the Mediterranean Basin, covering an area of 2.4 million hectares characterised by heterogeneous landscapes. The forest covers 26% of Sardinia's territory (626.240 hectares), with mainly *Quercus ilex* L., *Q. suber* L., *Q. pubescens* Willd., *Olea europea*, var. *oleaster*, but also planted conifers (*Pinus* spp. and *Eucalyptus* spp.), representing 8% of the Italian total forest area. Among other fire-prone land uses, Sardinia is also characterised by 28% of wooded area (674.851 ha) and agricultural and pasture areas (37.9 %), the whole island is susceptible to rural fires. Sardinia is a distinctively fire-prone region in Europe, with a Mediterranean humid climate favourable to fast fuel build-up, reaching an average of maximum temperatures of over 36°C in summer and relative humidity values below 6%.

In 2022, with a maximum recorded temperature peak of 43°C in June and over 36°C in July and August, the total burnt area reached almost 9.545 hectares (Sardinia Region data, 2022), among these, 1.140 hectares are forests (12%), and 2.086 pastures (21.8%), 5.265 hectares are arable land (56%), 5,7% permanent crops, less than 6% are other land uses. The last year has been less tragic than the previous (2021), which recorded the highest value of the burnt area of the last 23 years, considering the sum of all burnt surfaces each year. Out of 1438 wildfire events bigger or equal to 1000 m^2, a single wildfire lasted 6 days. It burned more than 12k hectares of the Montiferru historical region (Central-western part of Sardinia), with relevant impacts in a prized landscape and valuable forests (mostly cork oak trees, but also broadleaves).

Most wildfires have anthropogenic causes (>95%), and the fire risk is increasing dramatically in Sardinia, mainly due to the co-occurrence of a high fire danger related to weather and fuel conditions, and the increasing number of tourists, seasonal workers and recreational infrastructures on the coast, which explain the occurrence of high Wildland Urban Interface (WUI) on coastlines. The fire suppression system is coordinated by Civil Protection and Regional Forest Guards (CFVA) and operated by the FoReSTAS Agency in terms of men and vehicles. Voluntary forces contribute to fire suppression and fire brigades. Fire prevention has increased since the devastating extreme wildfire events of the Montiferru historical region in 2021, which luckily didn't cause fatalities. Since this fire, penalties have been increasingly enforced for private individuals or institutions that do not carry out biomass reduction measures as provided for by the regional rules. Before this approach, only intentional or accidental ignition of wildfires were pursued.

Factsheet #2

Community of Wildfire Innovation – Sardinia

Sardinia Island, in terms of forest ownership has around 2.4 million hectares as regional surface, it manages 413.521 hectares (66%) of private lands and 211.188 hectares (33%) of public property from local communities.

Under the Fire-RES project, Sardinia has a Living Lab extending over two case study areas, Porto Conte-Alghero, Sassari, with 7 hectares and Monte Arci -Usellus, Oristano, with 20 hectares. The Sardinia region represents the main fire-prone area at the Italian National level due to climate and vegetation.

The Sardinia community of wildfire innovations (CWI) integrates 15 members, divided into 5 strategic actors and 10 operational ones. FIRE-RES involves 3 partners: one institution in the public sector (FoReSTAS Agency), one in the scientific sector (the Italian National Research Council- Institute of BioEconomy – Sesto Fiorentino headquarters), and NOS – Associazione Nucleo Operativo Soccorsi, are Third party for the Italian partner's side. The CWI members are classified into six types: policy and decision-making (13%), emergency management (18%), asset owners and managers (31%), NGOs (20%), scientific community (8%), and private sector (10%), and are distributed over the categories of the 4-helix of innovation.

Annex II. Submitted Challenges Frame Forms - CDW

Nouvelle-Aquitaine

CHALLENGE DESIGN WORKSHOP – LL AQ

CHALLENGE FRAME

Prevention & preparedness

NAME
Legal brushing compliance in Nouvelle-Aquitaine

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Ensure proper application of legal brushing by private and public owners.

PROBLEM STATEMENT
Write a short promotional sentence of the challenge. (100-150 characters)
By French law, owners located within 200m of a forested area are required to apply this regulation on a 50 to 100m perimeter around their properties (and 10m around access roads). This legal obligation is rarely implemented.

WHY DOES THE PROBLEM EXIST?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)
Urban sprawl and the demographic trend lead to a strong increase in housing within the Living Lab area, especially in forested areas, thus increasing the Wildland Urban Interface. These newly arrived populations often have little knowledge of the fire-risk culture and traditional communication channels are becoming insufficient. We are now facing a decrease in the compliance with legal brushing obligations by owners, increasing the risk of fire outbreaks, spread and damage to human assets. However, houses are covered by insurances for fire risk and damage, regardless of the compliance with legal brushing.

WISHLIST

Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
The perfect solution would increase the percentage of compliant housing (up to 100%!). It would provide a possibility to monitor brushing stage by each owner. Furthermore, this solution would ensure the compliance of roads open to public traffic, power lines as well as railways, also subject to legal brushing, as stated in the French Forestry Code (Article L134-10, Article L134-11 and Article L134-12).

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
This solution needs to integrate the local context, thus taking into account the role of the defence system (DFCI), the city councils and the network of Communes Forestières.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)
N/A

CHALLENGE DESIGN WORKSHOP – LL AQ

CHALLENGE FRAME

Detection & response

NAME
Provide a title for the challenge.
Forest fire risk display

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
An efficient and up-to-date tool informing citizens of daily fire risk.

PROBLEM STATEMENT
Write a short promotional sentence of the challenge. (100-150 characters)
Currently, city councils, in charge of informing citizens of forest fire risk, do so by displaying a sheet informing citizens of the level of forest fire risk. This is insufficient to reach all citizens.

WHY DOES THE PROBLEM EXIST?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)
With a strong influx of new populations, unaware of the local fire risk, and the increase of close-to-nature activities, the Living Lab Nouvelle-Aquitaine is experiencing a high frequentation of its forest massifs, especially during summer, the highest risk season. Lack of fire culture risk leads to poor knowledge of the constraints and restrictions of access to forested areas during the fire season. This increases not only the risk for populations but also the chance of a fire outbreak (by human cause).

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
Any efficient and up-to-date communication tool to reach all citizens, tourists, etc. of the current forest fire risk and potential restricted access.

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)

This needs to be compliant with the local authorities' processes (préfectures, mairies, etc.). Indeed, Préfectures inform of the fire risk via their websites and an answering machine. This display needs to be consistent throughout the Landes massif, possibly France or even Europe.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)

Bulgaria

CHALLENGE DESIGN WORKSHOP – LL BG

CHALLENGE FRAME - 1

Prevention & preparedness

NAME An integrated landscape-level approach
Provide a title for the challenge. (50-75 characters) There is no established systematic, institutional and inter-institutional approach for analysis and classification, planning, financing, reporting and control of fire safety activities at the landscape level
Public departments with responsibility for fire safety work only within their capacity and direct responsibility - administrative approach

SUBTITLE Хармонизиране плановете за действиепо управление на риска
Write a short promotional sentence of the challenge (100-150 characters)
In the different types of territories that shape the landscape (agricultural, forest, urbanized) the planning and implementation of fire safety measures is insufficiently coordinated. There are no analyzes of the causes of the fires, and often the culprits remain undetected and unpunished. There is no system to stimulate and support the insurance of business objects in agricultural lands and forests.

PROBLEM STATEMENT
Provide an extended description of the problem that the challenge is going to address. (up to a 1000 characters)
The responsibility for the prevention and preparation for actions in case of disasters lies with the Ministry of Internal Affairs and especially with the fire safety service. In particular, the various departments have laws and by-laws for planning and implementing prevention and preparation measures. Often these measures are not sufficiently financially secured, or the control for their implementation is inconsistent and ineffective, for example in the case of agricultural lands. In the business plans for the forests, there are specific activities listed, the implementation of which is increasingly increased with funding from the Forest Enterprises themselves, which are directly responsible for the health of the forests. This is not the case with agricultural territories and with urbanized territories (infrastructural routes, such as roads, railway routes, pipelines) where the maintenance of easements is a permanent financial and organizational problem.

WHY THE PROBLEM EXISTS?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)
The problem is largely administrative and bureaucratic, but also a matter of capacity. Wildfires are still a seasonal problem that does not have a permanent presence. The

financial constraints of government departments caused by permanent shortages are not enough for long-term investments and planning. Budget funds are concentrated in urbanized areas. It is usually reactive, after the events, at the expense of prevention. There is a lack of adequate feedback between citizens and institutions (for example, when submitting a report to 112, the sender is not notified of the result of his report, leaving him unaware of how the relevant services reacted). The solution to the problem requires political action - regulations, reorganizations, electronic management, and transparency of planning and financial statements.

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
Studying and judiciously applying the experience of countries with greater experience and capacity in the construction of fire-resistant landscapes; Full implementation of the strategic documents for the activity of the Fire Service at the Ministry of the Interior; Review and changes in the regulatory framework affecting different types of territories and coordination of requirements between them; Preparation of appropriate landscape GIS systems at the municipality level for the purpose of risk analysis, resp. supporting planning and management in the direction of sustainability; Preparation of a General sustainability plan for the territory and a Regional plan for the development of the forest territories within a period of up to 5 years (i.e. all interested parties are involved); Determining the objective need for equipment and planning means for fire protection between the state, municipalities and land users, by including in appropriate projects with European and/or national funding. Supporting the insurance of vulnerable objects through a regulatory act.

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
Communication between public administrations and private owners is difficult; Educational campaigns are insufficient and ineffective; There is a discrepancy in the strategic documents that are adopted at the regional or state level and the capacity and finances of the departments responsible for their implementation, because there are no effective criteria for monitoring and control; Some of the problems are exploited politically, which creates distrust in the institutions;

ADDITIONAL INFORMATION*

Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)
All stakeholders raise the issue of proper financing of prevention as crucial. The same problem is classified as the most difficult to solve

CHALLENGE DESIGN WORKSHOP – LL BG

CHALLENGE FRAME – 2

Prevention & preparedness

NAME Access and modern fire monitoring systems and equipment
Provide a title for the challenge. A good monitoring system and access to all endangered territories and objects is not maintained (50-75 characters)
Actions are campaign, often reactive, lacking a unifying, coordinating unit.

SUBTITLE Maintenance of existing and construction of new agricultural and forestry roads
Write a short promotional sentence of the challenge. (100-150 characters)
There are insufficient funds for the maintenance and construction of forest and agricultural roads, there is even a restriction on the use of agricultural roads for activities in the forests. The monitoring of the forest areas is not provided with a technique for early detection of ignitions. The possibilities of Copernicus are not used due to lack of capacity and funds

PROBLEM STATEMENT
Provide an extended description of the problem that the challenge is going to address. (up to a 1000 characters)
(Agricultural and forestry roads have different owners, their management and use are subject to different laws without the necessary harmonization. The latter must be implemented through a General Development Plan and a Regional Plan for the Development of Forest Territories, but despite being laid down in the legislative framework, such plans are missing in most places. The reasons are lack of capacity and lack of funding for their creation. The construction of a common monitoring system is not agreed between the owners.

WHY THE PROBLEM EXISTS?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)
Roads and their maintenance in agricultural and forest areas are expensive. Their proper operation is often violated. In the event of a disaster situation, it is necessary

to have specialized high-passability equipment available, which requires additional investment. In the forest territories, which as a rule are state-owned (over 75%), the roads are financed with their own funds from the Forestry Enterprises with deductions in the Investments in Forests fund. These deductions are mandatory, as a share of the value of the harvested round timber. This rule is 11 years old, ie. the funds are not enough. Often they are invested where inaccessible mountain sites will be opened for use for wood extraction, and not for maintaining fire prevention in the lower-lying (and more vulnerable) forests. The maintenance of agricultural roads is carried out by the municipalities and the state, by transferring rights to the respective owners or lessees of agricultural areas. The latter can be partially supported by European or state subsidies, which everyone looks to save.
There are also infrastructural problems with providing water sources for extinguishing in the forest areas of LL.
The fire department does not have the authority or finances to monitor the condition of forest and agricultural roads, but it has the main responsibility for action in case of fire.
The information from the few available cameras in the country is not summarized in a common center. There are municipal monitoring towers, private towers (for mobile operators) and those of the Forest Enterprises, which are being built under the RDP. They are not coordinated and the signal from them is of different frequency, some remain unsupported when the warranty period of the project on which they were created passes.

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
Determining the most vulnerable areas. Planning sufficient funds to invest in infrastructure and surveillance assets in the coming years, starting with vulnerable areas; Realization of general surveillance of the territories, by using the network of mobile operators; Changes in the regulations concerning the rights and obligations of the institutions; Educational activities with the public, PR campaigns about the dangers and consequences of fires. Establishment of municipal points (centers) for a permanent hotline for irregularities in economic activity during the fire season

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
The provision of appropriate equipment for the implementation of the intended fire prevention measures is often hindered by bureaucratic requirements - e.g. the

construction of observation towers requires long procedures. A particular problem is the lack of motivation for effective control, since there are no corresponding punishments for those who break the rules, i.e. changes are needed in important laws such as the Penal Code. Preparing a District Plan for the development of forest territories requires time and information on GIS platforms, for which there are not enough trained personnel in municipalities.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)
The problem of access to the forest territories is defined as very important and at the same time, as a real quick solution with good planning

CHALLENGE DESIGN WORKSHOP – LL BG

CHALLENGE FRAME - 1

Detection & response

NAME
Provide a title for the challenge. (50-75 characters)
Insufficient provision of modern equipment and persons prepared to work with it for detection, reconnaissance and extinguishing of forest fires

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
There is no built-in comprehensive monitoring system in the forest territories, even in key and vulnerable places; Insufficient specialized vehicles in the Forest enterprise and the fire service for an initial attack. Lack of sufficiently innovative technical means for intelligence, modeling and forecasting; There is no specialized aviation unit to fight forest fires

PROBLEM STATEMENT
Provide an extended description of the problem that the challenge is going to address. (up to a 1000 characters)
The preparation part explains why there is no comprehensive detection monitoring system. The provision of equipment for extinguishing fires is hampered by the lack of sufficient equipment and the poor access infrastructure in some of the forest areas. So the response may be delayed. As it became clear, not enough funds are allocated for the implementation of the planned firefighting activities. In the Forest enterpises and in the fire service there is not enough capacity and funds to use e.g. reconnaissance drones. This is also related to the lack of detailed GIS systems for the regions. Forest fire development models are not used. Only the expertise, experience and theoretical knowledge of the potential development of the fire is used, which without good intelligence is less effective. A similar weakness is also related to the lack of a specialized aviation unit for extinguishing. Military helicopters are used as a last resort, the main purpose of which is something else. They are not efficient enough, their use is expensive and therefore limited.

WHY THE PROBLEM EXISTS?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)

Purchasing, maintaining and training personnel to operate modern fire detection and response equipment is financially expensive. Now, in individual ministries - the Ministry of the Interior, the Ministry of Agriculture - Forest enterprises, the Ministry of Defense and some private companies, there is equipment that is used and maintained to fight forest fires. There is no regulatory requirement for harmonization between them. Budgetary, state departments are chronically experiencing difficulties in financing. There is no common, coordinating unit to unite efforts at the national and regional level to provide modern fire-fighting equipment. The available contacts are rather a personal initiative of individual executives.

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
Clarification of responsibilities between different departments regarding the provision and maintenance of fire detection and response equipment. Coverage of the entire territory with online monitoring; Provision for all vulnerable points, initial fire attack technique, incl. in plans to provide water and personnel for action in the fire season; Solving the issue with a specialized aviation unit at the national level; Strengthening of the information campaign on these problems, to ensure public support and financing of budget departments, for new technical equipment.

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
Campaigning, lack of consistency in providing information on activities on forest fire issues. The public hardly becomes an ally of the government organizations that are paid to keep out fires. Financial restrictions. Lack of administrative capacity for innovative solutions.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)
Among the participants in the CWI group, there was an opinion that better communication with the general public and the accessible presentation of information on the deficits in detecting and extinguishing forest fires will contribute to decisions on their implementation.

CHALLENGE DESIGN WORKSHOP – LL BG

CHALLENGE FRAME – 2

Detection & response

NAME
Provide a title for the challenge. (50-75 characters)
Insufficient number of well-prepared and trained local firefighting units;

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
There is no coordination unit to deal with preparation, equipment and response readiness at the municipality level;

PROBLEM STATEMENT
Provide an extended description of the problem that the challenge is going to address. (up to a 1000 characters)
The problem is complex - economic and demographic. There are few young people left to live in small towns in rural areas. Volunteer fire brigades (fighting teams) no longer exist in many places. There is no comprehensive system for their training, equipment and motivation on the part of the institutions. There is no legal requirement for this to individual departments. The municipality, which is closest to the people, does not have such coordination functions. Separately, there is a lack of sufficiently trained personnel to work with modern equipment - GIS systems, surveillance cameras, drones, for reasons highlighted in other problems - ambiguities in the rights and responsibilities of the owners of the territories, lack of planned investments in new specialists.

WHY THE PROBLEM EXISTS?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)
35 years ago, voluntary groups for extinguishing forest fires were created in every populated place. They have undergone training courses. For their activities, they received equipment, and their annual needs for firewood were met with priority. In the years after the democratic problems, changes took place that brought market (monetary) mechanisms to the fore and a large part of the activities remained only on a professional basis. Currently, Forest Enterprises have the opportunity to train similar groups of people. Such an approach is quite difficult to administer and risky for management, due to the danger of accidents. Because of this, voluntary formations are decreasing.

Separately, working with high-tech platforms and machines requires highly qualified individuals, whose demand on the labor market is high. Seasonal forest work and field work is not the most attractive for them. The Forest Enterprises and the Fire Safety Service are working on training experts, but it is a slow process.
In reality, complex solutions are not sought between the individual institutions with partial capacity on the matter.

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
Prepared a streamlined system for training experts to work with modern fire-fighting equipment, by increasing the qualification of management personnel in the fire service; Creation of mobile volunteer firefighting groups on a municipal basis, which are constantly trained and supported (materially and morally); Implementing an effective communication strategy to increase public support for the activities of people who protect landscapes from fire; Integration of the efforts of individual services with capacity in digital technologies for common projects for fire risk monitoring and management (these are agricultural, forest service, road and railway maintenance, cadastre, educational and scientific institutions. Coordination is carried out at the municipality level, district level and genera.

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
The staff (number of employees) in budget departments is limited. There is a lack of sufficient funding for training activities. In many settlements, there are no persons suitable in age and qualification to form voluntary groups for extinguishing. Communication between the individual institutions is not well coordinated, often due to the lack of public information

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)
With the greatest weight, the participants determined the problems of ensuring coordination, and as the fastest way to solve the issue of providing mobile extinguishing groups in each municipality.

CHALLENGE DESIGN WORKSHOP – LL BG

CHALLENGE FRAME – 1

Restoration & Adaptation

NAME
Provide a title for the challenge. (50-75 characters)
An integrated landscape-level approach to recovery and adaptation does not exist

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Inefficient and slow system for analyzing the causes and consequences of forest fires. Investigations are limited to the specific location and source of ignition rather than the complex of causes that led to a large-scale fire. Cases of effectively punished arsonists (even if they become known to investigators) are extremely rare, because they are difficult to prove in court.

PROBLEM STATEMENT
Provide an extended description of the problem that the challenge is going to address. (up to a 1000 characters)
Recovery of the damages caused by forest fires is the responsibility of the owner of the territory. In the general case, these are Forest enterprises. Funds for the restoration are planned in accordance with the Forest Act and spent according to the expertise of foresters. Due to the lack of Regional plans for the development of forest territories (RPDFT) and/or General development plans (GDP), the methods of restoration depend on the activity of the owner. Other interested parties do not participate in these decisions. In cases where European program funds are used, there is a conservative control, only for the relevant site. There is no larger-scale view, with which the prerequisites for new fires remain.

WHY THE PROBLEM EXISTS?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)
At this point, wildfires are seasonal events that, once they pass, leave damage mainly to forestry. Farmers receive compensation and subsidies for the areas they farm under various programs (including state aid), while there are none for the forest areas. Thus, there is no pressure from the local public, media or NGOs, as there are not many direct victims of the fires. Media coverage of the recovery is not a priority, as is the fire event itself. The passivity of the media and institutions (investigative service) is even greater when the causes and agents remain unclear or not denied.

As pointed out in PP1 (preparedness and preparedness) there is no planning for sustainable landscapes To a large extent, the reasons also come down to the lack of uniform coordination of such processes, for example by the municipality.

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
A system built by all departments for monitoring and reporting the funds spent on recovery and support after forest fires and by ownership; Introducing a system to track what happens with fire investigations and what the results are; Changes in the regulatory framework to increase the authority of the municipality to coordinate landscape management at the municipal level, regardless of ownership; Creation of a coordination unit in the municipality, which will be financially secured for the creation of the GDP and RPDFT in a short period of time. Conducting an effective information campaign through the media and social networks.

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
The problems are at the political level. The capacity of the administration is insufficient, especially at the local level. There are no dedicated planned funds for such activities, except for external projects.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)
According to the CWI participants, the lack of comprehensive planning at the landscape level is of very high weight for solving the stated problem and is relatively affordable and feasible.

CHALLENGE DESIGN WORKSHOP – LL BG

CHALLENGE FRAME – 2

Restoration & Adaptation

NAME
Provide a title for the challenge. (50-75 characters)
Ineffective and inconsistent educational and informational activity to improve public awareness and responsibility regarding practical adaptation to environmental

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Insufficient educational activities and other informational activities for recovery and adaptation. Often the same are presented as additional requirements or restrictions, resp. find public support difficult.

PROBLEM STATEMENT
Provide an extended description of the problem that the challenge is going to address. (up to a 1000 characters)
The country has developed strategic documents on climate change, but they are known to individual experts and the institutions that prepared them. Likewise, actions to restore forest and other areas affected by fires follow old administrative rules, not strategies for the future. Educational activities are investments and require finances that are insufficient or inefficiently allocated.

WHY THE PROBLEM EXISTS?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)
The problem exists because adaptation measures are presented and understood as constraints rather than management adaptation. Thus, they do not meet enough public understanding and support, especially if they are associated with additional financial costs. Another reason is the ineffective educational and information activity for the dissemination and application of the achievements of science, regarding the adaptation of the management of natural resources. E.g. such specific educational subjects are lacking in schools. Courses for additional qualification of field personnel in forestry and agriculture are not always effective. There are no statutory requirements for the qualification of decision-makers, i.e. in political positions.

The media is not interested in capacity building efforts, only in the negative aspect of the issues.

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
Creation of projects with national or international funding with the aim of: Professionally planned, financed and implemented in a clear, understandable for individual target groups, educational and media strategy for the need to adapt the management of natural resources in accordance with climate change; The media have been drawn to the cause of adaptation through their involvement in plans and projects dedicated to adaptation;

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
Lack of capacity and funds. Campaign ability of actions. Adverse reaction of part of the logging and related industry,

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)
According to CWI participants, educational activities and other informational activities for recovery and adaptation are relatively easy to implement and have a high weight to solve the problem;

Catalonia

CHALLENGE DESIGN WORKSHOP – LL CAT

CHALLENGE FRAME – 1

Prevention & preparedness

NAME
Provide a title for the challenge. (50-75 characters)
Fire information platform for data sharing

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Platform to store relevant information for pre- and post-fire planning, as well as prioritized values that are continuously updated.

PROBLEM STATEMENT
Write a short promotional sentence of the challenge. (100-150 characters)
Making decisions on complex issues such as forest management to reduce fire risk or fire risk assessment needs to be supported by information such as soil moisture, the type and amount of fuel available, or the intensity and wind direction among others. These data, although may be available, are not up-to-date and are located on very different platforms, complicating continuous monitoring during fire seasons. Also, information about the response of the existing species in the different forest ecosystems in Catalonia to the effects of fire (fire ecology) and in the context of climate change (which species will be more adapted) is currently insufficient.

WHY THE PROBLEM EXISTS?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)
This problem exists for several reasons. On the one hand, different bodies are responsible for data collection, and they use independent platforms to store and to monitor them which are not integrated. Additionally, in some cases, there may not be the willingness to share the information. Also, in some cases, the data collection does not have the desired periodicity. Expensive methodologies for data collection together with limited budgets for the entities involved can be an impediment to the willingness to share information in an automated manner. The lack of a protocol to share data between entities means that the problem persists.

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
Establish a single platform for storage and access to relevant information to pre- and post-fire planning. It should be able to prioritize values and therefore it should be continuously updated (implying that the processes for introducing new data are defined and approved) employing a common agreed framework upon included variables. Ideally, this information would be represented on a map and the different actors involved in the management of the territory, forest fire risk prevention or preparation would have access to it.

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
The platform would use a homogenized cartography and serve to share the collected data among the relevant actors. Transparency of how and when data has been collected is important. The situation could be reached in which, even though the purpose of the tool is for the common good, some of the actors who dispose of the data would be reluctant to share it. Data that could be relevant may not exist. The possibility of expanding the platform with the results of future work should be left open.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)

CHALLENGE DESIGN WORKSHOP – LL CAT

CHALLENGE FRAME – 2

Prevention & preparedness

NAME
Provide a title for the challenge. (50-75 characters)
Reduction of available fuel in forest areas

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Reduction of available fuel by prioritizing strategic zones according to fire behaviour and wildfire impact

PROBLEM STATEMENT
Write a short promotional sentence of the challenge. (100-150 characters)
Rural depopulation and the consequent reduction of rural economic activities is allowing an increase of forest biomass in forests and in abandoned agricultural land. These forest that grow without active forest management represent an increase of wildfire risk and the consequent impacts on the natural and cultural heritage, as well as the properties close to these areas (businesses or real estate). Identifying which are the priority areas for carrying out forestry actions and silvicultural treatments to reduce fuel, as well as which are the most suitable treatments is essential. Specifically, identify possible treatments (change of land use, forestry treatments, prescribed burns, silvopastoral systems, agroforestry, etc.), generate recommendations on their practical application, feasibility on the ground, marginal cost, maintenance, and impact on accumulation of fuels and fire behaviour, it is necessary to standardize fuel management plans both at the stand level, as well as their spatialization in the landscape. It is also important within forestry activities and work to reduce fuel, to influence the importance of the elimination of the remains of felling and which are the most cost-efficient treatments for their elimination: cutting, shredding, burning, etc.

WHY THE PROBLEM EXISTS?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)
There is no standardized information base that covers all or a large part of the possible spectrum of treatments focused on fuel changes, and associated with a set of parameters, also standardized, that allow to evaluate their impact on fuels, costs, fire behaviour.

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
Management guidelines and silvicultural itineraries for each type of forest considering its cost-efficiency. Practical training classes on the best forest management itineraries for fire prevention. Guidelines for Sustainable Forest Management of Catalonia. Keys for the vulnerability to fire of tops of forest structures. Guidelines and working group on what to do with cutting remains, especially in the case of Strategic Management Points (PEGs).

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
For the parameterization of management alternatives and decision on where to act as a priority, information on fuel models, detailed dosometric data is needed. But in case of land use change, analysis of the possibility of conversion to crops, economic analysis of the potential of the crops. This database would not be spatialized in terms of the impact of adjacency, and the impact of the spatial configuration of the treatments. This would have to be analysed at landscape level.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)

CHALLENGE DESIGN WORKSHOP – LL CAT

CHALLENGE FRAME

Detection & response

NAME
Provide a title for the challenge. (50-75 characters)
Technological improvements to predict fire behaviour

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Technological improvements to predict fire behaviour using relevant and up-to-date environmental data

PROBLEM STATEMENT
Write a short promotional sentence of the challenge. (100-150 characters)
In emergency situations where quick decisions must be made, the criteria of professionals based on their knowledge and experience is prioritized. In a situation of paradigm shift, this knowledge and experience may become insufficient, but existing fire spread simulators are slow and not always reliable. Additionally, the reference data for decision-making during the emergency is updated every few hours, being too long periods in some cases. The responsibility of the commanders and information that at times may not be up-to-date creates an additional stress situation for the emergency commanders that makes it difficult to make decisions.

WHY THE PROBLEM EXISTS?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)
The currently available monitoring tools (software and real-time climate data frequency) of a forest fire are not effective in predicting the behaviour of the fire in during the emergency phase. This fact limits decision-making based primarily on the expert knowledge of the fire department. The emergence of the 6th generation fires where fire behaviour is different from that of traditional fires means that the decisions that can be made by commanders based on their experience is insufficient and even counterproductive in downdraft situations. The consequences of bad decisions can have serious consequences, not only in the goods that may be affected, but also in human lives of the emergency bodies.

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
Technology that allows predicting the evolution of the fire employing accurate and fast models to facilitate decision-making in emergency situations. The interface should be simple, but with the ability to enter the relevant characteristics to describe the existing fire. It should use trustful data sources (accurate cartography, vegetation maps, meteorological information, satellite data, etc.) updated with sufficient frequency in each case.

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
Models to be used during the emergency phase require accurate cartography, vegetation maps with scrub and more detail, relevant, continuous and reliable meteorological information, etc. in order to make accurate predictions. Its application should be simple and fast, and the data processing could be done on supercomputers. The results should be graphical to be able to be interpreted quickly by the emergency commands on site.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)

CHALLENGE DESIGN WORKSHOP – LL CAT

CHALLENGE FRAME

Restoration & Adaptation

NAME
Provide a title for the challenge. (50-75 characters)
Tool to support decisions about actions on burned land

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Land use decision support tool to evaluate actions on burnt land for climate change adaptation at long term

PROBLEM STATEMENT
Write a short promotional sentence of the challenge. (100-150 characters)
Climate change is creating a new context to which the vast majority of forests in Catalonia are not adapted. Natural disasters such as Extreme Wildfire Events where a large area is affected can become an opportunity to plan a resilient landscape that includes changes in land use or the introduction of species more adapted to the new context. Unfortunately, there is limited knowledge on technical aspects of the recovery of ecosystem services (natural dynamics vs. silvicultural restoration actions) with species adapted to the new climatic context, and often decisions are made at the stand level without considering a landscape planning that programs ex-ante (before the contingency) post-fire measures that improve the resilience of the territory to forest fires in economic, social and environmental terms.

WHY THE PROBLEM EXISTS?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)
Slow but continuous land abandonment in rural areas and a low economic direct profit of harvested products on natural land generated a landscape covered with large extensions of dense and homogenic forests which has high risk of wildfires. High costs of silvicultural treatment and long term turn overs contributed to this situation. The new climate context adds uncertainty on today's best decisions worsening the situation. Now, when the administration may have interest to solve the situation for the common good (improve ecosystem services and provision of local wood), available technical knowledge for decision makers is limited on some occasions to select the best practices on burned land to generate a new and improved multi-purpose landscape.

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
A decision support tool focused on improving landscape resilience to wildfires in economic, social and environmental terms that includes action protocols and priority areas for management/recovery of land use after a wildfire. It should include information about the territory (cartography, existing economic activity, climatology, settlements etc.) to determine priority areas and possible land use changes to create a territory ready for an improved response capacity in case of new wildfires.

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
This tool should include information on possible species and forestry actions necessary to create a territory resilient to climate change and its effects, as well as the typology and characterization of infrastructures to support extinction in the event of fire (all fire generations included).

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)

Chile

CHALLENGE DESIGN WORKSHOP – LL CHILE

CHALLENGE FRAME – 1

Prevention & preparedness

NAME
Provide a title for the challenge. (50-75 characters)
Public policy for the national prevention of rural and forest fires.

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Chile, territories and communities resilient to the forest fires of today and tomorrow.

PROBLEM STATEMENT
Write a short promotional sentence of the challenge. (100-150 characters)
Although several initiatives on prevention issues are being developed in Chile, a lack of unification and coordination of the relevant actors can be identified. Therefore, education actions for prevention, preparation of the territory (not only of forestry companies, but of all those that can cause fires such as electricity, railways, etc.) and preparation for emergencies must be coordinated by the State, for the entire territory, focused on the diversity of people and existing landscapes.

WHY THE PROBLEM EXISTS?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)
The problem exists because of the lack of a clear policy. Decision makers do not act specifically and their actions are carried out only for the duration of the emergency. Therefore, it is not established as a long-term priority by the political and legislative world. Being temporary events, as the months of fires pass, the topic stops being discussed until the next season starts again. Added to this, fires occur mostly away from the capital city (Santiago) and the real impact caused by the fires from the economic, environmental and social aspects is not visible for the major policy makers (since there is no monetary value, the real impact is never measured, since they are intangibles).

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
A community, public companies and private estates fully educated, prepared and prevented, in all aspects of fires so that they can go down to their minimum expression and in case of appearing, to be able to be prepared for the contingency.

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
Current budgets and legislation must be a priority at the country level, which is not the case because fires are a temporary emergency concentrated in a few months of the year and also because in Chile, the forestry sector does not have a good image, it is not a problem of national priority nor is it promoted by legislators. Finally, there are costs that are not perceived directly because they are intangible, such as environmental effects.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)
-

CHALLENGE DESIGN WORKSHOP – LL CHILE

CHALLENGE FRAME – 2

Prevention & preparedness

NAME
Provide a title for the challenge. (50-75 characters)
Quantification of benefits of preventive measures on multiple values t

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Prevention: benefits for one, benefits for all.

PROBLEM STATEMENT
Write a short promotional sentence of the challenge. (100-150 characters)
Although several initiatives on prevention issues are being developed in Chile, a lack of unification and coordination of the relevant actors can be identified, whether public or private, both at the national and regional level, as well as territorial.

WHY THE PROBLEM EXISTS?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)
One of the reasons for this lack of coordination is that the different actors are not capable of quantifying the effect of the preventive measures they carry out, leading them to underestimate it, which ends up generating little interest in coordinating with others. In addition, each of the actors has different interests in prevention. For this reason, it is relevant to quantify the effects of prevention policies on different values (economic, social, cultural, political, etc.) to highlight the importance of prevention and make visible the benefit that it can generate for each actor as a result of that collaboration.

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
That all stakeholders, both public and private, both at the national/regional level and at the territorial/communal level, can easily estimate the effect of fuel treatments, educational campaigns, patrols, etc. on their areas of interest (e.g. on housing and population in the case of public actors, on income and production in the case of private actors).

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
The system must be unique, accessible by the different actors and easy to use (non-expert users). It should provide quick and easy to interpret estimates. It must be able to deliver results of different prevention measures both on different values at risk, as well as in the number and intensity of fires in a season. It must make it possible to generate a record of the measures implemented for subsequent evaluation after the fire season.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)
-

CHALLENGE DESIGN WORKSHOP – LL CHILE

CHALLENGE FRAME – 1

Detection & response

NAME
Provide a title for the challenge. (50-75 characters)
Landscapes prepared for the emergency.

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Landscapes prepared for emergencies, which give an opportunity to combat efficiently taking care of the environment, especially in relation to the use of water.

PROBLEM STATEMENT
Write a short promotional sentence of the challenge. (100-150 characters)
There is a lack of public-private coordination for fuel management in the territory.

WHY THE PROBLEM EXISTS?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)
The area currently covered by plantations has been established in large extensions of territory continuously, whether it is a large or medium-sized private company or a small owner, which makes it more difficult to manage uniform and adequate fuel to lower its continuity and load in the territory. In addition, not all owners incur costs associated with forest management, since they do not have the financial and/or technical support for it. On the other hand, commonly an owner may have all the prevention measures implemented (firebreaks, strips free of vegetation, pruned trees, etc.) but the neighbour/s does not, so all the effort is lost because the fire encounters a greater number of fuel available to burn and propagate.

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
- That all owners manage their forests. - The ideal would be to have a landscape level with protection structures that allow combat resources to arrive safely. - Have efficient and low-cost machinery available to private SME owners.

- That despite the adverse conditions for aerial firefighting (due to low visibility) it is possible to fight on the ground. This means that air combat is not the only option.

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
All the actors present in the territory must meet and plan the measures at the landscape level and not at the property-owner level as is currently the case. It is necessary to have some legal instrument that benefits or encourages SME owners to manage their forests, something like DL 701 was in the past. There should be support (economic and technical) from the State through the municipalities, for example, for the execution of these prevention measures on properties owned by SMEs.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)

CHALLENGE DESIGN WORKSHOP – LL CHILE

CHALLENGE FRAME – 2

Detection & response

NAME
Provide a title for the challenge. (50-75 characters)
Management of major emergencies due to forest fires.

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
An effective public-private coordination supported by high-level technicians.

PROBLEM STATEMENT
Write a short promotional sentence of the challenge. (100-150 characters)
There is a lack of public-private integration, alignment and coordination to face the fight against large fires.

WHY THE PROBLEM EXISTS?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)
The problem exists due to a lack of planning and a lack of technical analysis of fires, the political and the technical do not talk or do little. Furthermore, there are no political priorities to do so. Today there is an inefficient management of resources by not establishing strategic and tactical objectives based on analysis of the forest fire.

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
• Political technical balance. • Unified technical command.

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
• Policy that integrates the technical vision of emergency management, public policies on forest fire management in accordance with the Disaster Risk Management (DRM) policy. • National Plan for the Prevention and Control of Forest Fires.

• Forest Fire Law.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)

CHALLENGE DESIGN WORKSHOP – LL CHILE

CHALLENGE FRAME

Restoration & Adaptation

NAME
Provide a title for the challenge. (50-75 characters)
Comprehensive rehabilitation with local relevance and in expert hands.

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Social, environmental and productive rehabilitation based on science and expertise with prospective and predictive thinking.

PROBLEM STATEMENT
Write a short promotional sentence of the challenge. (100-150 characters)
Restoration is not incorporated into fire management, nor is there an understanding of the territory as a whole, mainly due to a lack of knowledge and scientific information that allows understanding how ecosystems work before, during and after fires.

WHY THE PROBLEM EXISTS?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)
When it comes to fire management, in Chile, financing is directed mainly at combat and to a lesser extent at prevention, but restoration is not considered. Some years financing is considered to address the restoration, but there is no continuity, it is a reactive decision rather than a strategic one. It is also not clear who are the ones that carry out the post-fire restoration, there are the municipalities, the regional governments, and other public institutions, but they do not talk to each other. Finally, the restoration must be thought from the perspective of prevention and the conformation of landscapes and communities, however, currently only actions are carried out after the catastrophe.

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
- Risk plan (emergency - prevention - restoration) integrating the social and ecological aspects. - Incorporation of a scientific basis in decision-making related to restoration.

- Basal financing to promote and execute restoration plans. - Ability to manage the state with other organizations and among the state. - Go from reactive to predictive.

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
- There is a limitation of financing, which is not stable and long-term plans cannot be developed. - There is a bad perception of society before the forestry sector and the fires aggravate that feeling.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)

Galicia

CHALLENGE DESIGN WORKSHOP – LL GAL

CHALLENGE FRAME

Prevention & preparedness

NAME
Provide a title for the challenge.
Highly specialised training in technical fire, for operatives, forest firefighters and technical firefighting managers (DTE).

SUBTITLE
Write a short promotional sentence about the challenge.
Funding is being sought for the creation of an area of pre-dried fuel plots for the development of high-intensity technical fire.

DESCRIPTION OF THE PROBLEM
Provide an extended description of the problem to be addressed by the challenge. (Up to 1,000 characters)
Climate change is more frequently producing drier and hotter landscapes that are more susceptible to burning and, moreover, with greater severity, which increases the risk of large forest fires, also known as mega-fires or sixth-generation fires, extreme forest fires, which in most cases exceed the extinguishing capacity of the most advanced devices in the world. The abandonment of rural areas allows a greater accumulation of fuel in areas of great biomass production potential (more fertile and deeper soils), which implies a greater convective potential and a greater affectation of rural and urban environments, which means a greater risk to life and property. One of the most effective actions during extinguishing in this type of context is technical fire management. The use of fire is carried out under very narrow window of opportunity conditions, which is why it is necessary to have highly specialised personnel, as for other types of personnel it would simply be outside the window of opportunity. On the other hand, it is important to manage stress, to generate certainty in an interface environment.

WHY DOES THE PROBLEM EXIST?
Describe the context of the problem addressed in the challenge. Explain and explore why the problem exists and why it is important in the context of the challenge. (Up to 1,000 characters)
The problem exists because the training that most closely resembles a real fire today is the execution of prescribed burns, which are carried out under non-extreme conditions in which fire management is relatively simple and with little risk. The other

training is the experience gained in extreme behavioural scenarios, where stress and fear management come into play when confronted with situations they have not been able to experience before.
We believe it is necessary to create a pre-designed environment, where fuels have a humidity more similar to the one we will have during extinguishing, and in which forest firefighters can apply different fire management and containment techniques, without the danger of pyroescape.
We also believe it is necessary to develop an interface environment, both rural and urban (housing estates), where real fire can be generated in a previously designed environment (safety) so that firefighters can train the different manoeuvres before they have to do so in a real scenario.

WISH LIST
Indicate which features and benefits you would like to have in the "perfect" solution. If there are key features that would be relevant, indicate them. (Up to 500 characters)
To have the necessary funding for the creation of: 1. Installation for pre-drying vegetable fuel, controlling the temperature and humidity, and with a storage area. 2. A minimum area of 10 hectares, where pre-dried vegetable fuel can be installed, with pre-designed plots, so that when ignition begins, a high intensity fire can be created: Training and certification of forest firefighters and technical directors of extinction, in technical fire management, being able to control the severity of the fire. Testing of the equipment used in extinguishing forest fires. Possibility of developing new tools that allow operatives to tackle fires with greater skill and safety in operations. 3. Creation of scenarios with containers and other elements to simulate rural and urban interface environments, with gas installation to be able to regulate the intensity of the fire and inclination of the flame.

REQUIREMENTS AND LIMITATIONS
Indicate the requirements and constraints for the solution to meet the challenge (technical, economic, social, other). (Up to 500 characters)

ADDITIONAL INFORMATION
Please provide any additional information you consider relevant to the description of the challenge or possible solution. (Up to 500 characters)
(...)

CHALLENGE DESIGN WORKSHOP – LL GAL

CHALLENGE FRAME – 1

Detection & response

NAME
Provide a title for the challenge.
To form SMART GOGGLES that provide certainty and increase the safety of Forest Firefighters during emergencies.

SUBTITLE
Write a short promotional sentence about the challenge.
A tool that will allow Operatives to be more precise when carrying out extinguishing manoeuvres in the new type of forest fires.

DESCRIPTION OF THE PROBLEM
Provide an extended description of the problem to be addressed by the challenge. (Up to 1,000 characters)
Forest firefighters have to deal more and more frequently with a new type of fire that is becoming more dangerous, more voracious and more catastrophic with each passing year: 6th generation forest fires and extreme forest fires. Devastating fires that, with power levels of over 90,000kW/m, are capable of devastating everything they intend to destroy. Examples: Portugal (Pedrograo 2017), Sweden (2018), Australia (2019-2022), California (2021), Turkey (2021), Greece (2021), London (2022), Spain (Malaga (Sierra Bermeja 2021), Avila (2022), Galicia (O Courel and Valdeorras 2022)). It is obvious that knowing all of the above we need tools to help us tackle the problem safely, clearly smart glasses alone will not be enough, but complemented with training, knowledge, equipment and resources will increase the chances of success.

WHY DOES THE PROBLEM EXIST?
Describe the context of the problem addressed in the challenge. Explain and explore why the problem exists and why it is important in the context of the challenge. (Up to 1,000 characters)
The problem exists because of the simultaneous combination of many factors among which we can highlight: • Climate change (with higher temperatures, longer and longer periods of drought, etc.). • The progressive abandonment of rural areas • Uncontrolled planting of pyrophytic species • Developments built on rezoned rural land encroaching on forest land

- And of course, intentionality.

WISH LIST
Indicate which features and benefits you would like to have in the "perfect" solution. If there are key features that would be relevant, indicate them. (Up to 500 characters)
The SMART GLASSES will have a series of applications that will display data on a screen: • we would have the possibility to take pictures of what we see, • we would know how far we are from the flames, • the level of radiation to which we are exposed, • the pollutants we are exposed to and their concentration, • the amount of water remaining in the pump truck, • wireless connectivity modules for data transmission, • voice commands to control the device, • GPS and GOOGLE EARTH sensor that would allow us to see where our comrades are, nearby water recharging points, access tracks, firewalls... and any other information transmitted to us from the Advanced Command Post, • thermal camera, night vision... • augmented reality that helps us step by step to carry out manoeuvres, small mechanical repairs, even overcoming obstacles, etc. The INTELLIGENT GLASSES would monitor the Forest Firefighter and would know at all times how much stress he/she is undergoing and other important medical data.

REQUIREMENTS AND LIMITATIONS
Indicate the requirements and constraints for the solution to meet the challenge (technical, economic, social, other). (Up to 500 characters)
The SMART GOGGLES should be perfectly inserted/adapted to the helmet of the Personal Protective Equipment and should be light (low weight) while maintaining the characteristics of conventional firefighting goggles (watertight, comfortable and with a wide angle of vision).

ADDITIONAL INFORMATION
Please provide any additional information you consider relevant to the description of the challenge or possible solution. (Up to 500 characters)
(...)

CHALLENGE DESIGN WORKSHOP – LL GAL

CHALLENGE FRAME – 2

Detection & response

NAME
Provide a title for the challenge.
PHOTOLUMINESCENT HOSES

SUBTITLE
Write a short promotional sentence about the challenge.
Flexible photoluminescent hoses 25 mm Ø for forest fire fighting

DESCRIPTION OF THE PROBLEM
Provide an extended description of the problem to be addressed by the challenge. (Up to 1,000 characters)
• Many hoses are lost at night when extinguishing forest fires. • That many stray hoses are burnt at night during forest fire extinguishing works. • That hoses are very expensive. • Operatives usually have problems moving safely through the burnt area of a forest fire at night, either because of heavy smoke, dense vegetation or unfamiliarity with the surroundings, so long hose lines, if visible, would function as a safe escape route for the Forest Firefighters in case of an emergency.

WHY DOES THE PROBLEM EXIST?
Describe the context of the problem addressed in the challenge. Explain and explore why the problem exists and why it is important in the context of the challenge. (Up to 1,000 characters)
Because most of the windows of opportunity for large forest fires are at night and this is when forest firefighters can work in direct attack with water lines.

WISH LIST
Indicate which features and benefits you would like to have in the "perfect" solution. If there are key features that would be relevant, indicate them. (Up to 500 characters)
• The fact that the long water lines would be visible would increase the safety of operations and avoid unnecessary loss of material. • The luminescence remains active for several hours.

REQUIREMENTS AND LIMITATIONS
Indicate the requirements and constraints for the solution to meet the challenge (technical, economic, social, other). (Up to 500 characters)
• 25 mm diameter • Flexible • Slight • Resistant • Price contained

ADDITIONAL INFORMATION
Please provide any additional information you consider relevant to the description of the challenge or possible solution. (Up to 500 characters)
(...)

CHALLENGE DESIGN WORKSHOP – LL GAL

CHALLENGE FRAME - 3

Detection & response

NAME
Provide a title for the challenge.
COOLING SYSTEM TO KEEP THE WATER IN THE TANKERS OF THE FIRE ENGINES AT 4ºC

SUBTITLE
Write a short promotional sentence about the challenge.
Increase the extinguishing capacity of water by lowering its temperature.

DESCRIPTION OF THE PROBLEM
Provide an extended description of the problem to be addressed by the challenge. (Up to 1,000 characters)
The new type of fires are characterised by their very high intensity and the enormous amount of water needed to put them out, so the colder the fire, the less water will be needed, since in the bush, the amount of water is limited to that which can be carried by the fire engines.

WHY DOES THE PROBLEM EXIST?
Describe the context of the problem addressed in the challenge. Explain and explore why the problem exists and why it is important in the context of the challenge. (Up to 1,000 characters)
The determinants are climate change (higher temperatures and longer periods of drought) and the large amount of fuel available.

WISH LIST
Indicate which features and benefits you would like to have in the "perfect" solution. If there are key features that would be relevant, indicate them. (Up to 500 characters)
Maintain the water inside the tanks of fire engines at 4º C.

REQUIREMENTS AND LIMITATIONS
Indicate the requirements and constraints for the solution to meet the challenge (technical, economic, social, other). (Up to 500 characters)
Condition to be fulfilled: water cooling system incorporated in the water tank Limitation: possibility to operate with the vehicle's engine or to have its own cooling system engine. Weight and volume of the cooling equipment could be a limiting factor.

ADDITIONAL INFORMATION
Please provide any additional information you consider relevant to the description of the challenge or possible solution. (Up to 500 characters)
(...)

CHALLENGE DESIGN WORKSHOP – LL GAL

CHALLENGE FRAME – 1

Restoration & Adaptation

NAME
Provide a title for the challenge.
Increased accuracy of rainfall intensity prediction

SUBTITLE
Write a short promotional sentence about the challenge.
Amplification of rainfall modelling in quantity and intensity.

DESCRIPTION OF THE PROBLEM
Provide an extended description of the problem to be addressed by the challenge. (Up to 1,000 characters)
Rainfall modelling prediction models in terms of quantity and especially intensity do not have the necessary accuracy to be able to predict the increased runoff that occurs in areas affected by high severity fire. Better prediction of high intensity events could help to implement a runoff warning system in areas affected by high severity fires.

WHY DOES THE PROBLEM EXIST?
Describe the context of the problem addressed in the challenge. Explain and explore why the problem exists and why it is important in the context of the challenge. (Up to 1,000 characters)
Spatio-temporal resolution should be increased, fundamental meteorological studies on physical processes should be carried out, and more reliable data assimilation methods should be developed. Considering the new demand for continuous forecasting, innovative and refined assessment should be designed and carried out to understand and track the origin of model biases. Similarly, to understand the crucial dynamic and physical processes in the atmosphere and to improve model performance, more field campaigns should be designed and conducted.

WISH LIST
Indicate which features and benefits you would like to have in the "perfect" solution. If there are key features that would be relevant, indicate them. (Up to 500 characters)
Have a flood risk warning system in areas affected by fires.

REQUIREMENTS AND LIMITATIONS

Indicate the requirements and constraints for the solution to meet the challenge (technical, economic, social, other). (Up to 500 characters)

ADDITIONAL INFORMATION
Please provide any additional information you consider relevant to the description of the challenge or possible solution. (Up to 500 characters)
(...)

CHALLENGE DESIGN WORKSHOP – LL GAL

CHALLENGE FRAME – 2

Restoration & Adaptation

NAME
Provide a title for the challenge.
Assessment of fire severity impact on the soil

SUBTITLE
Write a short promotional sentence about the challenge.
Development of a remote sensor to analyse and assess the severity of a forest fire on the ground

DESCRIPTION OF THE PROBLEM
Provide an extended description of the problem to be addressed by the challenge. (Up to 1,000 characters)
At present, there is no known remote sensor that can perform an analysis of fire severity on the ground, and field assessments are required, which is more resource-intensive and time-consuming.

WHY DOES THE PROBLEM EXIST?
Describe the context of the problem addressed in the challenge. Explain and explore why the problem exists and why it is important in the context of the challenge. (Up to 1,000 characters)
The severity of fire on the ground determines the risk of post-fire runoff and erosion. Its rapid and accurate assessment is essential to mitigate this risk.

WISH LIST
Indicate which features and benefits you would like to have in the "perfect" solution. If there are key features that would be relevant, indicate them. (Up to 500 characters)
Have sensors to assess the severity with which a fire affects the ground.

REQUIREMENTS AND LIMITATIONS
Indicate the requirements and constraints for the solution to meet the challenge (technical, economic, social, other). (Up to 500 characters)

ADDITIONAL INFORMATION

Please provide any additional information you consider relevant to the description of the challenge or possible solution. (Up to 500 characters)
(...)

CHALLENGE DESIGN WORKSHOP – LL GAL

CHALLENGE FRAME – 3

Restoration & Adaptation

NAME
Provide a title for the challenge.
Flood warning system.

SUBTITLE
Write a short promotional sentence about the challenge.
Runoff and flood forecasting system.

DESCRIPTION OF THE PROBLEM
Provide an extended description of the problem to be addressed by the challenge. (Up to 1,000 characters)
There is no evidence of a runoff and flood forecasting system in Galicia and Spain for areas where forest fires have occurred, which would prevent possible damage to the inhabitants of these areas.

WHY DOES THE PROBLEM EXIST?
Describe the context of the problem addressed in the challenge. Explain and explore why the problem exists and why it is important in the context of the challenge. (Up to 1,000 characters)
The last decade has seen an increase in mega-forest fires, severely affecting important watersheds.

WISH LIST
Indicate which features and benefits you would like to have in the "perfect" solution. If there are key features that would be relevant, indicate them. (Up to 500 characters)
To have an open and dynamic information system that can raise awareness of the risk of runoff and flooding among the population, with special emphasis on areas that have lost vegetation cover due to a forest fire.

REQUIREMENTS AND LIMITATIONS
Indicate the requirements and constraints for the solution to meet the challenge (technical, economic, social, other). (Up to 500 characters)

ADDITIONAL INFORMATION

Please provide any additional information you consider relevant to the description of the challenge or possible solution. (Up to 500 characters)
(...)

Germany- The Netherlands

CHALLENGE DESIGN WORKSHOP – LL GER-NL

CHALLENGE FRAME - 1

Prevention & preparedness

NAME
Provide a title for the challenge. (50-75 characters)
Low awareness on nature-fire risk among citizens in the Netherlands

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Regarding risk culture, citizens are highly aware of flood risk in the Netherlands because of its well-documented historical relevance and experience. However, nature fire risk awareness is not yet broadly developed within society due to the historically low occurrence of such events on its landscape (Oswald, 2016). In recent years, wildfire risks have slowly gained relevance in social media due to their increasing incidence and their portrayal as of concern in local media. However, the challenge of rising nature fire risk awareness and the role of society in it remains untackled (Oswald, 2016).

PROBLEM STATEMENT
Provide an extended description of the problem that the challenge is going to address. (up to a 1000 characters)
Natuurbrandsignaal report 2023 suggest that the design of national action plan should follow a system of multi-layered safety, which serves various users' functions, and measures from the different layers complement and reinforce each other: Layer 1: Measures that try to reduce the risk of a wildfire (to a certain level). Layer 2: Measures to limit the impact of a wildfire: landscaping, compartmentalization, the adaptation of vegetation, adapted construction in high-risk areas, drought measures and mowing management. Layer 3: Measures to combat incidents and crisis management in the event of a wildfire improving: new tactics and techniques, training, adaptive strategies. Society in general (homeowners and users of nature and nature-urban interface, others) are critical in Layer 1 as wildfire ignitions in the Netherlands ignite on its majority due to human causes. The Natuurbrandsignaal '23 report aligns with the views gathered during a Stakeholders workshop on July 2023 to discuss wildfire in the Netherlands: awareness and education are critical to managing wildfires and building a fire risk culture. The authors of the report state that although we cannot manipulate the weather conditions that influence fire risk, we can manage the layout of the

landscape. Among their recommendations to tackle landscape management from a civil society front are:

- Education and awareness in the broader society
- All residents and users in or around nature reserves have to take measures to limit the flammability of their garden, home, business or activity.
- All residents should know what to do if a wildfire breaks out.

WHY THE PROBLEM EXISTS?

Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge.
(up to a 1000 characters)

According to the Natuurbrandsignaal (2023) report, wildfire ignitions in the Netherlands are rarely from a natural phenomenon (lightning strike) but human causes, for example, carelessness with a campfire or barbecue or people playing with fire in nature. Awareness campaigns and/or enforcement of regulations on the use of public land can help to reduce unwanted ignitions, which is particularly important where the majority of fires are due to human-caused ignitions (Barros, 2021).

There are few studies evaluating nature-fire risk perception in the Netherlands. Oswald (2016) explored the perception towards wildfire of residents living in the human-nature interface of the Veluwe National Park. Their study found out that residents recognized wildfire as a threat to residents living within the Veluwe but not to themselves or the community, even if they were within the Veluwe area. In addition, respondents agreed not to be prepared or informed and underestimate their ability to mitigate the risk and assume that such a responsibility belongs to the government, the emergency agencies and the media.

The low societal awareness and perception of nature-fire risk in the Netherlands and the responsibility of human activities in risk mitigation (by decreasing the likelihood of potential ignitions) is a gap in the integrated and sustained management of the increasing wildfire risk in the Netherlands that need to be tackled (Natuurbrandsignaal report, 2023).

WISHLIST

Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate.
(up to a 500 characters)

According to Rejeski (1993), discussions around risk include three primary groups: scientists, policymakers, and the public. While scientists form their opinion through rational processes and policymakers base it on multiple qualitative and quantitative sources of information, the public base it on their perspectives of circumstances despite data provided by the other two groups. Therefore, he asserts that trust among the three groups is critical to achieving a shared view of risk and encourages using more

participatory processes and dialogues. He suggests tools that visualize scientific data concerning a hazard that provides a point of access to meaningful discussion (Pine-John, 2014).

Participatory approaches have evolved and its applications expanded significantly the last decades. For example, the application of experiential learning through game-based methods is broadly documented in the field of education with positive learning outcomes (Stanitsas, 2019). We suggest, based on Stanitsas (2019) and Terpstra (2014), that:

- Public participatory engagement can become the means to integrate a nature-fire risk culture in modern society, which comes with a focus on building trust between actors and on raising awareness and motivation for taking actions to mitigate the impacts of hazards (see Wachinger et al., 2013).
- Public participatory engagement can be involved in DRR practices to create curiosity among individuals and collaborate with other institutions or related centers.

Therefore, the main desired characteristics of the participatory tools used to raise awareness by activating learning and enhancing meaningful discussion, are:

- The tool offers participants a space to share their experiences, perception and knowledge about a given situation.
- The tool implementation creates a safe space where participants share their values, norms, roles and goals around the given situation.
- The tool provides a simplified version of a complex concept, problem or scenario, creating a temporary situation with a common focus for participants to experience together and make sense of it.

We consider that serious games are tools that can offer the key features to evaluate and raise awareness on nature-fire risk among citizens, and motivate citizens to seek for more information.

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
From a risk communication perspective, a Risk Dialogue Approach can be beneficial and effective for increasing societal awareness. In this communication approach, the design of the participatory process depends on the purpose. In the case of the development of a game in the context of the Netherlands, such a goal is to evaluate and generate awareness. A game-based learning approach has an instrumental rationale because the focus is on building trust among actors and motivating people to take action to mitigate the impact of wildfires.

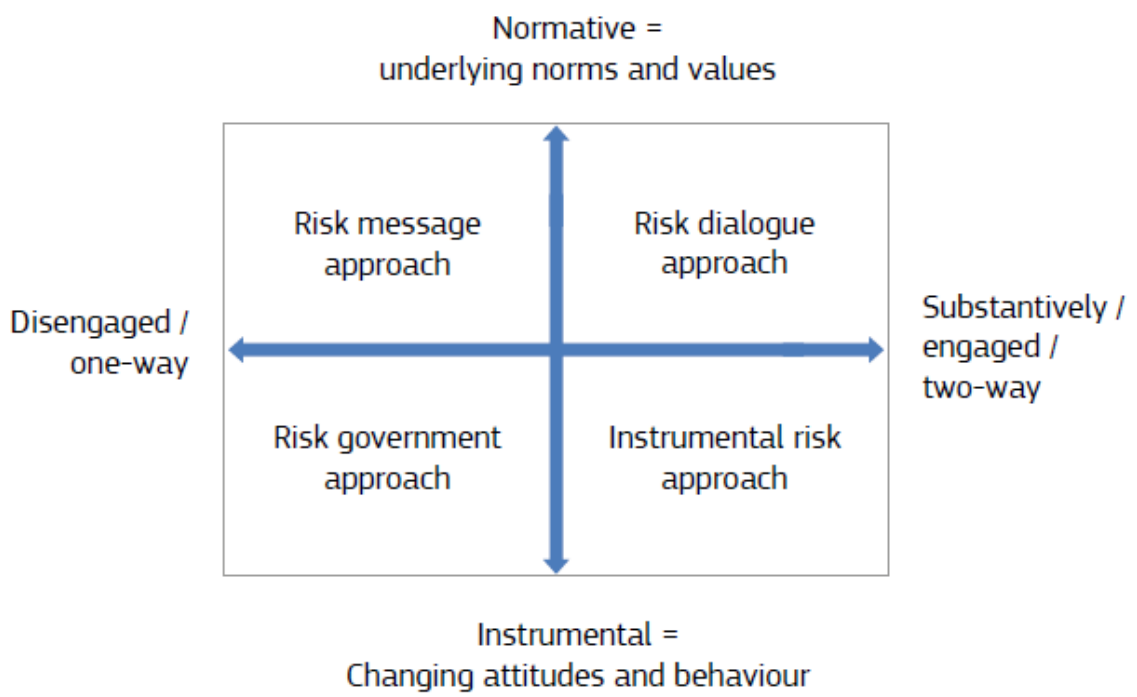


Figure 1 Different approaches in risk communication (Tepstra, 2017)

Requirements:

- The game-based learning tool must have a user-friendly design that reflects the local context and elicits discussion.
- There must be a network to facilitate the testing, implementation and evaluation of the game-based learning tool with citizens.
- The participation of citizens must be informed-consented.

Limitations:

- Time and resources will allow a limited implementation of the game-based tool.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)
N/A

CHALLENGE DESIGN WORKSHOP – LL GER-NL

CHALLENGE FRAME – 2

Prevention & preparedness

NAME
Provide a title for the challenge. (50-75 characters)
Low awareness on nature-fire risk among household owners in the wildline-nature interface in the Netherlands

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Regarding risk culture, citizens are highly aware of flood risk in the Netherlands because of its well-documented historical relevance and experience. However, nature fire risk awareness is not yet broadly developed within society due to the historically low occurrence of such events on its landscape (Oswald, 2016). In recent years, wildfire risks have slowly gained relevance in social media due to their increasing incidence and their portrayal as of concern in local media. However, the challenge of rising nature fire risk awareness and the role of society in it remains untackled (Oswald, 2016).

PROBLEM STATEMENT
Provide an extended description of the problem that the challenge is going to address. (up to a 1000 characters)
Natuurbrandsignaal report 2023 suggest that the design of national action plan should follow a system of multi-layered safety, which serves various users' functions, and measures from the different layers complement and reinforce each other: Layer 1: Measures that try to reduce the risk of a wildfire (to a certain level). Layer 2: Measures to limit the impact of a wildfire: landscaping, compartmentalization, the adaptation of vegetation, adapted construction in high-risk areas, drought measures and mowing management. Layer 3: Measures to combat incidents and crisis management in the event of a wildfire improving: new tactics and techniques, training, adaptive strategies. Society in general (homeowners and users of nature and nature-urban interface, others) are critical in Layer 1 as wildfire ignitions in the Netherlands ignite on its majority due to human causes. The Natuurbrandsignaal '23 report aligns with the views gathered during a Stakeholders workshop on July 2023 to discuss wildfire in the Netherlands: awareness and education are critical to managing wildfires and building a fire risk culture. The authors of the report state that although we cannot manipulate the weather conditions that influence fire risk, we can manage the layout of the landscape. Among their recommendations to tackle landscape management from a civil society front are:

- Education and awareness in the broader society
- All residents and users in or around nature reserves have to take measures to limit the flammability of their garden, home, business or activity.
- All residents should know what to do if a wildfire breaks out.

WHY THE PROBLEM EXISTS?

Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge.
(up to a 1000 characters)

Besides experience as a fundamental factor shaping hazard awareness and risk perception, research shows that laypersons often rely on the knowledge and skills of experts to mitigate risks. Hence, their perception of the expert's effective performance will shape laypersons' risk perception and the intention to implement advised mitigation measures. This is particularly relevant in homeowners on accepting and adopting mitigation practices, as they might perceive some mitigation measures (such as prescribed burning or promoting native plants reforestation) as a threat to natural value of their landscape (Ryan, 2012; Santana, 2021). Likewise, knowledge about native ecosystems and subjective knowledge about natural areas and wildfire risk among local residents significantly influences their support for managerial strategies and likelihood to take defensible space action (Ryan, 2012).

There are few studies evaluating nature-fire risk perception in the Netherlands. Oswald (2016) explored the perception towards wildfire of residents living in the human-nature interface of the Veluwe National Park. Their study found out that residents recognized wildfire as a threat to residents living within the Veluwe but not to themselves or the community, even if they were within the Veluwe area. In addition, respondents agreed not to be prepared or informed and underestimate their ability to mitigate the risk and assume that such a responsibility belongs to the government, the emergency agencies and the media.

In the Netherlands, natural and cultural values of wildlands have developed in society without considering wildfire risks. Therefore, increasing awareness and knowledge among homeowners and residents inhabiting the nature-human interface is critical to increasing willingness to take individual and collective action in their defensible space and supporting institutional mitigation strategies.

WISHLIST

Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate.
(up to a 500 characters)

According to Rejeski (1993), discussions around risk include three primary groups: scientists, policymakers, and the public. While scientists form their opinion through rational processes and policymakers base it on multiple qualitative and quantitative

sources of information, the public base it on their perspectives of circumstances despite data provided by the other two groups. Therefore, he asserts that trust among the three groups is critical to achieving a shared view of risk and encourages using more participatory processes and dialogues. He suggests tools that visualize scientific data concerning a hazard that provides a point of access to meaningful discussion (Pine-John, 2014).

Participatory approaches have evolved and its applications expanded significantly the last decades. For example, the application of experiential learning through game-based methods is broadly documented in the field of education with positive learning outcomes (Stanitsas, 2019). We suggest, based on Stanitsas (2019) and Terpstra (2014), that:

- Houseowners engagement can become the means to integrate a nature-fire risk culture in modern society, which comes with a focus on building trust between actors and on raising awareness and motivation for taking actions to mitigate the impacts of hazards (see Wachinger et al., 2013).
- Houseowners engagement can be involved in DRR practices to create curiosity among individuals and collaborate with other institutions or related centers.

Therefore, the main desired characteristics of the participatory tools used to raise awareness by activating learning and enhancing meaningful discussion, are:

- The tool offers participants a space to share their experiences, perception and knowledge about a given situation.
- The tool implementation creates a safe space where participants share their values, norms, roles and goals around the given situation.
- The tool provides a simplified version of a complex concept, problem or scenario, creating a temporary situation with a common focus for participants to experience together and make sense of it.

We consider that serious games are tools that can offer the key features to evaluate and raise awareness on nature-fire risk among houseowners, and motivate citizens to seek for more information.

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
From a risk communication perspective, a Risk Dialogue Approach can be beneficial and effective for increasing societal awareness. In this communication approach, the design of the participatory process depends on the purpose. In the case of the development of a game in the context of the Netherlands, such a goal is to evaluate and generate awareness. A game-based learning approach has an instrumental

rationale because the focus is on building trust among actors and motivating people to take action to mitigate the impact of wildfires.

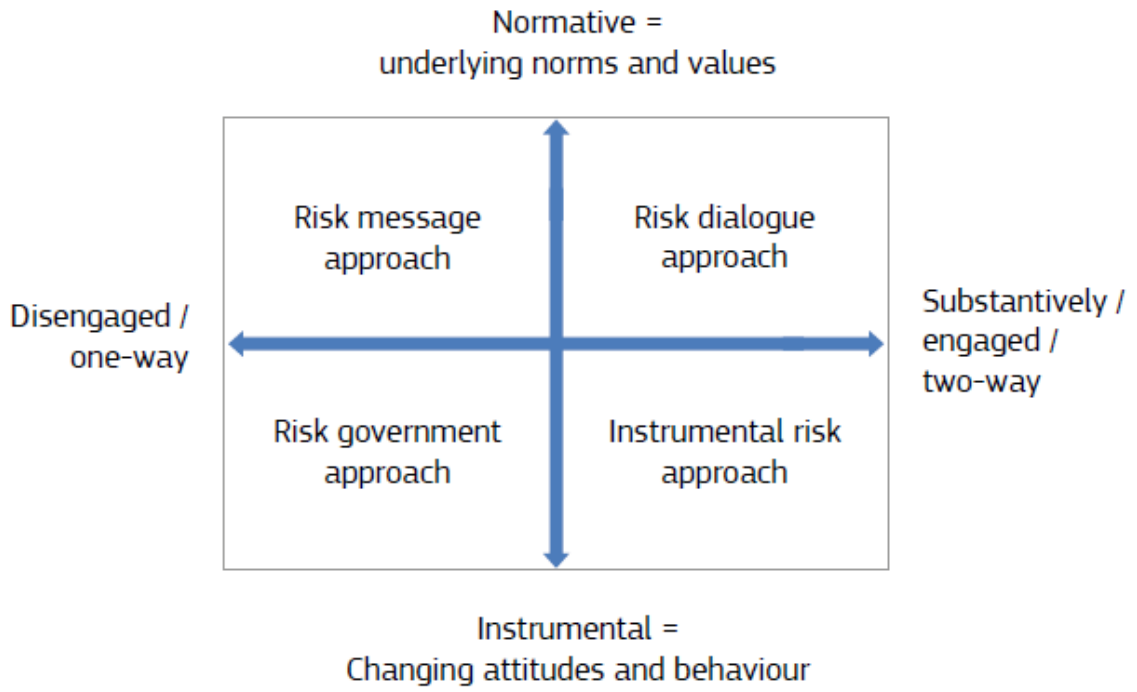


Figure 1 Different approaches in risk communication (Tepstra, 2017)

Requirements:

- The game-based learning tool must have a user-friendly design that reflects the local context and elicits discussion.
- There must be a network to facilitate the testing, implementation and evaluation of the game-based learning tool with household owners.
- The participation of citizens must be informed-consented.

Limitations:

- Time and resources will allow a limited implementation of the game-based tool.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)
N/A

CHALLENGE DESIGN WORKSHOP – LL GER-NL

CHALLENGE FRAME – 3

Prevention & preparedness

NAME
Provide a title for the challenge. (50-75 characters)
Lack of involvement of the at-risk population in the design of strategic communication strategies to respond in case of a wildfire incident

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Regarding risk culture, citizens are highly aware of flood risk in the Netherlands because of its well-documented historical relevance and experience. However, nature fire risk awareness is not yet broadly developed within society due to the historically low occurrence of such events on its landscape (Oswald, 2016). In recent years, wildfire risks have slowly gained relevance in social media due to their increasing incidence and their portrayal as of concern in local media. However, the challenge of raising nature fire risk awareness and the role of society in it remains untackled (Oswald, 2016).

PROBLEM STATEMENT
Provide an extended description of the problem that the challenge is going to address. (up to a 1000 characters)
Natuurbrandsignaal report 2023 suggest that the design of national action plan should follow a system of multi-layered safety, which serves various users' functions, and measures from the different layers complement and reinforce each other: Layer 1: Measures that try to reduce the risk of a wildfire (to a certain level). Layer 2: Measures to limit the impact of a wildfire: landscaping, compartmentalization, the adaptation of vegetation, adapted construction in high-risk areas, drought measures and mowing management. Layer 3: Measures to combat incidents and crisis management in the event of a wildfire improving: new tactics and techniques, training, adaptive strategies. Active involvement of the population at risk in the design of communication strategies to respond in case of a wildfire incident is critical in Layer 3, as the Netherlands is the second country in Europe with the highest fragmentation of land cover with complex mixtures of human settlement and land uses. The Natuurbrandsignaal '23 report aligns with the views gathered during a Stakeholders workshop on July 2023 to discuss wildfire in the Netherlands: awareness and education are critical to managing wildfires and building a fire risk culture. The authors of the report state that although we cannot manipulate the weather conditions

that influence fire risk, we can manage the layout of the landscape. Among their recommendations to tackle landscape management from a civil society front are:

- Education and awareness in the broader society
- All residents and users in or around nature reserves have to take measures to limit the flammability of their garden, home, business or activity.
- All residents should know what to do if a wildfire breaks out.

WHY THE PROBLEM EXISTS?

Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge.
(up to a 1000 characters)

There are few studies evaluating nature-fire risk perception in the Netherlands. Oswald (2016) explored the perception towards wildfire of residents living in the human-nature interface of the Veluwe National Park. Their study found out that residents recognized wildfire as a threat to residents living within the Veluwe but not to themselves or the community, even if they were within the Veluwe area. In addition, respondents agreed not to be prepared or informed and underestimate their ability to mitigate the risk and assume that such a responsibility belongs to the government, the emergency agencies and the media.

In the Netherlands, natural and cultural values of wildlands have developed in society without considering wildfire risks. Therefore, increasing awareness and knowledge among homeowners and residents inhabiting the nature-human interface is critical to increasing willingness to take individual and collective action in their defensible space, taking an active roles in evacuation plans and supporting institutional mitigation and response strategies.

WISHLIST

Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate.
(up to a 500 characters)

According to Rejeski (1993), discussions around risk include three primary groups: scientists, policymakers, and the public. While scientists form their opinion through rational processes and policymakers base it on multiple qualitative and quantitative sources of information, the public base it on their perspectives of circumstances despite data provided by the other two groups. Therefore, he asserts that trust among the three groups is critical to achieving a shared view of risk and encourages using more participatory processes and dialogues (Pine-John, 2014).

REQUIREMENT(S) AND LIMITATION(S)

Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others).

(up to a 500 characters)
From a risk communication perspective, a Risk Dialogue Approach can be beneficial and effective for increasing societal awareness. In this communication approach, the design of the participatory process depends on the purpose, which is to design a participatory communication strategy for resident to act in case of a wildfire incident.

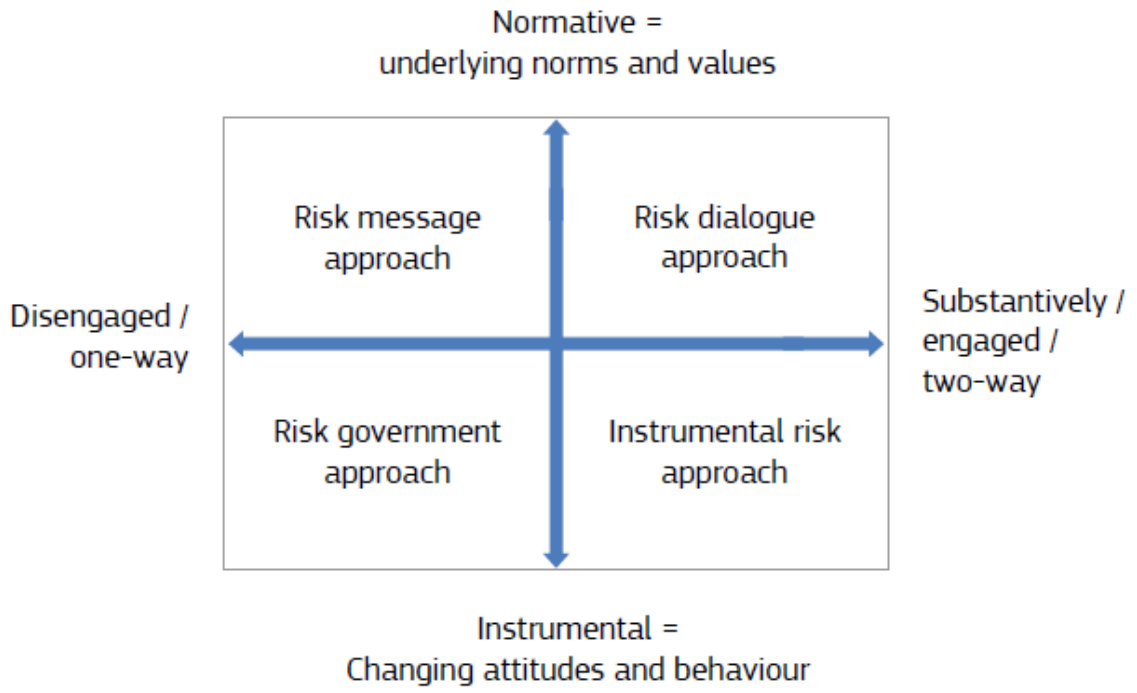


Figure 3 Different approaches in risk communication (Tepstra, 2017)

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)
N/A

CHALLENGE DESIGN WORKSHOP – LL GER-NL

CHALLENGE FRAME – 4

Prevention & preparedness

NAME
Provide a title for the challenge. (50-75 characters)
Lack of specialized knowledge and training in integrated nature-fire management

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Although wildfires have occurred frequently, the Netherlands has only limited focus on this type of incident. The system of the fire brigade (care) is primarily geared to the urban environment with building fires. This is reflected in the entire system, from attendance times, legislation and (personal) equipment to training (Natuurbrandsignaal report, 2023).

PROBLEM STATEMENT
Provide an extended description of the problem that the challenge is going to address. (up to a 1000 characters)
Currently, there is no action perspective to limit the impact of wildfires in the Netherlands, partially because there is a lack of understanding of such impacts and a corresponding legal and operational framework. The design of such an action plan needs to focus on the adaptation and mitigation phase to limit the impacts of wildfire and the response phase, where fire brigades can prioritize and combat incidents properly. Experts contributing to the Natuurbrandsignaal report 2023 suggest that the action plan follows a system of multi-layered safety, which serves various users' functions, and measures from the different layers complement and reinforce each other: Layer 1: Measures that try to reduce the risk of a wildfire (to a certain level). Layer 2: Measures to limit the impact of a wildfire: landscaping, compartmentalization, the adaptation of vegetation, adapted construction in high-risk areas, drought measures and mowing management. Layer 3: Measures to combat incidents and crisis management in the event of a wildfire improving: new tactics and techniques, training, adaptive strategies. Focusing on Layer 3, the system of fire brigade care in the Netherlands has, until now, mainly focused on preventing, limiting, and combating fires in buildings or urban areas, as well as providing technical assistance in the road and water accidents. It means that the system used nowadays to manage wildfires is not designed for such tasks, including policies, training, and equipment. Therefore, there is the need to include integral

wildfire management in the spectrum of the safety system, from the legislation for activities or companies taking place in places at risk of wildfire (nature reserves, wildland-urban interface) up to and including the training for firefighters and land managers (Natuurbrandsignaal report, 2023).

WHY THE PROBLEM EXISTS?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)
In wildfire-risk emerging countries, risk awareness is usually low across all stakeholders, ranging from legislation for its management to implementing strategies to prevent wildfire events through awareness campaigns and landscape management and design (green space, nature and forest areas, and design of houses and gardens). It is the case for the Netherlands, which as an emergent country, wildfire management often focuses on fighting fire rather than preventing it (Stoof, 2022).

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
To provide training in fire burn, including the understanding of in which situation and how to apply it. The training must be based on international best practices and tailored to the Netherlands and Germany climate conditions.

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
Requirements: The training could have different formats. We consider that (given the budget limitations) the ideal would be an online didactical format. The second best option would be a paper-based training format (book, guidelines, etc.). And finally, field training (though the budget might be limited). All options should be open access to facilitate replication. Limitations: Budget and format might limit the number of people that can be trained.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)
N/A

CHALLENGE DESIGN WORKSHOP – LL GER-NL

CHALLENGE FRAME – 5

Prevention & preparedness

NAME
Provide a title for the challenge. (50-75 characters)
Lack of a clear overview of national legislation and risk ownership in nature-fire risk management in the Netherlands

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
According to results from the National Stakeholder meeting about nature fires in the Netherlands, held on July 2022, participants agreed that there is not a common view of what are the different laws, regulations, and policies in terms of wildfire management.

PROBLEM STATEMENT
Provide an extended description of the problem that the challenge is going to address. (up to a 1000 characters)
Currently, there is no action perspective to limit the impact of wildfires in the Netherlands, partially because there is a lack of understanding of such impacts and a corresponding legal and operational framework. The design of such an action plan needs to focus on the adaptation and mitigation phase to limit the impacts of wildfire and the response phase, where fire brigades can prioritize and combat incidents properly. Experts contributing to the Natuurbrandsignaal report 2023 suggest that the action plan follows a system of multi-layered safety, which serves various users' functions, and measures from the different layers complement and reinforce each other: Layer 1: Measures that try to reduce the risk of a wildfire (to a certain level). Layer 2: Measures to limit the impact of a wildfire: landscaping, compartmentalization, the adaptation of vegetation, adapted construction in high-risk areas, drought measures and mowing management. Layer 3: Measures to combat incidents and crisis management in the event of a wildfire improving: new tactics and techniques, training, adaptive strategies. A prerequisite for the successful design and implementation of an action plan is to count with a clear overview of current laws, regulations, policies in place to manage wildfire risk.

WHY THE PROBLEM EXISTS?

Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)
For most countries, there is no overview of what it is legally possible and/or mandated to do in terms of fire management (laws and regulations), no overview of how fire management is going to be implemented (policy documents), and no overview of what fire management considerations are made in the management of nature areas (forest and nature management plans). This also holds true for the Netherlands which lies in the heart of Northwestern Europe. Without having an overview of laws, regulations, policies, and forest and nature management plans it is difficult to evaluate the current situation and to determine if a change in strategy with regard to fire management and fire risk governance is needed (extract from Tersmette, 2023).

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
To develop a comprehensive Guide of Laws, Regulations, Policies, and Forest and Nature Management Plans in the context of Landscape Fire and Wildfire in the Netherlands for practitioners, researchers, policymakers and the public in general.

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
Requirements: The guide should include but not be limited to: • Inventory of laws, regulations, and policies explicitly including landscape and wildfire management. • Review of wildfire preventive strategies in decision-making on nature management. • Review and analysis of wildfire risk ownership. • Policy and practical implications and expectations Limitations: Resources might be limited for its wide distribution among stakeholders.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)
N/A

Greece

CHALLENGE DESIGN WORKSHOP – LL GR

CHALLENGE FRAME

Prevention & preparedness

NAME
Provide a title for the challenge. (50-75 characters)
Effective forest fuel management and treatments

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Management of forest fuels in public and/or private forests: a) planning of biomass removal or prescribed burning methods to break the forest fuel continuity; b) cost estimation of operations; c) criteria and objectives depending on the area (forest or wildland-urban interface), c) assessment of effectiveness (cost-benefit analysis) and sustainability.

PROBLEM STATEMENT
Provide an extended description of the problem that the challenge is going to address. (up to a 1000 characters)
• The high density of biomass on both sides of the road network obstructs a large part of the road network. This has a negative impact on the preparedness/ prevention and suppression of a possible wildfire. • Maintenance of forest roads is carried out disorganized, at the discretion of local authorities, or following reports from forest rangers to the Forest Service and inspections by the Fire Service. • Lack of resources and planning for the maintenance/ opening of the entire network of existing roads within a forest. • Local authorities do not have a centralized and transparent plan for carrying out work on the road network, in consultation with the Forest and Fire Service authorities, in short- or long-term basis. • Increased costs of carrying out biomass treatments and road opening/ maintenance, as more time is needed to carry out the effort after years of abandonment, and there is an increased amount of work to be done per unit area. • There are also increased costs for the disposal, rearrangement and removal of the logging residues. The contractors do not burn them. This is due to the late approval of funding and the concurrent starting of the fire season. Further costs arise from chipping, crushing, lopping and scattering/ disposal in the forest. Pile burning at collection points or near forest roads is one solution, but problems arise when it is applied during the fire season.

- The planning of placing biomass management projects is based solely on the actions of the society as a whole. Specifically, any complaints or requests made by citizens or institutions regarding where biomass management projects should be located are collected and analyzed. Then, the importance of each request/ complaint is assessed and a priority is given. When planning projects for the following year, the Forest Service concentrates its resources in these areas to ensure legal liabilities and avoid claims in case of a fire event.

WHY THE PROBLEM EXISTS?

Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge.
(up to a 1000 characters)

- Lack of long-term planning for fuel management projects and forest management in general, regardless of ownership status.
- Lack of human and financial resources to carry out activities related to fuel management.
- Delays in approving/ funding of fuel management projects: the submission of objections usually adds significant delays in the start of projects' implementation. Work must be conducted between October and April, outside of the fire season.
- In logging residue management, there are no contractors available to collect the biomass and it therefore remains in the forest. It is not economically viable to transport it, especially in case of coastal pine forests. Forests of oak or beech are of more interest to companies. When large amounts of biomass are removed, there is an increased risk of nutrient removal from the forests.

WISHLIST

Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate.
(up to a 500 characters)

- Establish a department dedicated exclusively to the annual recording of the forest road network and its accessibility, maintenance and improvement parameters.
- Planning the financing of fuel management projects with a 10-year horizon, at the level of Forestry Directorates.
- Implementation of effective fuel management measures by informing stakeholders and society. Press releases and information campaigns by relevant ministries, public agencies, universities etc.
- Establish a team of forest workers, e.g. like the hotshot fire crews, integrated into the Forest Service to carry out fire prevention work outside the fire season, while working as forest guards in the summer.

REQUIREMENT(S) AND LIMITATION(S)

Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others).

(up to a 500 characters)
• Universal jurisdiction for the preparation of plans and fire protection projects in the Forest Service, regardless of the ownership status. • Central planning of firebreaks. Creation of new firebreak zones around the settlements, as and when needed. Preference to be given to sheltered zones with a width of 15 m + 15 m from the main firebreak or on both sides of roads. • Institutional framework for the application of scientific forest fuel treatment techniques, such as prescribed burning.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)
Provide incentives for companies to collect fuel with a specific rational design and protocol. Creation of new forest products that will be introduced into the market.

CHALLENGE DESIGN WORKSHOP – LL GR

CHALLENGE FRAME

Detection & response

NAME
Provide a title for the challenge. (50-75 characters)
A more effective forest fire suppression

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
The role of initial attack and effective suppression in fighting wildland and WUI fires, in the shortest possible time and with the lowest possible damages (area burned, human casualties etc.).

PROBLEM STATEMENT
Provide an extended description of the problem that the challenge is going to address. (up to a 1000 characters)
A critical problem identified at this phase is the first attack due to accessibility difficulties. It varies from region to region in Greece depending on specific characteristics, such as islands, mainland areas, high altitude areas, Mount Athos (a UNESCO World Heritage site), etc. Despite the Forest Service's efforts to maintain and open forest roads when necessary, much of the forest road network is extremely difficult to access for fire fighting vehicles, delaying timely access and hindering effective overall response to a fire event. In addition to accessibility, there may be other parameters to the problem of the first attack, such as: - Initial assessment of the problem (measure up) - Optimal allocation of resources to the event - Appropriate initial coordination - Optimization of first attack sites - Training and drills to practice the difficulties of first attack Early warning was also considered as a potential problem. However, the discussion showed that it is not a problem (because of existing extensive network of fire stations, increased patrols by fire and police vehicles and information from citizens) and that the detection times are relatively satisfactory.

WHY THE PROBLEM EXISTS?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge.

(up to a 1000 characters)

- The road network is not in a good condition of maintenance, both for the initial approaching and for the firefighting operations. The difficulty of access is often due to the accumulation of forest fuels that hinders the work, and to the fact that the new type of fire engines (electronic) have difficulties moving on the unmaintained road network compared to the older type of fire engines (motorized). Several rural roads leading to cultivated/ agricultural areas are also inaccessible, making firefighting more difficult when fires break out.
- The density of the road network should be estimated on a case-by-case basis (e.g. km of road per km^2 of forest or similar). The forest road network should also meet the multiple objectives of management and ecosystem services. In addition, a correlation analysis of fire initiation/ spread related to the road network is required to adequately substantiate the view of this density problem.
- A large fire front during initial attack: due to fuel accumulation and the general meteorological and topographical conditions, sometimes the characteristics of the fire when it starts make rapid initial suppression impossible.
- The mixed fire patrols are not performing adequately. A change in staffing is required. There are too many people involved in fighting fires. Although protocols are in place, some people often go beyond their responsibilities, especially from locals and politicians.
- The lack and heterogeneity of appropriate human resources (both within and outside the Fire Service).
- Limited integration of technology in suppression. Problems with radio communications and lack or non-utilization of specialized communications protocols.
- Limited access to existing information.

WISHLIST

Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate.
(up to a 500 characters)

- To develop a methodology through the systematization/ standardization of environmental factors, initial attack procedures (in a spatiotemporal context) and suppression, taking into consideration the history of wildfires and the specificities of Greece. This methodology will define areas that require a different approach to initial attack and extinguishing means, in order to increase suppression efficiencies. Also, it will contribute to less empirical suppression operations.
- Establishment of objective indicators for the evaluation of the suppression operations.
- Fire ignition risk and spread indices with greater spatial resolution, possibly linked to the ENGAGE Fire Service operational system.
- Capability for online and real-time detailed cartographic imaging of the fire front (e.g. with thermal cameras) and transmission to the Coordination Center.
- Dense and well-maintained road network.

- A denser network of meteorological stations linked to the ENGAGE operational system. Possibility to access existing weather stations provided by other agencies (e.g. from the National Observatory of Athens).
- Suggesting that a meteorological station be installed in each Fire Station to enable simulations to be carried out or to create a meteorological database at the level of the Prefectural Administration.
- Provide a portable meteorological station at the incident site, close to the operational base, to record real-time meteorological data (microclimate parameters) and contribute to any fire behavior simulation.
- Personnel trained in new technologies.

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)

- Recruitment/ engagement of staff with high levels of education and knowledge/ skills, and assignment of appropriate staff
- Learning/ training in new technologies
- Training of existing personnel
- Integration of new technologies at operational level
- Equipment supply
- Financial constraints
- Technological and other constraints with regard to the capture of the actual situation at the event.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)

It would be advisable to make sure that the information that is already available is understood and used in an appropriate way. Access modes exist and are constantly being added to the Fire Service's operational system (as applications) and are adapted to provide as much information as possible and necessary, depending on personnel duties and assignments in the initial attack process.

CHALLENGE DESIGN WORKSHOP – LL GR

CHALLENGE FRAME

Restoration & Adaptation

NAME
Provide a title for the challenge. (50-75 characters)
Study and organization of post-fire rehabilitation and post-fire reconstruction of affected forest areas and settlements

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Planning and implementation of environmental, regional, technological and economic actions with priorities on holistic protection and restoration of burned forest areas and fire-affected populations

PROBLEM STATEMENT
Provide an extended description of the problem that the challenge is going to address. (up to a 1000 characters)
THERE IS A GREAT NEED FOR: • anti-erosion and anti-flooding projects in burned coniferous rather than broadleaf forest mapping of burned areas and effective declaration of reforested/ replanted areas • addressing socioeconomic impacts on citizens and the community (e.g. N. Evvoia mega-wildfire of 2021) • monitoring, preservation and cultivation of post-fire restoration measures • areas, especially in the wildland-urban intermix and interface (WUI) • clarification of the Technical Services' role in the Regions and the Municipalities on adaptation and rehabilitation issues • upgrade of the Forest Service with sufficient personnel for the restoration and protection of burned areas • indicators, actions and measures for fire ecology and management, water economy, erosion, flooding, agricultural issues, spatial development planning and local sustainable development, • studying the impacts of fires on non-market values and animals, agricultural lands and the urban environment.

WHY THE PROBLEM EXISTS?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)

- Unachievable circumstances and multiple needs
- Understaffed Forest Service, where practically one person per each local Forest Office is dealing with restoration activities
- There are technological needs and shortages throughout the Public Sector
- There is a lack of investment in integrated spatial planning and an insufficient budget for development projects
- The voluntary offer is based on the initiative and patriotism of the citizens, without any actual support.

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)

- Use of technology (such as satellite images, UAVs, etc.) to map burned areas, fire intensity and ecological effects (combined with pre-fire conditions).
- Long-term monitoring of burned areas.
- Post-fire timber, log and branch barriers parallel to the contours, small wooden dams in ravines, and small concrete dams for erosion and flood protection in burned areas.
- Reforestation after two (2) years, if necessary. In the majority of cases, natural regeneration works much better if there are no inappropriate anthropogenic interventions (e.g. grazing).
- Reforestation with known individual species and protocols for fire protection and fire resistance in WUI areas, as well as in plots and courtyards of houses, tourist facilities and units
- Protocols, instructions and permissions from relevant authorities (e.g. Forest Service, Local Authorities) for landscaping burned areas in settlements, residential areas, infrastructure etc.
- Measures and practices to provide medium-term financial support for the activities impacted by wildfires (tourism, businesses, crops etc.).
- Impact-based action plans.

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)

In general, a threefold axis of interventions is required from the State after a wildfire for affected areas:
1. Promotion of a sustainable economic development (Economy)
2. Establishment of utilities and infrastructure (Society)
3. Implementation of rational environmental policies and rehabilitation measures (Environment).

Socio-economic support and rehabilitation of nationally and multiply vulnerable island and other border regions of the Greek periphery is also necessary and critical for the survival, retention and future attraction and reintegration of permanent residents.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)
• Prohibition of hunting and grazing with additional protected (buffer) zones • Floods and water resources management • The local community to participate as a moving force with incentives • Arrival of modern science and know-how to the Greek State is generally systematically delayed, while the State's absence and lack of relevant know-how are frequently cited.

Norway-Sweden

CHALLENGE DESIGN WORKSHOP – LL NOR-SW

CHALLENGE FRAME – 1

Prevention & preparedness

NAME
Provide a title for the challenge. (50-75 characters)
Mutual training platform

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Establishment and implementation of a mutual training platform for stakeholders related to effective and innovative Extreme wildfires events (EWEs) firefighting.

PROBLEM STATEMENT
Provide an extended description of the problem that the challenge is going to address. (up to a 1000 characters)
There is a lack of a basic and continuous evaluation, standardisation and training platform between stakeholders in critical functions related to effective Extreme wildfires events (EWEs) firefighting activities. This also involves leadership, competency and innovation initiatives driven in a structured manor. In addition, this also involves interaction and coordination between several critical functions from government agencies required to work together despite defined areas of responsibility. This interaction is often hindered by lack of defined requirements, standards, mutual information platforms/portals and most importantly lack of insight of the current status of an evolving extreme wildfires events (EWEs) resulting in reduced situational awareness and high risk of miss judgment and adequate action initiatives at an early stage. Training culture and structure from the aviation industry could benefit towards a mutual training platform, especially related to EWE's.

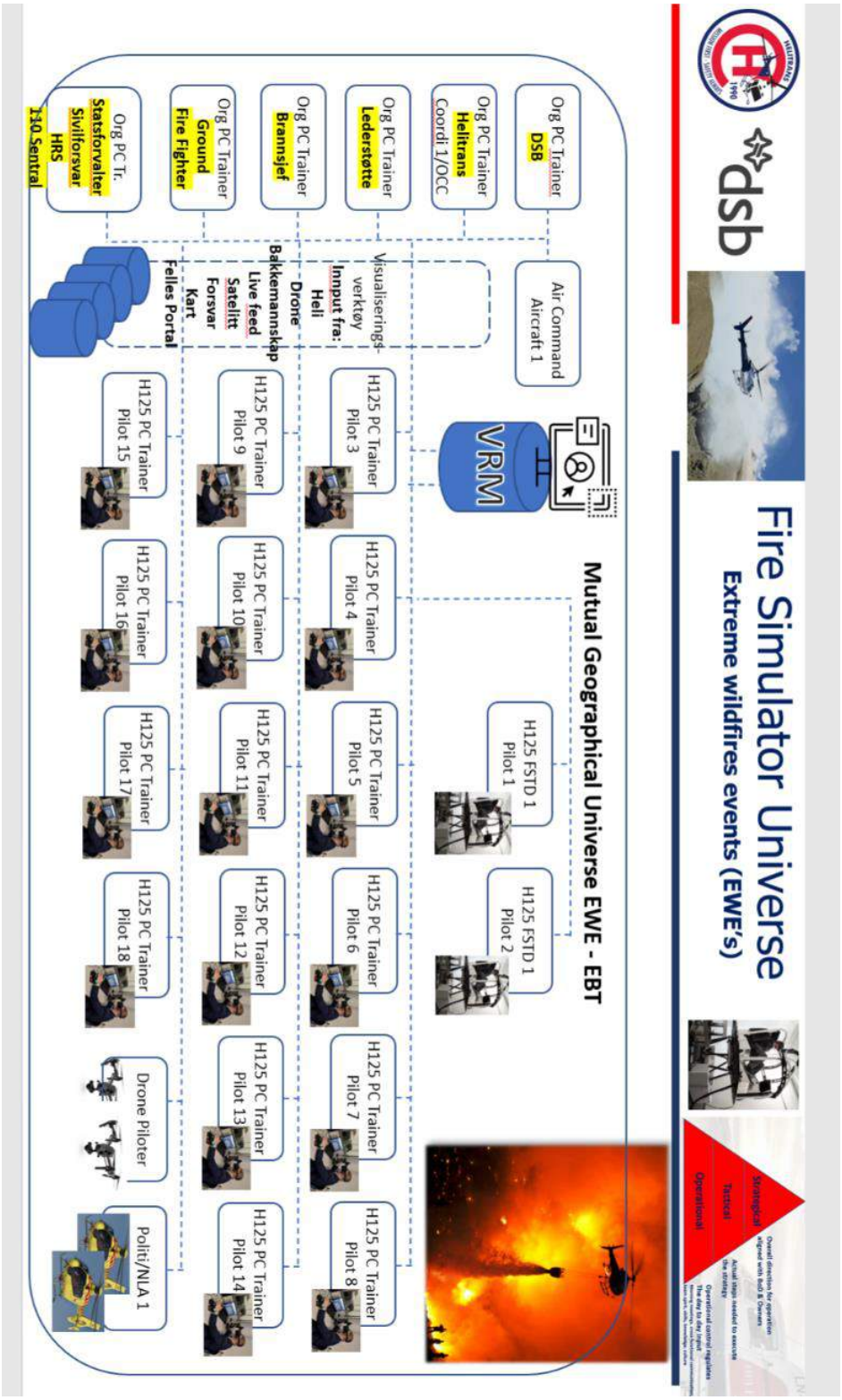
WHY THE PROBLEM EXISTS?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)
Root cause is lack of a mutual training platform for all stakeholders connected to EWE's. There is a lack of defined standards and demands to interaction and training ultimately enhancing each areas involved in the activities. There is a lack of an overlying centralized management governing body which defines the standards and

demands to interaction and training. There is a lack of culture defining standards and demands to interaction and training. There is a lack of an overarching owner which defines standards and demands to interaction and training for all parties involved in EWE's.

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
Establishment of a mutual training platform which ultimately identifies areas of improvement related to EWE activities for each stakeholder. This involves a magnitude of elements ranging from implementation of Evidence Based Training from the aviation industry where there is a continuous identification of risks, safety culture improvements, competency building and innovation resulting in improved ability to effectively and at an early stage reduce the risk of EWE. Technology solutions and shortcoming of such would be identified through the evaluation process of each training session resulting in an continuous improvement cycle for all stakeholders. This in the end will improve the ability for all stakeholders to effectively function and work together through a structured manner.

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
Requirements: Establishment of a mutual training platform portal. Limitations: Lack of support from leadership within each stakeholder. Lack of funding initiatives. Lack of willingness to change. Lack of ability to complete the entire process. Lack of will to change

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)
Training culture and structure from the aviation industry could benefit towards a mutual training platform, especially related to EWE's


Fire Simulator Universe
Extreme wildfires events (EWE's)
Mutual Geographical Universe EWE - EBT
Org PC Trainer DSB
Org PC Trainer Helitrans Coordi 1/OCC
Org PC Trainer Lederstøtte
Org PC Trainer Brannsjef
Org PC Trainer Ground Fire Fighter
Org PC Tr. Statsforvalter Sivilforsvar HRS 110 Sentral
Air Command Aircraft 1
Visualiserings-verktøy
Innput fra:
Heli
Drone
Bakkemannskap
Live feed
Satelitt
Forsvar
Kart
Felles Portal
VRM
H125 FSTD 1 Pilot 1
H125 FSTD 1 Pilot 2
H125 PC Trainer Pilot 3
H125 PC Trainer Pilot 4
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Drone Piloter
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CHALLENGE DESIGN WORKSHOP – LL NOR-SW

CHALLENGE FRAME – 2

Prevention & preparedness

Name:	Forebygging av store skogbranner Prevention of large wildfires
Subtitle: 3	Det er behov for et politisk beslutningsdokument for å fremme forebygging av skogbranner. There is a need for a policy document on prevention and preparedness towards large wildfires.
Problem statement: 5 3	Avklare ansvarsområder og tilføre ressurser for forebygging av skogbranner. Clarify and define responsebilities and allocate resources towards preparedness and prevention of large wildfires.
Why the problem exist: 4 6	Fordi vi har en hendelsesstyrt beredskap/forebygging Klimaendring øker risiko Liv og helse Infrastruktur Verdisikring Because we have a preparedness and prevention system based on past incidents Expected climate changes increase the risk Public safety Need to secure assets and infrastructure
Wishlist: 6 2	Utvikle juridiske og økonomiske virkemidler Develop legal and economic means of action
Requirement(s) and limitation(s): 6	Risiko og sårbarhetsanalyser – overordnet Fokus på forebygging er "frustrerende" på det øverste nivå Begrenset budsjettfordeling Need risk and vulnerability analysis – at a general level

	Focus on prevention and prepearedness is challenging at the highest level Limited allocation of funding in the public budget
Additional information	Liv og helse, Klima, Infrastruktur og Verdisikring Keywords: Public health and safety, climate change, infrastructure secure assets in society

CHALLENGE DESIGN WORKSHOP – LL NOR-SW

CHALLENGE FRAME – 3

Prevention & preparedness

Name:	Skogbrannfarevarsling Wildfire risk alert
Subtitle: 3	Hvordan kan vi skaffe vegetasjonsdata slik at vi kan lage skogbrannfarevarsling basert på vegetasjons og uttørkingsdata/brennverdi for "fuel" How to get data on the vegetation in order to make wildfire risk alerts based on actual values for vegetation and fuel properties
Problem statement: 5 3	Det er mye data tilgjengelig for vær (regn, vind mm), men det er mindre tilgjengelig data for vegetasjon og hvordan denne endres i forhold til eksempelvis tørke/temperatur/vind og fuktighet. • Meteorologiske data er i stor grad ivaretatt • Vegetasjonsdata er I mindre grad tilgjengelig • Det er usikkert om det er verktøy som kan koble disse datasettene sammen • FWI kobler noe data men Kanadisk skog • Indeksdata må differensieres for ulike delser av landet • Det må kunne vises enkelt i kart. There is a lot of information available on the weather, but less available data on the vegetation, and how the state of the vegetation changes with for example drought, temperature, wind and moisture. • Meteorological data is to a great degree present • Vegetation information is lacking • Is there good tools to connect the two types of information? • Current FWI (fire weather index) include some vegetation parameters, but use

	parameters developed for Canadian conditions. • Data need to be differentiated between different regions • Need to be easily visualised in a map
Why the problem exist: ④⑥	Bedre farevarsling gir en tydeligere indeks som sørger bade for at befolkningen ikke starter branner og beredskapen settes riktig. Vi kan unngå de store brannene fordi ressursene er riktig plassert og tilgjengelig. Ressursene blir ikke brukt for mye og det kan bidra til å redde liv fordi vi får evakuert områder før brannen. Better and more precise risk alert give a clearer message to the public and fire management. It can lead to less fires started by the public, and a more correct level of preparedness. Large fires might be avoided if the resources are more optimally allocated. Better allocation of the fire & rescue resources might in turn save lives, since it will be better chances for evacuation.
Wishlist: ⑥②	Bedre vegetasjonsdata som oppdateres med værdata kontinuerlig. Det må være et verktøy som data kan oppdateres i og vises i forhold til faktiske forhold. Det må kunne si noe om brannintensistet og mulig størrelse basert på vegetasjon og værdata satt sammen. Better vegetation data, combined with continuously updated weather data. Should be a tool with updated data, representing the actual conditions in the field. Should have information about expected fire intensity, and expected fire behaviour and extent, based on the vegetation and current weather data.
Requirement(s) and limitation(s): ⑥	Det er ikke nok kunnskap om uttørking av vegetasjon og hvordan vegetasjonen påvirkes av været. Det må finnes teknisk kompetanse for å koble dette. Det finnes mye grunnlag, men kunnskap og teknikk til å sette dette sammen må utvikles.

	Need for knowledge on how the moisture content of the vegetation is affected by the weather. Need for technically skilled personnel to make the connection. Need for knowledge and methods to combine available information on vegetation and weather.
Additional information	Kjenne til vegetasjonsegenskap i forhold til uttørking. Vær og vind er kjente data. Hvordan brannutviklingen påvirkes av vegatasjonens uttørking. Vegetasjon er fuel og hvor brennbart er materialet og hvilken spredning får man gitt en værsituasjon. [Repetition of information above]. Need for information about fire behaviour and development, and how this is affected by weather, vegetation and moisture content.

CHALLENGE DESIGN WORKSHOP – LL NOR-SW

CHALLENGE FRAME – 1

Detection & response

Navn: Aksjonsledelsen mangler fullstendig situasjonsforståelse ved store branner

Name: Incident commanders lack coherent understanding of the situation in the case of large wildfires

Ingress:

Skissert scenario om store gigantbranner er noe nytt og vil være enda mer krevende enn tidligere Aksjonsledelsen vil ha behov for bedre støtteverktøy for beslutninger.

Scenarios on large wildfires or megafires describe a new situation (in the Nordic countries) and more demanding than current incidents. Incident commanders would need better tools to support and guide decisions.

(3)

Problembeskrivelse:

Det mangler samkjøring av alle inndata og modelleringer av brannen, ulike scenario modeller og modellering av ulike tiltak. Hvordan dette påvirker utviklingen. Mangler inndata med Nordisk innhold.

Description of challenge:

There is a lack of coordination of all the available data, modelling of the fire and modelling of fire behavior under different conditions and actions. Lack of data and model parameters for Nordic conditions.

(5) (3)

Hvorfor eksisterer denne utfordringen?:

Forventet klimaendring er ikke kommet i Norge.
Behovet for verktøyet er ikke foreløpig relevant.
Situasjonsforståelsen er basert på andre faktorer.
Hendelser er for små/korte.
Øvelser kan avdekke behovet, men det øves foreløpig mot for små scenarioer.

Why does this challenge exist?

Expected climate changes has not yet come to Norway.
The tools have so far not been relevant (small fires).
The understanding of the situation is based on other information.
So far mostly small incidents.
Training can shed light on the needs, but so far only training on small incidents.

4 6

Ønskeliste:

Ledelsestøtteverktøy.

- Dataprogram som kan analysere skadestedfaktorer,
- vise forventet utvikling dager/timer
- modellere ulike worst case
- modeller scenariotiltak mot brannen
- programmet må bringe inn brannens egen påvirkning på brannutvikling.

Wishlist:

Incident commander tools

- Software tool for analysis of factors at the incident location
- Tool for modeling expected fire behavior, days/hours
- Modeling worst case scenarios
- Modeling effect of actions on the development of the fire
- Models should incorporate the fires own effects on the local climate and further fire development

6 2

Behov og begrensninger:

Manglende skadestedsfaktorer

- feil inndata
- feil oppsett av modellering
- Manglende samkjøring og f
- Stole bedre på systemet, mismatch system/skadested

Needs and limitations/obstacles:

Lack of incident location factors

- Wrong input data
- Wrong specification and parameters for modeling
- Lack of cooperation
- Put more trust in the system, mismatch between system and actual incident

6

CHALLENGE DESIGN WORKSHOP – LL NOR-SW

CHALLENGE FRAME – 2

Detection & response

Navn: Nasjonal ressursbank (Stabsledelse)

Name: National level framework for incident management organization

Ingress:

Det må på plass forskrift/lov som hjemler og finansierer en nasjonal stab

There is a need for regulations/law to ensure a national level incident management (team), including funding.

3

Problembeskrivelse:

Direktoratet må forankre mot JD for å få til lovendring. Samtidig må det jobbes med finansiering. Må være en skal krav

Description of challenge:

The Directorate for Civil Protection should engage with the Ministry of Justice and Public Security in order to incorporate changes in the law. At the same time work on funding. Implementation of the regulations on incident management should be mandatory for all fire & rescue services.

3 5

Hvorfor eksisterer denne utfordringen?:

For stor variasjon og organisering, spesielt på ledernivå i de ulike brannvesen.

Why is this a challenge?

Too large variation in organization, especially at the management level in the local fire & rescue services.

4 6

Ønskeliste:

- Nasjonalt organ gjennom Fagdirektoratet
- Politisk vilje
- Finansiering

Wishlist:

National body organized through the Directorate for Civil Protection
Political backing / will
Funding

2 6

Behov og begrensninger:
En profesjonell stab som er gode/har kompetanse til store komplekse hendelser.
Manglende forståelse av samfunnsutviklingen.

Needs and obstacles:
A professional incident management team capable of handling large and complex incidents.
Lack of understanding of the current development in the society.

6

Tilleggsinformasjon:
Det finnes allerede ELS veileder og Telemark har en regional stab.

Additional information:
There are already ICS guidelines.
Telemark county do have a regional incident management team.

CHALLENGE DESIGN WORKSHOP – LL NOR-SW

CHALLENGE FRAME – 1

Restoration & Adaptation

Navn: Erkjennelse

Name: Framework/criteria for acknowledging a type 3 wildfire

Ingress:

Planverk og kriteriesett for å avdekke/erkjenne at man står ovenfor en type 3 skogbrann og hvordan den skal håndteres.

A need for a framework and set of criteria for to identify that one is facing a type 3 wildfire, and plans on how to handle it further.

3

Problembeskrivelse:

Bruke planverk og gjennomgå kriterier for type 3 skogbrann.
Samle samvirkeaktørene og aksjonere i tråd med avtaler og planverk. For å få dette til kan følgende brukes:

- ICE/ELS læremateriell
- hente erfaring fra utlandet
- hente planverk fra utlandet
- etablerer felles forståelse i bedredskapsråd
- kriseledelser
- ressurspersoner og samvikeaktører
- etterretning er viktig HKE/drone,
- digitale verktøy for info og analyse.
- aktører MET, NIBIO, Statsforvalter

Description of challenge:

With the basis in existing plans, develop plans and agreements towards how actors should react and cooperate in the case of a type 3 wildfire. Ensure that all relevant actors act together, and in accordance with the agreements and plans. Means to achieve this could be:

- ICS learning material
- get experience and knowledge from other countries
- get existing plans from other countries
- establish a common understanding in emergency council(s) (bedredskapsråd)
- emergency management / crisis management

- influential individuals and cooperating actors and entities
- Intelligence is important. Helicopter/UAV.
- Digital tools for info and analysis.
- Actors: Meteorological Institute, Norwegian Institute for Bioeconomy Research, Statsforvalter

5 3

Hvorfor eksisterer denne utfordringen?:
Mangler planverk for skogbrann type 2 og 3.
Mangler avtaler og felles situasjonsforståelse mellom samvirkeaktører. Mangler nasjonalt krav til samvirke og planarbeid.
Nytt fenomen/trussel i Norge.
Gapene er nasjonal forankring, felles forståelse, avtaler, planverk og kriteriesett for type 3 skogbrann. Har ikke vært type 3 skogbrann i Norge. Brann- og redningstjenesten mangler "tyngde" i beredskapsarbeid.

Why does this challenge exist?
Lack of plans and framework for handling of wildfires of type 2 and 3.
Lack of agreements and common understanding of the situation between relevant actors.
Lack of national regulations on cooperation and developments of plans.

A new phenomena/threat in Norway.

Agreements at the national level, common understanding, agreements, plans and criteria for wildfires of type 3.
Has never been a type 3 wildfire in Norway. Fire & Rescue services lacks “weight” in the work and discussions on preparedness.

6 4

Ønskeliste:
Mangler planverk basert på ICS, som omtaler strategisk- og taktisk nivå og admin.plan.
Nasjonal forankring, felles forståelse, avtaler, planverk og kriteriesett for type 3 skogbrann.
Økt kunnskap, tilstrekkelige økonomiske rammer.

Wishlist:
Plans and agreements based on ICS, handling strategic and tactical levels, as well as administrative plans.
National level framework and common understanding, agreements, plans and criteria for type 3 wildfire.

Increased knowledge and sufficient funding.

(2) (6)

Behov og begrensninger:

Skape nasjonal forankring gjennom stortingsmelding for brann- og redningstjenesten og totalberedskapskommisjonen. Skape lokal forståelse og forankring gjennom samvirkeaktører og beslutningsorganer. Inngå avtaler, utarbeide planverk og kriteriesett for skogbranner type 1, 2 og 3. Trene og øve på beredskapsplaner. Begrensningene er erkjennelse for problemstillingen lokalt og nasjonalt. Ingen økonomiske midler.

Need and limitations:

Create national level understanding and framework through “stortingsmelding” (report from the Parliament) and “totalberedskapskommisjonen” (preparedness commission).
Create local level understanding through cooperating actors and decision entities.
Establish agreements, create plans and define criteria for wildfires of type 1,2 and 3.
Training, using the plans and agreements.
This topic need to be recognized at both at the local and national level.
Currently no financial incentives.

(6)

Tilleggsinformasjon:

Dersom skogbrann type 3 oppstår og det ikke er planverk for å erkjenne og håndtere kan utfallet bli katastrofalt. Lokal brannsjef blir syndebukk og må ta ansvar for manglende planverk og samvirke.

Additional information:

If a wildfire of type 3 occurs and plans and criteria for acknowledging the situation is missing, the result might be catastrophic. The local Fire chief might have to take the responsibility for missing plans and agreements.

Portugal

CHALLENGE DESIGN WORKSHOP- LL PT

CHALLENGE FRAME – A

Prevention & preparedness

NAME
Provide a title for the challenge. (50-75 characters)
Management at a landscape scale.

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Land ownership cooperation can be strengthened or promoted to achieve economically profitable and sustainable forest management that fulfils all landscape-scale functions.

PROBLEM STATEMENT
Define the problem that the challenge is meant to address. (100-150 characters)
The lack of scale and ownership fragmentation limits the potential for landscape-level forest management to address resiliency in a context characterized by wildfire risk; it limits further the promotion of ecosystem services due to the lack of profitability.

WHY THE PROBLEM EXISTS?
Describe the context of the problem e. Explain and explore why the problem exists and why it's important that is addressed by the challenge. (up to a 1000 characters)
Due to a set of factors: • small size and fragmentation of ownership (based on an unsuitable socio-economic model that does not promote adequately association and cooperation between owners) • depopulation and ageing, which led to the abandonment of land/territorial management. • lack of cadastral survey and owners' identification

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
Management units with scale for achieving: • Valuation of the property and return on investment.

- Resilient territory
- Production of ecosystem goods and services
- Attract private investment

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for a solution to the problem by the challenge (technical, economic, social, others). (up to a 500 characters)

- Solutions with short-term effects
- Incentive or coercive mechanisms

Limitations: complex, time-consuming, and inefficient bureaucratic processes often not addressing adequately the need to promote cooperation and association of forest owners.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of problem, framing of the challenge and achieving a solution. (up to a 500 characters)

(...)

CHALLENGE DESIGN WORKSHOP- LL PT

CHALLENGE FRAME – B

Prevention & preparedness

NAME
Provide a title for the challenge. (50-75 characters)
Economic profitability of forests by maximizing the benefits of their ecosystem services.

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Ensuring payment for ecosystem services to make forest properties profitable and pay the costs of management activities.

PROBLEM STATEMENT
Define the problem that the challenge is meant to address. (100-150 characters)
The lack of instruments to strengthen the supply of ecosystem services as well as the lack of markets makes it difficult to maximize the benefits from ecosystem services

WHY THE PROBLEM EXISTS?
Describe the context of the problem e. Explain and explore why the problem exists and why it's important that is addressed by the challenge. (up to a 1000 characters)
There is a lack of strategies/planning with scale, to support innovation in management practices, to promote and incentivize entrepreneurs and to create/expand markets so that forestland may be used to provide a plethora of products and services.

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
Create effective mechanisms and markets to compensate for the products and services provided by forest ecosystems.

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for a solution to the problem by the challenge (technical, economic, social, others). (up to a 500 characters)
• Lack of management scale; • Lack of markets/industries; • Lack of entrepreneurship/innovation;

• Low attractiveness of forestry activities.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of problem, framing of the challenge and achieving a solution. (up to a 500 characters)
(...)

CHALLENGE DESIGN WORKSHOP- LL PT

CHALLENGE FRAME – C

Prevention & preparedness

NAME
Provide a title for the challenge. (50-75 characters)
Profitable forest

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Managing the forest well means making money.

PROBLEM STATEMENT
Define the problem that the challenge is meant to address. (100-150 characters)
The lack of instruments to strengthen the supply of ecosystem services as well as the lack of markets makes it difficult to maximize the benefits from ecosystem services

WHY THE PROBLEM EXISTS?
Describe the context of the problem e. Explain and explore why the problem exists and why it's important that is addressed by the challenge. (up to a 1000 characters)
The absence or inadequacy of policies aiming at attracting people to rural areas has led to a trend of people moving to urban centres, given rise to a rural exodus. Those who remain in rural areas often lack financial resources and are aging. The lack of investment in rural areas, led to a consequent decrease in profitability.

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
• Involvement of the forestry sectors, landowners, and academia. • Creation of communication channels with owners. • Public investment

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for a solution to the problem by the challenge (technical, economic, social, others). (up to a 500 characters)
• Lack of motivation among forest owners; • Poor communication among stakeholders;

• Need for effective technical and economic models with realistic income forecasts for the owners; • Lack of efficient financial support

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of problem, framing of the challenge and achieving a solution. (up to a 500 characters)
(...)

CHALLENGE DESIGN WORKSHOP- LL PT

CHALLENGE FRAME – D

Detection & response

NAME
Provide a title for the challenge. (50-75 characters)
New fire modelling processes (EWE) with AI (artificial intelligence).

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Realistic and credible simulations.

PROBLEM STATEMENT
The existing simulations are not very representative of the actual conditions of fire evolution (EWE)

WHY THE PROBLEM EXISTS?
Describe the context of the problem e. Explain and explore why the problem exists and why it's important that is addressed by the challenge. (up to a 1000 characters)
The complexity of fire behaviour, which depends on many variables, and the lack of reliable real-time data due to insufficient human resources for data collection.

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
• Developing a system that accurately simulates fire behaviour (EWE), including suppression actions and realistic conditions that reflect the evolution of real fires.

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for a solution to the problem by the challenge (technical, economic, social, others). (up to a 500 characters)
• Large set of variables; • Difficulty in modelling the phenomenon (EWE); • Lack of human resources and real-time information; • Difficulty in integrating climate models of extreme events

ADDITIONAL INFORMATION*

Provide any additional information considered relevant for the description of problem, framing of the challenge and achieving a solution. (up to a 500 characters)
(...)

CHALLENGE DESIGN WORKSHOP- LL PT

CHALLENGE FRAME – E

Restoration & Adaptation

NAME
Provide a title for the challenge. (50-75 characters)
"Joint "Portugal

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
What strategies can be employed to increase the average size of managed forested lands and to encourage landscape-level management?

PROBLEM STATEMENT
• Small holding property, • lack of joint collaborative management

WHY THE PROBLEM EXISTS?
Describe the context of the problem e. Explain and explore why the problem exists and why it's important that is addressed by the challenge. (up to a 1000 characters)
Because there is still a degree of attachment to the land, and the division since the 19th century among the several heirs has fostered a fragmentation of the property. Moreover, policies promoting association and collaboration between owners

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
• Areas of continued management with an impact on the landscape • New economic profitability instruments associated with ecosystem services. • Greater awareness of forest service's value

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for a solution to the problem by the challenge (technical, economic, social, others). (up to a 500 characters)
• Regularizing the Portuguese land registry. • Integrating and operationalizing different territorial management instruments.

• Establishing mechanisms for communicating and enhancing the value of forests.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of problem, framing of the challenge and achieving a solution. (up to a 500 characters)
(...)

CHALLENGE DESIGN WORKSHOP- LL PT

CHALLENGE FRAME – F

Restoration & Adaptation

NAME
Provide a title for the challenge. (50-75 characters)
Paramedics of the forest

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Faster, more efficient and major restoration efforts are needed in areas affected by extreme rural fires.

PROBLEM STATEMENT
Delayed activate actions in post-fire burnt areas due to a lack of leadership.

WHY THE PROBLEM EXISTS?
Describe the context of the problem e. Explain and explore why the problem exists and why it's important that is addressed by the challenge. (up to a 1000 characters)
Bureaucracy, a lack of a clear decision-making processes, and an overabundance of entities in Portuguese territory.

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
• A multidisciplinary team with a range of skills, resources, and the necessary legitimacy to act

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for a solution to the problem by the challenge (technical, economic, social, others). (up to a 500 characters)
• Requirements: well-defined objectives and useful spatio-temporal • Limitations: break the status-quo

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of problem, framing of the challenge and achieving a solution. (up to a 500 characters)

Legislative amendment

Sardinia - Monte Arci -Usellus

CHALLENGE DESIGN WORKSHOP – LL SAR MAU

CHALLENGE FRAME

Prevention & preparedness

NAME
Provide a title for the challenge. (50-75 characters)
Reverse the trend

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Forest restoration beyond public funding

PROBLEM STATEMENT
Provide an extended description of the problem that the challenge is going to address. (up to a 1000 characters)
The problem is defined as the general land abandonment status in Sardinia, with a lack of management of biomass residues, of appropriate after-fire land recovery practices, of maintenance of viable rural roads (especially in mountainous areas) to guarantee adequate access to woodlands. The goals in 2030, would entail well planned territories, well managed and with good infrastructures to sustain the wildfire management cycle.

WHY THE PROBLEM EXISTS?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)
Land abandonment before and after fires is mainly due to the low profitability of rural and forest management, not fully addressed by adequate measures in the CAP funding, and more in general at the national and regional level. I tis also due to the length and complexity of bureaucratic procedures to promptly carry out restoration practices after fires, but mostly to the lack of funding, of a forest management culture and professional skills both at the forest farm and institutional levels.

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
In order to address the problem, it is desirable to: • enhance multifunctional farming (to increase farmers' income)

- to increase the economic value of single multifunctional-farming-products (acting towards marketing, quality, etc)
- to raise awareness of policy makers and institutional mangers concerning financial planning for dedicated supporting measures

The possible options should include

- the adoption of best/successful practices
- activities of communication and dissemination concerning actions
- training on Mediterranean ecosystems evolution
- be reliable approaching specific measures of funding to manage farming tares

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
Among the barriers, the challenge could face poor knowledge of farmers and institutions (e.g. extension services) for multifunctional management and product valorisation and of the complex procedures to benefit from European funds. Another barrier is the uncertainty linked to the markets.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)

CHALLENGE DESIGN WORKSHOP – LL SAR MAU

CHALLENGE FRAME

Detection & response

NAME
Provide a title for the challenge. (50-75 characters)
Operation “Developing skills”

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)

PROBLEM STATEMENT
Provide an extended description of the problem that the challenge is going to address. (up to a 1000 characters)
The group had an in-depth discussion of the problem concerning limited training of firefighters of voluntary forces concerning fire behaviour. A scenario of Sardinia in 2030 was foreseen, with the fulfilment of this training gap among all forces involved in firefighting.

WHY THE PROBLEM EXISTS?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)
The stated problem exists due to the lack of financial resources dedicated to training, poor planning activities towards the issue at the institutional level. We perceive who is in charge to plan is far from the reality and needs of firefighters, underestimating fire risk. Politicians don’t feel to be responsible for taking decisions and it seems the previous experiences do not add new knowledge to take new decisions. Beyond all this, it seems a lack of an “environmental culture” is the ultimate reason that justifies these approaches.

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
We could act towards firefighting training, finding financial resources to be dedicated to environmental education projects, selecting people to train following real attitudes of descendants, using adequate equipment. Educational and training activities should also support the turnover of retired firefighters. Among the requirements to face the challenge:

- increase the financial resources devoted to training
- to create a working group who decides training contents, established also by the representatives of the firefighting world
- Planning to disseminate the environmental culture at each level, also including young citizens

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
Political instability and managerial uncertainty to realize programmes and reforms, recruitment of new human resources devoted to firefighting ineffective. Among risks, demographic crisis and lack of aptitude of younger generations of firefighters.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)

CHALLENGE DESIGN WORKSHOP – LL SAR MAU

CHALLENGE FRAME

Restoration & Adaptation

NAME
Provide a title for the challenge. (50-75 characters)
Active and Resilient Communities

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Promoting participation towards resilience of territories facing extreme wildfire events

PROBLEM STATEMENT
Provide an extended description of the problem that the challenge is going to address. (up to a 1000 characters)
Actually in Sardinia we face a lack of planning concerning activities for functional restoration of burnt areas. Furthermore, regulations are old and there is scarce dialogue among stakeholders. There is no planning of the required measures to restore areas after fire occurs. How could we promote planning that also engages local communities?

WHY THE PROBLEM EXISTS?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)
The problem exists due to lack of relevant economic stakeholders, fragmentation of properties, especially private ones, small forest enterprises, lack of trust in institutions by the general public and scarce civil participation, along with a general acceptance that forest planning is poorly applied.

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
In order to solve the challenge, it would be desirable to increase the multifunctionality of activities in the territories, as well as to update rules concerning the forest sector in Sardinia. Also promoting multi-disciplinary working groups to plan forest resources in the short-mid-term.

To reach a perfect solution, we need to have more detailed administrative plans with operative protocols to manage land resources, as well as to promote the creation of sustainable forest enterprises, to update agronomic practices based on specific needs of the territories, to promote active citizenship to involve communities in all stages through participatory approaches and opportunities.

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
Among the limitations our challenge could face, the lack of communication, both internal and external, to promote a general change at each level (institutional, societal).

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)

Sardinia - Porto Conte-Alghero

CHALLENGE DESIGN WORKSHOP – LL SAR PCA

CHALLENGE FRAME

Prevention & preparedness

NAME
Provide a title for the challenge. (50-75 characters)
FIRE PLANNING 2030

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Land planning for territories preparedness and prevention toward wildfires

PROBLEM STATEMENT
Provide an extended description of the problem that the challenge is going to address. (up to a 1000 characters)
Actually several land planning tools do not concern wildfire prevention issues. Tools dedicated to the topic are often not coherent with other tools or plans, concerning all scales: from urban plans up to Natura2000 management plans, coastal land use tools to civil protections planning ones, including forest district management tools.

WHY THE PROBLEM EXISTS?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)
The problem exists due to not harmonised goals by public institutions, missing a general and systematic vision of the wildfire issue. In fact, Sardinia has several different institutional subjects as well as sectoral policies which (seem to) underestimate the gravity and complexity of wildfire risk. The institutional "fulfilment mood" together with the lack of a long-term planning and fragile mission feeling is another cause which favours prompt approaches to manage the emergency with respect to acting towards prevention in mid-long term.

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
Solutions to the challenge identified could aim to: • collecting inputs for a legislative reform towards the integration of risk in land planning instruments

- to address major communication activities and integration among subjects devoted to work on different issues and levels of land planning
- to promote a cultural revolution, breaking that institutional fulfilment mood by public administration/institutions, to enhance risk perception and acknowledge the complexity and importance of prevention.

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
A limit could contemplate the lack of adequate competences to steer the change, while barriers take into account difference of views and interest by policy makers towards other topics/issues vs wildfire prevention. A big risk could be represented by the increasing events to manage due to climate emergency intensification within 2030.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)
Target of the challenge consists in Sardinian public institutions responsible for land policies and governance.

CHALLENGE DESIGN WORKSHOP – LL SAR PCA

CHALLENGE FRAME

Detection & response

NAME
Provide a title for the challenge. (50-75 characters)
FENICE - FirEfighting sector's reNaIssanCE

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Facilitate new FireFighting sector of Sardinia, from turn-over policies to professional training for all the human firefighting "machine"

PROBLEM STATEMENT
Provide an extended description of the problem that the challenge is going to address. (up to a 1000 characters)
A shared problem concerns the lack of efficient recruitment as well as professional training for human resources devoted, either institutionally or as voluntary corps, to face the emergency. Among the 7000 people involved in the human firefighting machine (among all corps and voluntary resources) there is a various and not coherent level of competences The average age of people from institutions involved is over 55 years old, considered too mature to respond promptly and adequately to emergencies with respect to younger resources, scarcely represented at the institutional level due to insufficient recruitment policies. They are present among voluntary corps, which however are not trained as experts.

WHY THE PROBLEM EXISTS?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)
Problem exists due to the lack of human resource recruitment planning, coherent with the needs of turnover employment. The origin could be found both in a lack of financial resources and of political will. It seems voluntary will is far from the territory's needs. Of course, lack of human resource management also encompasses the administrative levels of institutions which suffer lack of personnel, devoted to - for example - intercept and adequately manage European funds to face the regional daily management.

WISHLIST

Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
First, in order to satisfy the demand for training, we need to transfer all cultural skills and knowledge acquired in wildfire-fighting to the younger generations. In order to act towards a better management of resources for recruitment in the firefighting sector, we need to intercept dedicated European funds, participating in Eu programmes and projects but also being responsive about how those funds are accounted for, in terms of political transparency. To reach those goals, the Sardinian region needs also to have experts enabled to apply for and manage European funds.

REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
We need a cultural shift in the political will, simplifying the bureaucracy related to ordinary recruitment, often determined by labour rules and unions, rather than tailored to the real needs, not addressing the ability to recruit adequate human resources in terms of number and skills. The low birth rate which affected Sardinia in recent decades reflects today the lack of young resources to be employed in various sectors, such as firefighting, already scarcely frequent in terms of public employment. What could happen in 2030? We will face a climate emergency worsening every year, and the loss of firefighting culture by people becoming retired. The main risk is to not have young resources as well as the traditional knowledge of firefighting.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)

CHALLENGE DESIGN WORKSHOP – LL SAR PCA

CHALLENGE FRAME

Restoration & Adaptation

NAME
Provide a title for the challenge. (50-75 characters)
Let's get involved and take action ("armiamoci e partiamo")

SUBTITLE
Write a short promotional sentence of the challenge. (100-150 characters)
Coordination of post-fire interventions

PROBLEM STATEMENT
Provide an extended description of the problem that the challenge is going to address. (up to a 1000 characters)
The challenge aims to address the issue of land abandonment after wildfires, especially after extreme wildfire events. There are no specific tools or knowledge to quantify and understand resource losses after wildfire events, also in order to improve management towards restoration of natural vegetation, to support wild fauna and livestock, and for adaptation measures to prevent new extreme wildfire events (resilience at 2030).

WHY THE PROBLEM EXISTS?
Describe the context of the problem being addressed in the challenge. Explain and explore why the problem exists and why it's important within the context of the challenge. (up to a 1000 characters)
The problem exists due to the lack of a strategic vision, integrated management and missing coordination among institutions. The main cause of that is perceived in the shifting responsibilities among institutions with different competences, due to lack of long-term planning and understanding of each ones' role, no interdisciplinary approaches, missing dedicated skills in the ruling class. Other causes are established by poor (internal and external) communication, too much bureaucracy that hinders practical management, but also scarce knowledge of the complexity concerning restoration of burnt areas, as well as of territories by institutions. Absence of post-fire management plans.

WISHLIST
Indicate what would be desired characteristics and benefits to have in the "perfect" solution. If there are key features that would be relevant please indicate. (up to a 500 characters)
Desirable tools could be

- the creation of a permanent technical working group, devoted to post fire restoration management
- central coordination of site-specific post fire restoration activities
- regional control-cabin for stakeholder engagement and promotion of guidelines of post fire management and restoration at different landscape levels/scales
- clear definition of stakeholders in charge of dedicated funding, rules and responsibility of each part involved, including local communities/citizens.

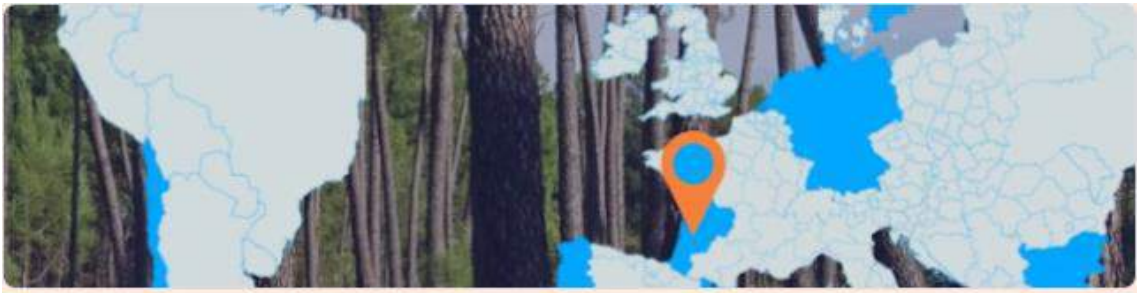
REQUIREMENT(S) AND LIMITATION(S)
Provide the requirements and limitations for the solution to answer the challenge (technical, economic, social, others). (up to a 500 characters)
Gaps could be found in the lack of trust in institutions devoted to post-fire management by the general public, as well as a missing sense of responsibility by citizens (wildfire risk management as well as post-fire interventions are perceived as an institutional - public duty). Barriers could be represented by the high number of institutions in Sardinia involved in land management, and the lack of communication among them. Restrictions could be represented by bureaucracy, lack of funds to support post fire management in the long term as well as poor citizen perception and engagement.

ADDITIONAL INFORMATION*
Provide any additional information considered relevant for the description of the challenge or the potential solution. (up to a 500 characters)

Annex III. Unique Personnel Survey - Challenges list

Nouvelle-Aquitaine

https://forms.gle/b86uPrXtS9YRQXR79



D6.2 . Nouvelle-Aquitaine - VIM & CIS | Survey for first inputs on identified key points.

As you may know, ForestWISE is responsible for delivering the **Deliverable 6.2** which integrates:

>> creating a **Visual Inspiration Map** (VIM) to represent the wildfire context/vision/challenges of each Living Lab's (LL) Community of Wildfire Innovation (CWI) for a wildfire-resilient landscape.

>> a **Catalogue of innovative solutions** (CIS) compiling relevant technological, entrepreneurial, and social needs and potential solutions to address CWI' challenges across different LLs.

In this regard, we kindly come to you, asking for your valuable contribution to guide us in feeding the Living Lab factsheets that will be included in D6.2.

We include in this survey the key points collected from M8.1, MS8.2, and the challenge frame document (Whislist content) for the CWI description, Wildfire context, and CWI challenges per LL, respectively.

Your contribution matters ... We appreciate your feedback so that we can use accurate information and build the CIS according to each LL.

Bulgaria

https://forms.gle/Z7Ngzt6AQhPE31CR7

D6.2. Bulgaria - VIM & CIS | Survey for first inputs on identified key points.

As you may know, ForestWISE is responsible for delivering the **Deliverable 6.2** which integrates:

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>> a **Catalogue of innovative solutions** (CIS) compiling relevant technological, entrepreneurial, and social needs and potential solutions to address CWI' challenges across different LLs.

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We include in this survey the key points collected from M8.1, MS8.2, and the challenge frame document (Whislist content) for the CWI description, Wildfire context, and CWI challenges per LL, respectively.

Your contribution matters ... We appreciate your feedback so that we can use accurate information and build the CIS according to each LL.

Catalonia

https://forms.gle/7stPZtkA8Nq8rthu7

D6.2 . CAT - VIM & CIS | Survey for first inputs on identified key points.

As you may know, ForestWISE is responsible for delivering the **Deliverable 6.2** which integrates:

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>> a **Catalogue of innovative solutions** (CIS) compiling relevant technological, entrepreneurial, and social needs and potential solutions to address CWI' challenges across different LLs.

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We include in this survey the key points collected from M8.1, MS8.2, and the challenge frame document (Whislist content) for the CWI description, Wildfire context, and CWI challenges per LL, respectively.

Your contribution matters ... We appreciate your feedback so that we can use accurate information and build the CIS according to each LL.

Galicia

https://forms.gle/5JpnBJWqL5978Nb89

D6.2 . Galicia - VIM & CIS | Survey for first inputs on identified key points.

As you may know, ForestWISE is responsible for delivering the **Deliverable 6.2** which integrates:

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>> a **Catalogue of innovative solutions** (CIS) compiling relevant technological, entrepreneurial, and social needs and potential solutions to address CWI' challenges across different LLs.

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We include in this survey the key points collected from M8.1, MS8.2, and the challenge frame document (Whislist content) for the CWI description, Wildfire context, and CWI challenges per LL, respectively.

Your contribution matters ... We appreciate your feedback so that we can use accurate information and build the CIS according to each LL.

Germany- The Netherlands

https://forms.gle/kSbRLt5xXKBMLffz9

D6.2. Germany-The Netherlands - VIM & CIS | Survey for first inputs on identified key points.

As you may know, ForestWISE is responsible for delivering the **Deliverable 6.2** which integrates:

>> creating a **Visual Inspiration Map** (VIM) to represent the wildfire context/vision/challenges of each Living Lab's (LL) Community of Wildfire Innovation (CWI) for a wildfire-resilient landscape.

>> a **Catalogue of innovative solutions** (CIS) compiling relevant technological, entrepreneurial, and social needs and potential solutions to address CWI' challenges across different LLs.

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We include in this survey the key points collected from M8.1, MS8.2, and the challenge frame document (Whislist content) for the CWI description, Wildfire context, and CWI challenges per LL, respectively.

Your contribution matters ... We appreciate your feedback so that we can use accurate information and build the CIS according to each LL.

Greece

https://forms.gle/LBMfTrVrTAbLuk1Q6

D6.2 . Greece - VIM & CIS | Survey for first inputs on identified key points.

As you may know, ForestWISE is responsible for delivering the **Deliverable 6.2** which integrates:

>> creating a **Visual Inspiration Map** (VIM) to represent the wildfire context/vision/challenges of each Living Lab's (LL) Community of Wildfire Innovation (CWI) for a wildfire-resilient landscape.

>> a **Catalogue of innovative solutions** (CIS) compiling relevant technological, entrepreneurial, and social needs and potential solutions to address CWI' challenges across different LLs.

In this regard, we kindly come to you, asking for your valuable contribution to guide us in feeding the Living Lab factsheets that will be included in D6.2.

We include in this survey the key points collected from M8.1, MS8.2, and the challenge frame document (Whislist content) for the CWI description, Wildfire context, and CWI challenges per LL, respectively.

Your contribution matters ... We appreciate your feedback so that we can use accurate information and build the CIS according to each LL.

Norway-Sweden

https://forms.gle/mzwABEokARwkTozV6

D6.2 . Norway - Sweden - VIM & CIS | Survey for first inputs on identified key points.

As you may know, ForestWISE is responsible for delivering the **Deliverable 6.2** which integrates:

>> creating a **Visual Inspiration Map** (VIM) to represent the wildfire context/vision/challenges of each Living Lab's (LL) Community of Wildfire Innovation (CWI) for a wildfire-resilient landscape.

>> a **Catalogue of innovative solutions** (CIS) compiling relevant technological, entrepreneurial, and social needs and potential solutions to address CWI' challenges across different LLs.

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We include in this survey the key points collected from M8.1, MS8.2, and the challenge frame document (Whislist content) for the CWI description, Wildfire context, and CWI challenges per LL, respectively.

Your contribution matters ... We appreciate your feedback so that we can use accurate information and build the CIS according to each LL.

Portugal

https://forms.gle/EiDWSmCPNewDyrwW9

D6.2 . PT - VIM & CIS | Survey for first inputs on identified key points.

As you may know, ForestWISE is responsible for delivering the **Deliverable 6.2** which integrates:

>> creating a **Visual Inspiration Map** (VIM) to represent the wildfire context/vision/challenges of each Living Lab's (LL) Community of Wildfire Innovation (CWI) for a wildfire-resilient landscape.

>> a **Catalogue of innovative solutions** (CIS) compiling relevant technological, entrepreneurial, and social needs and potential solutions to address CWI' challenges across different LLs.

In this regard, we kindly come to you, asking for your valuable contribution to guide us in feeding the Living Lab factsheets that will be included in D6.2.

We include in this survey the key points collected from M8.1, MS8.2, and the challenge frame document (Whislist content) for the CWI description, Wildfire context, and CWI challenges per LL, respectively.

Your contribution matters ... We appreciate your feedback so that we can use accurate information and build the CIS according to each LL.

Sardinia

https://forms.gle/fKaeJdvAtJ4HbDBw8

D6.2 . Sardinia - VIM & CIS | Survey for first inputs on identified key points.

As you may know, ForestWISE is responsible for delivering the **Deliverable 6.2** which integrates:

>> creating a **Visual Inspiration Map** (VIM) to represent the wildfire context/vision/challenges of each Living Lab's (LL) Community of Wildfire Innovation (CWI) for a wildfire-resilient landscape.

>> a **Catalogue of innovative solutions** (CIS) compiling relevant technological, entrepreneurial, and social needs and potential solutions to address CWI' challenges across different LLs.

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Your contribution matters ... We appreciate your feedback so that we can use accurate information and build the CIS according to each LL.

Annex IV. Key needs and solutions per IFM Phases & typologies

Nouvelle-Aquitaine

Table IV. 1 Nouvelle-Aquitaine (France) challenges and priorities towards resilient landscapes

Living Lab - Nouvelle-Aquitaine			
Phase	1st level - Objective	2nd level - Action	3rd level - Beneficiary Agents
Prevention & preparedness	Ensure proper application	Legal fuel treatments	Owners (Private & public)
Prevention & preparedness	Reduce fuel biomass inside WUI	Enhance risk perception	Urban & rural communities
Detection & response	Efficient & up-to-date tool	Communication strategies	Society
Detection & response	Enhance fire risk culture	Communication strategies	Society

Bulgaria

Table IV. 2 Bulgaria challenges and priorities towards resilient landscapes

Living Lab - Bulgaria			
Phase	**1st level - Objective**	**2nd level - Action**	**3rd level - Beneficiary Agents**
Prevention & preparedness	Address wildfire risk	Approaches & tools improvement	Society
Prevention & preparedness	Construction of resilience landscapes	International transferring knowledge	Society
Prevention & preparedness	Fire protection equipment	European/national funding	Fire end users
Prevention & preparedness	Sustainable management planing	Municipality landscape GIS systems	Decision makers | Fire end users
Prevention & preparedness	Improve risk areas accessibility	Planning fund/invests	All the actors
Prevention & preparedness	Institutions' rights/obligations	New regulations	Decision makers
Prevention & preparedness	Updated GIS platforms	Municipality training	Decision makers
Prevention & preparedness	Risk awareness	Educational activities/campaigns	Society
Prevention & preparedness	Constant fire season assessement	Design a monitoring system	All the actors
Detection & response	Innovative technical equipment	Informative & permanent campaign	All the actors
Detection & response	Services/equipment during fire season	Risk assessment framework	Fire end users
Detection & response	Improved first attack	Monitoring forecasting modelling	Decision makers | Fire end users
Detection & response	Expert training	Streamlined system	Fire end users
Detection & response	Fire risk monitoring & management	Improve digital technologies	Decision makers | Fire end users
Detection & response	Integral support & motivation	Creation of municipality fire brigades	Fire end users
Detection & response	Increase prevention & response	Rights/responsibility of stakeholder	Society
Restoration & Adaptation	Monitoring & reporting funds	System to compile restoration efforts	All the actors
Restoration & Adaptation	Long term resilience in post-fire actions	Integrated fire management	All the actors
Restoration & Adaptation	Empowering stakeholders for resilient landscapes	Municipality regulatory framework changes	Decision makers
Restoration & Adaptation	Capacity building for targeted stakeholders	national/international funded projects	Policy makers and media
Restoration & Adaptation	Risk awareness education actions	Approaches methods & tools	Children's audience
Restoration & Adaptation	Improve field personnel skills	Certified training	Rural communities

Catalonia

Table IV. 3 Catalonia (Spain) challenges and priorities towards resilient landscapes

Living Lab - Catalonia			
Phase	**1st level - Objective**	**2nd level - Action**	**3rd level - Beneficiary Agents**
Prevention & preparedness	Pre- & post-fire planning	Unique platform improvement	Fire end users
Prevention & preparedness	Transparency and standardized data	Unique platform improvement	All the actors
Prevention & preparedness	Infographic information	Unique platform improvement	Fire end users
Prevention & preparedness	Best management pratices	Practical training	All the actors
Prevention & preparedness	Fuel reduction	Management guidelines	All the actors
Detection & response	Predicting fire evolution	Technological improvement	Fire fighters
Detection & response	Facilitate decision-making	Technological improvement	Fire fighters
Detection & response	Wildfire monitoring	Effective tools	Fire end users
Detection & response	Awareness and education	Communication strategies	Urban and rural communities
Restoration & Adaptation	Increase landscape resilience	Decision support tool upgrade	All the actors
Restoration & Adaptation	Socio-economic and ecological planning	Decision support tool upgrade	All the actors
Restoration & Adaptation	Improve response capacity	Decision support tool upgrade	All the actors

Galicia

Table IV. 4 Galicia (Spain) challenges and priorities towards resilient landscapes

Living Lab - Galicia			
Phase	**1st level - Objective**	**2nd level - Action**	**3rd level - Beneficiary Agents**
Prevention & preparedness	Technical fire training & certification	Funding	Fire end users
Prevention & preparedness	Safety rural/urban interface environment	Creation of scenarios for training/real simulation	Fire end users
Prevention & preparedness	Testing equipment/training in a real environment	Pre-designed fuel plots	Fire end users
Prevention & preparedness	Properly fire management	Effective regulations & sanctions	Land owners
Detection & response	New generation of Personal Protective Equipment	Design a new tool (smart glasses)	Fire end users
Detection & response	Safety of the operatives	Integrate photoluminescence into hoses	Fire end users
Detection & response	Avoid material losses	Integrate photoluminescence into hoses	Fire end users
Detection & response	Optimise the water in fire-engines	Built-in water cooling system (4°C)	Fire end users
Restoration & Adaptation	Implement erosion awareness system	Reliable data methods/models	Post-fire teams
Restoration & Adaptation	Assessment of field-fire severity	Improvement of sensors	Post-fire teams
Restoration & Adaptation	Runoff & flood awareness	Dynamic forecasting system	Post-fire teams

Germany- The Netherlands

Table IV. 5 Germany – The Netherlands challenges and priorities towards resilient landscapes

Living Lab - Germany-The Netherlands			
Phase	**1st level - Objective**	**2nd level - Action**	**3rd level - Beneficiary Agents**
Prevention & preparedness	Public participatory engagement	Game-based learning approach	Society
Prevention & preparedness	Nature-fire risk awareness	Risk communication approach	Society
Prevention & preparedness	Multilayer safety system	National action plan	Society
Prevention & preparedness	Nature-fire risk culture	Risk communication approach	Homeowners
Prevention & preparedness	WUI assessement/management	Implement WUI tools	Homeowners
Prevention & preparedness	Societal awareness	Risk communication strategies	Society
Prevention & preparedness	Enhance specialized IFM knowledge	Wildfire management training	All the actors
Prevention & preparedness	Wildfire management strategies	New wildfire regulations/policies	Decision makers

Greece

Table IV. 6 Greece challenges and priorities towards resilient landscapes

Living Lab - Greece

Phase	1st level - Objective	2nd level - Action	3rd level - Beneficiary Agents
Prevention & preparedness	Forest road management actions	Accurate forest network database	Fire end users
Prevention & preparedness	Effective fuel management measures	Information campaigns	Stakeholders and society
Prevention & preparedness	Annual fire prevention plans	Forestry crews creation	All the actors
Prevention & preparedness	Awareness and education	Programs/strategies development	Society
Prevention & preparedness	Fuel and management cost reduction	Agroforestry practices enhancement	Rural communities
Prevention & preparedness	Electricity network cleaning	Development of programs	Rural communities
Prevention & preparedness	Prescribed burning impremementation	Legislative regulation	Decision makers
Detection & response	Online and Real-time cartographic	Fire front tools upgrade	Fire end users
Detection & response	Up-to-date a meteorological station	Fire station improvement	Decision makers
Detection & response	Network of meteorological stations	Greek operational system connection	Fire end users
Detection & response	Enhance knowledge/ skills	New technologies training	Fire end users
Detection & response	Increase suppression efficiencies	Development of systematised methodologies	Fire end users
Detection & response	Accurate spatial fire indices	Greek operational system linkage	Fire end users
Restoration & Adaptation	Monitoring fire and ecological effects	Technological improvement	All the actors
Restoration & Adaptation	Measures/practices improvement	Financial support	Actors impacted by wildfires
Restoration & Adaptation	Erosion and flood protection	Silvicultural pos-fire adaptations	All the actors
Restoration & Adaptation	Reforestations in WUI areas	Silvicultural pos-fire instructions	All the actors
Restoration & Adaptation	Fire smart urban planing	Fire-resilient protocol	Urban and rural communities
Restoration & Adaptation	Fire severity common protocol	EFFIS linkage	Decision makers

Norway-Sweden

Table IV. 7 Norway-Sweeden challenges and priorities towards resilient landscapes

Living Lab - Norway-Sweden			
Phase	**1st level - Objective**	**2nd level - Action**	**3rd level - Beneficiary Agents**
Prevention & preparedness	Reduce the WF risk	Safety culture improvement	All the actors
Prevention & preparedness	Continuous identification of risks	Mutual training platform	Aviation industry
Prevention & preparedness	Risk awareness	Mutual training platform	Stakeholders
Prevention & preparedness	Public health & safety	Legal and economic actions	All the actors
Prevention & preparedness	WF risk assessment	Legal and economic actions	Decision makers
Prevention & preparedness	Secure assets & infrastructure	Legal and economic actions	Society
Prevention & preparedness	Update/coupling vegetation & weather data	Unique platform database	All the actors
Prevention & preparedness	Wildfire risk alert	Fire severity/behaviour assessment	Fire end users
Prevention & preparedness	Dissemination of new behaviours/practices	Communication strategies	Society
Detection & response	Coordination available data	Case-specific software	Fire end users
Detection & response	Estimation fire effects/behaviour	Modeling Nordic conditions	Fire end users
Detection & response	Support risk scenarios decisions	Tools improvement	Fire end users
Detection & response	National incident management	Relocate Civil Protection organism	Decision makers
Detection & response	Local fire/rescue services	Funding implementation	Decision makers
Detection & response	Professional incident management team	Regulation/political support	Fire end users
Restoration & Adaptation	Exchange knowledge/plans & regulations	Benchmarking country analysis	Decision makers | Fire end users
Restoration & Adaptation	Creation strategic & tactical plans	Financial incentives	Decision makers | Fire end users
Restoration & Adaptation	Local-level understanding	Coorporate decision making	All the actors
Restoration & Adaptation	Wildfire types assessment	Define criteria for wildfires types	Decision makers | Fire end users

Portugal

Table IV. 8 Portugal challenges and priorities towards resilient landscapes

Living Lab - Portugal			
Phase	**1st level - Objective**	**2nd level - Action**	**3rd level - Beneficiary Agents**
Prevention & preparedness	Increase Investment	Effective technical and economic models	Public
Prevention & preparedness	Attract Investment	Forest properties policies	Private owners
Prevention & preparedness	Best practices	Communication strategies	Private owners
Prevention & preparedness	Fuel management awareness	Communication strategies	Society
Prevention & preparedness	Prescribed burnings acceptance	Communication strategies	Rural communities
Prevention & preparedness	Involvement 4-helix	Communication strategies	All the actors
Prevention & preparedness	Property appreciation	Policy investment return	Property owners
Prevention & preparedness	Resilient territory	Management at a landscape scale	All the actors
Prevention & preparedness	Production of ecosystem goods/services	Efficient mechanism	Property owners
Detection & response	Realistic fire behavior	Software improvement	Fire end users
Detection & response	Real-time fire evolution	Software improvement	Fire end users
Detection & response	Improve communication	Communication strategies	All the actors
Restoration & Adaptation	Control invasive plants	Post fire actions	Multidisciplinary team
Restoration & Adaptation	Enhance skills	Certified training	Post fire teams
Restoration & Adaptation	Ecosystem services profitability	Increase certification	Forest actors
Restoration & Adaptation	Ecosystem services value	Market services	Forest actors
Restoration & Adaptation	Development rural territories	Bio-businesses creation	Urban and rural communities
Restoration & Adaptation	Attract people to rural territories	Socio economically viable	Urban and rural communities

Sardinia

Table IV. 9 Monte Arci – Usellus (Sardinia) challenges and priorities towards resilient landscapes

Living Lab - Sardinia			
Phase	**1st level Objective**	**2nd level Action**	**3rd level beneficiary Agents**
Monte Arci -Usellus			
Prevention & preparedness	Successful practices	Communication/dissemination strategies	All the actors
Prevention & preparedness	Active forest managment	Local/regional funding measures	All the actors
Prevention & preparedness	Multifunctional farming	Bioeconomic improvement	Rural communities
Prevention & preparedness	Knowledge/expertise in the firefighting sector	Training new generation	Fire end users
Detection & response	Environmental education projects	Finding financial resources	All the actors
Detection & response	Firefighters adequate training	Increase financial resources	Fire end users
Detection & response	Appropriated equipment	Increase financial resources	Fire end users
Detection & response	Benchmarking experts group	Define training contents	Fire end users
Restoration & Adaptation	Functional restoration	Increase multifunctionality of activities	All the actors
Restoration & Adaptation	Update forest sector rules	Detailed administrative plans	All the actors
Restoration & Adaptation	Sustainable forest planning	Multi-disciplinary working group	All the actors
Restoration & Adaptation	Promote active citizenship	Participatory approaches	All the actors
Restoration & Adaptation	Restoring & recovering action	Local financial instruments	All the actors

Table IV. 10 Porte Conte-Alghero (Sardinia) challenges and priorities towards resilient landscapes

Living Lab - Sardinia			
Phase	**1st level - Objective**	**2nd level - Action**	**3rd level - Beneficiary Agents**
	Porto Conte-Alghero		
Prevention & preparedness	Land planning instruments	Integration of plans	All the actors
Prevention & preparedness	Enhance risk perception/prevention	Exchange institutional/administrative culture	Decision makers
Prevention & preparedness	Integration of risk	Major communication activities	All the actors
Prevention & preparedness	Implement change in legal/sectorial policies	Land policies & governance improvement	Decision makers
Detection & response	Firefighter recruitment	Suitable EU funds	Decision makers
Detection & response	Responsive & expert knowledge	Participation in EU funds	Decision makers
Detection & response	Facilitate political transparency	Profissional training	Decision makers
Detection & response	Simplify bureaucracies	EU funds regional administratives	Decision makers
Restoration & Adaptation	Promotion guidelines at different scales	Stakeholders engagement	Society
Restoration & Adaptation	Site-specific restoration activities	Central post-fire coordination	Decision makers
Restoration & Adaptation	Strategic post-fire planning	Creation of permanent technical group	All the actors
Restoration & Adaptation	Revising laws & procedures	Policies establishments	All the actors
Restoration & Adaptation	Post-fire data/monitoring	Integrated post-fire management	All the actors

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