FIREURISK - DEVELOPING A HOLISTIC, RISK-WISE STRATEGY FOR EUROPEAN WILDFIRE MANAGEMENT

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Quality Control

Type	Date	Reviewed by	Approved/Comment
Internal	14/04/2025	Ana Miranda (UA)	The Deliverable adequately reports high-quality training events and shows how those impacted stakeholders. Congratulations on the nice work.
Internal	24/04/2025	Tiago Rodrigues (ADAI), on behalf of QRB	Approved with minor suggestions
Internal	24/04/2025	Klelia Petrou (EUC – WP6)	Made minor corrections in some sentences and suggested for some alterations. Executive summary to be updated based on the previous comments from the Periodic Review and add the Take Away messages

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Executive Summary

Deliverable D6.5 , entitled "*Training organization - v.2*", is the fifth Deliverable of WP6 ("Policy integration & outreach – Networking & dissemination") of the FirEURisk project. The Deliverable updates the activities of CNR under Task A6.2.2, aimed at supporting the sharing, dissemination, and inception of the project's results through the organization of several training activities in different forms (e.g., practitioners' workshops, focused webinars, online discussions with policymakers, web-based simulation exercises) targeting different types of stakeholders actors (e.g., practitioners, professionals, researchers), and supported by the development of specialized training materials. It builds on D6.4, which had outlined the planning of five training events: *Fuel Mapping* and *WUI Mapping* for WP1, *Guidelines to Face Extreme Fires* for WP2, *Future Fire Risk and Adaptation Measures* for WP3, and *Roadmap for an Integrated Strategy* for WP4. The first two training activities were successfully held by month 24 (M24). From M25 onward, adjustments were needed to align training schedules with other Work Packages, leading to some rescheduling and new proposals.

D6.5 describes the final three online events: Training Event #3 (Nov 8, 2024): "New Challenges for Responders" – 70 participants (51% professionals in wildfire, civil protection, environmental, and health sectors); Training Event #4 (Feb 25, 2025): "Understanding Climate Scenarios for Wildfire Studies" – 88 participants (47% from wildfire risk management and civil protection); Training Event #5 (Mar 10, 2025): "FirEURisk Information, Data and Visualization Tools" – 356 participants (mainly researchers and wildfire actors). Overall, the training activities reached 954 participants, with recordings surpassing 900 views, 500 downloads of presentations, and 470 downloads of other materials (e.g., scripts, maps, articles).

Key take aways:

- 👥 **Diverse Target Groups Reached:** Training events successfully engaged practitioners, researchers, professionals, and, to a lesser extent, policymakers. Researchers consistently represented a large proportion of attendees, while civil protection professionals showed increased engagement over time.
- 🌍 **Geographic Participation Insights:** Southern Europe (Portugal, Spain, Italy) showed consistently high engagement due to their existing networks and wildfire exposure. Future initiatives should focus on building stronger stakeholder networks in Northern and Eastern Europe and tailoring content to the specific needs and wildfire risk perceptions of these regions.
- 🔗 **Sustainability of Resources:** All event recordings and materials remain publicly available on the the FirEURisk website, section "Resources": https://fireurisk.eu/training-event-materials/, and YouTube channel: https://www.youtube.com/@fireurisk9834/videos, supporting continued knowledge sharing after the project's conclusion.

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List of Acronyms

Table 1: List of Acronyms

List of Acronyms	
ADAI	Associacao para o Desenvolvimento da Aerodinamica Industrial
CNR	National Research Council of Italy
FIRE-ADAPT	The Role of Integrated Fire Management on Climate Change Adaptation for Ecosystem Services in Tropical and Subtropical Regions
FIRELOGUE	Cross-sector dialogue for Wildfire Risk Management
FIRE-RES	Innovative technologies and socio-ecological-economic solutions for fire-resilient territories in Europe
ICFBR2022	III International Fire Behaviour and Risk Conference, 2022
MED-Star	*Strategie e misure per la mitigazione del rischio di incendio nell'area Mediterranea* (Strategies and measures for fire risk mitigation in the Mediterranean area)
Pyrolife ESRs	Pyrolife Early Stage Researchers
SAFE	Association Pegase
SILVANUS	Integrated Technological and Information Platform for wildfire Management
SISEF	Italian Society of Silviculture and Forest Ecology
TREEDS	A Holistic Fire Management Ecosystem for Prevention, Detection and Restoration of Environmental Disasters
TUD	Technische Universitaet Dresden
UAH	Universidad de Alcala
UH	University of Haifa
WP	Work Package
UAVR	Universidade de Aveiro
ARBO	Arbonaut Ltd

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1 Introduction

The main goal of Work Package 6 is to define, establish and perform highly effective communication, dissemination and exploitation actions to ensure the project's success and long-term legacy in achieving its goals across all EU regions and beyond. WP6 receives inputs from all WPs to share and promote knowledge, experience and expertise generated and validated within FirEURisk, concerning alternative wildfire management practices to best address the changing risks across Europe. This includes effective communication, dissemination, and integration of the integrated strategy for holistic risk-based fire management across Europe (O1, FirEURisk Grant Agreement, Annex 1-3)[1] as well as expand the EU-wide community of different stakeholders involved in wildfire management (O17)[2]. In this framework, and in particular in Activity 6.2.2, the National Research Council of Italy (CNR) organized several training activities, supported by the development of specialized training materials, in different forms (e.g., practitioners' workshops, focused webinars, online discussions with policy-makers, web-based simulation exercises) targeting different types of stakeholder actors (e.g., practitioners, professionals, researchers). The final aim is to support the sharing and inception of the project's results.

1.1 Purpose of the document

The purpose of D6.5 is to update and expand on the training activities proposed and outlined in D6.4.
In Deliverable D6.4 "Training organization – v.1", the main steps towards the organization of the training activities were illustrated in detail. The process started with the first identification of a possible list of project results suitable for training activities [M12-M16], and continued with a discussion on the activities with WP leaders, asking for feedback and possible other interesting FirEURisk results that could be exploited as training activities [M17-M20]. In the meantime, CNR defined the factsheet representing the structure of the training activities [M19], also used as dissemination material shared with the targeted audiences. D6.4 ended describing the first two training events that were organized by M24, providing also some main remarks on the work done and on the future activities.

D6.5 "Training Organization – v.2" provides, at first, an updated overview of the training activities conducted up to M24, including engagement metrics such as the number of views and downloads of the training materials. It is also aimed at documenting the events organized from M25 to M48, detailing the organization, implementation, and outcomes of these training sessions, and highlighting their impact on different target audiences. Furthermore, similarly to D6.4, D6.5 includes a set of specialized training materials delivered at M48. Finally, D6.5 offers some final remarks on the overall impact of the training activities and suggests possible future directions for improving knowledge dissemination and stakeholder engagement.

[1] FireEURisk O1 – Objective 1: Develop and validate a novel and integrated strategy for holistic risk-based fire management, addressing all phases of wildfire challenges (prevention, monitoring, preparedness, response, and restoration) (WP1 to WP6).
[2] FireEURisk O17 – Objective 17: Expand the EU-wide community of different stakeholders involved in wildfire management (civil protection, fire and forest services, timber/paper industry, forest owners, tourist resources, insurance companies) to share fire knowledge, research outputs, and good practices for fire management. (WP5, WP6)

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1.2 Structure of the document

This Deliverable is structured into four main sections. Following the Introduction (Section 1), Section 2 provides a concise overview of the updated outcomes (in terms of number of views and downloads of training material) of the training events organised from M12 to M24. Section 3 presents the selected training activities from M25 to M48 and their organization, while section 4 describes the training events, emphasizing their impact on various target audiences. Finally, Section 5 offers the main conclusions drawn from the analysis of all training outcomes. The factsheet used to detail all the training activities are presented in Annex A, and the detailed reports from the "questions and answers" sessions of the training events can be found in Annex B.

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2 Overview and updates of the first training activities [M12-M24]

This section provides updates on the participants' analysis metrics about the previous training events, namely the TR#1 – *The FirEurisk Fuel Classification System* and the TR#2 – *Mapping the Wildland-Urban Interface*. Figure 1 presents a comparison of the number of event recording views and downloads of slides or additional materials between M24 and M48 for these first two training events.

The analysis below shows that recordings and materials from the training events are frequently accessed, viewed, and downloaded after the events have taken place. This highlights the importance of organizing such events and underscores the continued relevance and use of the project's outcomes by researchers, first responders, and other stakeholders involved in wildfire risk assessment and management.

2.1 Training Event #1: The FirEurisk Fuel Classification System

TR#1 was held online on February 2, 2023, and attracted 392 registrants, with approximately 240 attending. Participants included researchers (33%), wildfire risk management professionals (33%), and PhD students (26%), mainly from Portugal (29%), Spain (24%), and Italy (17%). Notably, 17 attendees were involved in FirEUrisk, while 48 others were engaged in fire-related projects like FIRE-RES, FIRELOGUE, SILVANUS, TREEADS, and other EU-funded initiatives. By M24, the event recording had accumulated 203 views, along with 157 downloads of the slides and 143 downloads of other materials. By M48, the views had increased to 394, with 260 downloads of the slides and 245 downloads of other materials (Figure 1).

2.2 Training Event #2: Mapping the Wildland-Urban Interface (WUI)

Held online on February 22, 2023, TR#2 had 407 registrants, with about 200 attending. Attendees included wildfire risk management professionals (45%), researchers (28%), and graduate/PhD students (27%), mainly from Portugal (45%), Spain (17%), and Italy (16%). Among participants, 9 were involved in FirEUrisk, 18 in projects like FIRE-RES, FIRELOGUE, SILVANUS, TREEADS, and 56 in other fire-related projects. Awareness of the event came through various channels, including referrals (27%) and CNR emails (23%). By M24, the event recording had reached 109 views, with 145 downloads of the slides and 135 downloads of additional materials. By M48, the views had increased to 351, accompanied by 257 downloads of the slides and 229 downloads of additional materials (Figure 1).

Both events' recordings and materials are accessible on the FirEUrisk website under the "Resources" section: https://fireurisk.eu/training-event-materials/.

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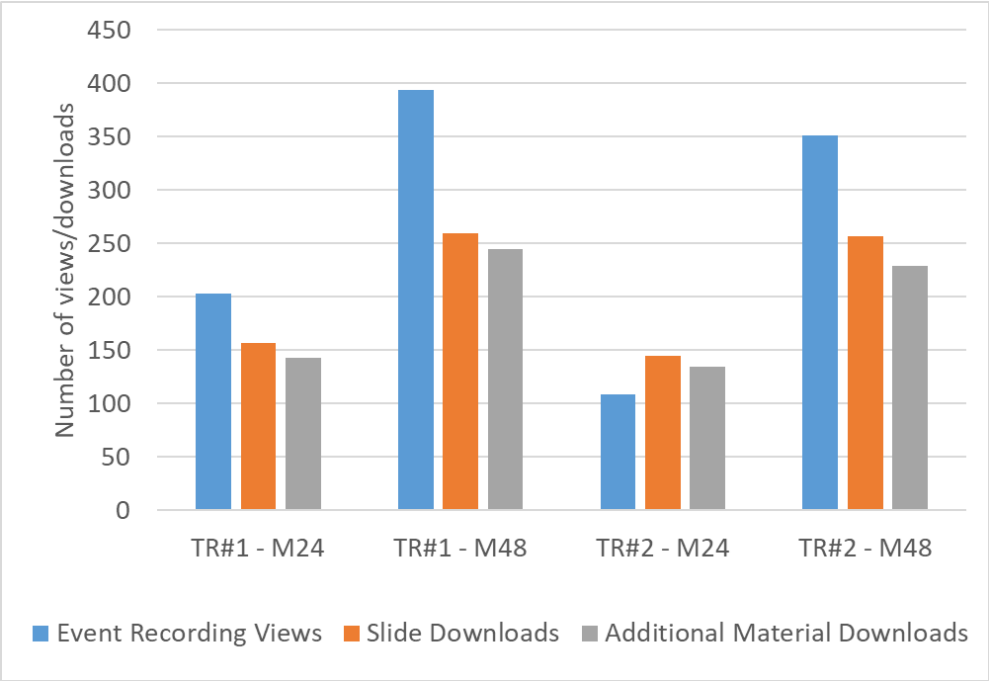


Figure 1. Comparison of the number of event recording views and downloads of slides or additional materials between M24 and M48 for the first two training events.

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3 Organization of training events from M25 to M48

This section presents the events organized during the last training period through the factsheets prepared to outline the training event structure. Although the training activities and the related calendar were defined at M20, it was necessary to align them with the activities of other WPs, which led to some training being postponed or replaced with alternative proposals. From M25 to M48, three on-line events were organised:

(i) **New Challenges for Responders: Guidelines and Tools for Extreme Fire and Fire in WUI Management (TR#3)** [Nov 8, 2024 - M44]. This training event aimed to bridge the gap between research and operational practices by sharing the knowledge and tools developed through the FirEUrisk project. Speakers: Sébastien Lahaye (SAFE, France), Ana Miranda (UAVR, Portugal), Domingos X. Viegas, Carlos Viegas (ADAI, Portugal), David Caballero (Meteogrid, Spain).

(ii) **Understanding climate scenarios and data for wildfire studies: Key concepts and best practices (TR#4)** [Feb 25, 2025 - M47]. The main objective of this training was to equip participants with the knowledge and practical skills needed to effectively use climate data in wildfire studies. Speaker: Carlos Prado Lopez (Meteogrid, Spain).

(iii) **FirEUrisk Information, Data and Visualisation Tools (TR#5)** [Mar 10, 2025 - M48]. The webinar presented the Integrated Risk Index datasets at both European and Pilot Site levels, introduced the Open Platform for accessing and downloading the data, demonstrated the FirEUrisk Viewer for geographic visualization, and showcased the FirEUrisk Mobile App and WIKI pages. Speakers: Prof. Emilio Chuvieco (UAH, Spain), Aggelo Aggelis (SATWAYS, Greece), Tuomo Vuorenpää (ARBONAUT, Finland), Christopher Marrs (TUD, Germany).

Before the description of the training events outcomes, in Section 4, it is important to highlight that, at M19, CNR developed a factsheet outlining the structure of the trainings (see Figure 2). This document has been designed to ensure clarity and coherence for trainees, providing a structured overview of objectives, activity design, and development pathways. In the end, the factsheet is composed by four main sections anticipating and providing the context for the agenda:

- **Define Training Objectives and Expected** Results – Specify key concepts and skills trainees should acquire.
- **Clarify Key Topics and Related Concepts** – Provide an overview of the theme, including necessary tools and data.
- **Organize Material** – Draft the session outline and ensure alignment with objectives.
- **Define Presentation Techniques** – Choose suitable formats (e.g., workshops, webinars) and engagement methods (e.g., lectures, case studies).

The factsheets concerning the overview of the training activities conducted during the M25-M48 period are presented in Annex A.

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	TITLE	
General description		
Main objectives		
Expected results/outcomes		
Format	*N. of hours*	*Presentation technique*
Audience		
Agenda/Outline of the Training Session		
Date		
Speaker(s)		
Agenda	*List of the points to be covered*	
	List of the points to be covered	
	List of the points to be covered	
Training material		
Slides	*Provide the presented slides*	
Scripts (if any)	*Provide the scripts needed for the training*	
Data and tools	*Describe the tools and the data needed for the training*	
Q&A Transcript	*Report on the question-and-answer session*	

Figure 2. Factsheet structure of the training activities

After finalizing the training event details, CNR began the publicity phase. The first step was creating a summary banner, which was shared on social networks and published on the FirEUrisk events page (https://fireurisk.eu/events/). Scienseed managed the event branding following the project's established graphic guidelines.
The banner, the factsheet with the agenda, and the registration link were distributed through a mailing list compiled by CNR. This list included:

- FirEUrisk project partners;
- Coordinators and participants in fire-related projects funded by the European Horizon 2020 (FIRE-RES, FIRELOGUE, SILVANUS, TREEDS);
- Other fire-related networks, such as NERO Costa Action, FIRE-ADAPT (Marie Curie Rise), Pyrolife ESRs (Early Stage Researchers), Med-Star and its four related simple projects (EU Italy-France Maritime Programme), the III International Fire Behaviour and Risk Conference (ICFBR2022), and the Italian Society of Silviculture and Forest Ecology (SISEF).

A special note should be made for the last event (TR#5), organized within the framework of WP4. In this case, CNR provided support to the organizers (TUD) in the promotion of the event, which was further publicized through the CEIF-ADAI channels.

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4 Outcomes of training events organized from M25 to M48

This section describes the three training events organized from M25 to M28 in terms of number of participants, reached target groups and countries, number of views and material downloads.

4.1 FirEUrisk Training event #3 – New Challenges for Responders: Guidelines and Tools for Extreme Fire and fire in WUI Management

The third FirEUrisk training event "New Challenges for Responders: Guidelines and Tools for Extreme Fire and fire in WUI Management" took place online on November 8, 2024, from 10:30 AM to 12:30 PM CET (Figure 3 and Figure 4). The event was promoted via the channels outlined in Section 3 (Figure 3), as well as through emails sent on October 23, 2024.



Figure 3. The description of the third training on the FirEUrisk event page at https://fireurisk.eu/events/

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Figure 4. Prof. Domingos Viegas (ADAI) presenting the contents of the third online training event (Nov. 8, 2024)

According to the information collected during the registration phase, the target audience for this event included civil protection personnel, actors involved in wildfire risk management (e.g., forest managers, forest services, firefighters), and professionals from the environmental and health sectors. In the registration phase, 111 people signed up for the training event before the deadline; of these, about 70 attended. Approximately 90% of the attendees were evenly distributed between the "Governance" and "Research/Education" target groups (Figure 5). Within the "Governance" category, 47% of participants were "Actors involved in wildfire risk management", while 33% represented "Civil Protection". Professionals from the environmental and health sectors were the 20%.

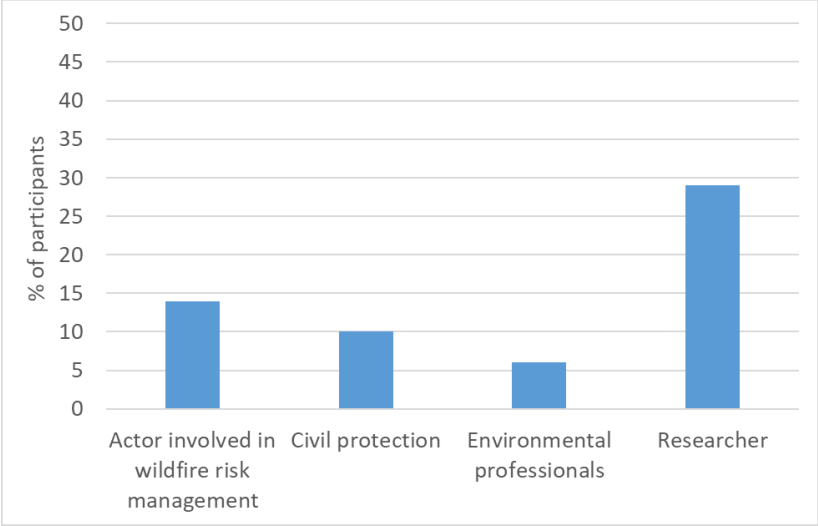


Figure 5. The percentage (%) of participants per target group during the third training

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During the third training event, the three most represented countries were Italy (25%), Portugal (27%), and Spain (13%), followed by France in fourth place with 8%.
The training event participants (excluding the organizers and speakers) were not limited to those involved in the FirEUrisk project. While FirEUrisk was the most frequently cited, with 16 mentions, six participants informed the organizer that they were engaged in one or more projects funded under the topic LC-GD-1-1-2020 (Preventing and fighting extreme wildfires with the integration and demonstration of innovative means), such as FIRE-RES, FIRELOGUE, and SILVANUS. Nine people were involved in the recently concluded MED-Star project (IT-FR Interreg Maritime 2014-2020), while five participants mentioned their involvement in the recently started NERO Cost Action, in addition to one of the H2020 projects. Three participants referenced the FIRE-ADAPT MCSE RISE project. Finally, 14 other participants indicated their involvement in various national or regional fire-related projects.
Regarding how participants learned about the webinar, about 53% received information via email from CNR, 21% were informed by a friend or colleague, 11% learned about it through the FirEUrisk website, and 8% were reached through social media. The remaining participants received this information through other sources.
The registration of the third training event is publicly available at the FirEUrisk website, section "Resources": *https://fireurisk.eu/training-event-materials/*. Furthermore, by M48, the event recording had 46 views, and the slides had 54 downloads.

4.2 FirEUrisk Training event #4 – Understanding climate scenarios and data for wildfire studies: Key concepts and best practices

The fourth FirEUrisk training event took place online on February 25, 2025, from 11:00 AM to 12:30 PM CET (Figure 6 and Figure 7). The event was promoted via the channels outlined in Section 3, as well as through emails sent on February 13, 2025. The target audience for this event included researchers, PhD students, fire management operatives, civil protection professionals, and environmental experts. 153 people signed up for the training event before the deadline; of these, 88 attended. According to the information collected during the registration phase, approximately 52% of the attendees were in the “Research/Education” target group and the 42% in the “Governance” category (Figure 8). Within this group, 53% of participants were “Actors involved in wildfire risk management”, while 36% represented “Civil Protection”. Professionals from the environmental sector were the 11%.

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Figure 6. The description of the fourth training on the FirEUrisk event page at https://fireurisk.eu/events/

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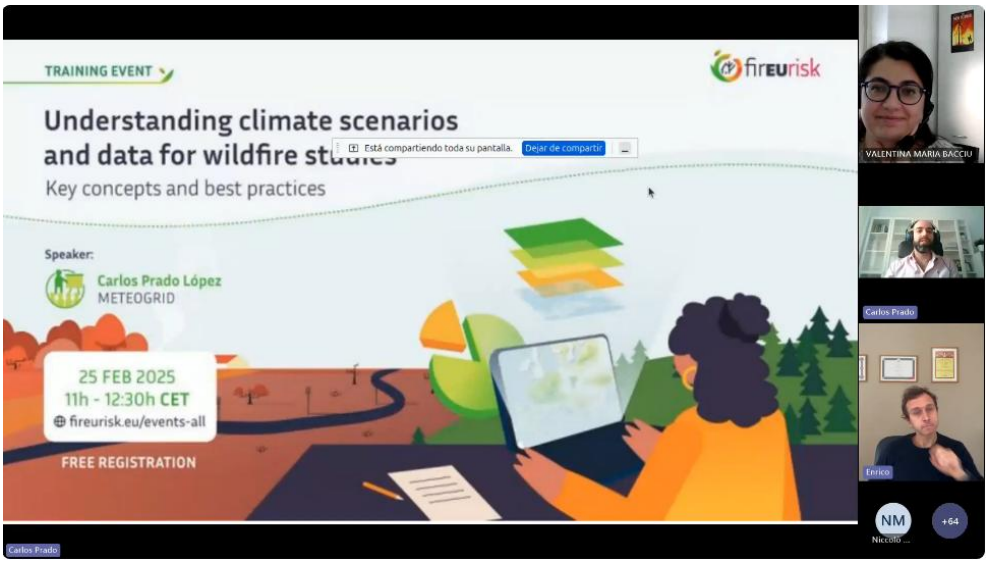


Figure 7. Dr. Carlos Prado (Meteogrid) presenting the contents of the fourth online training event (Feb. 25, 2025)

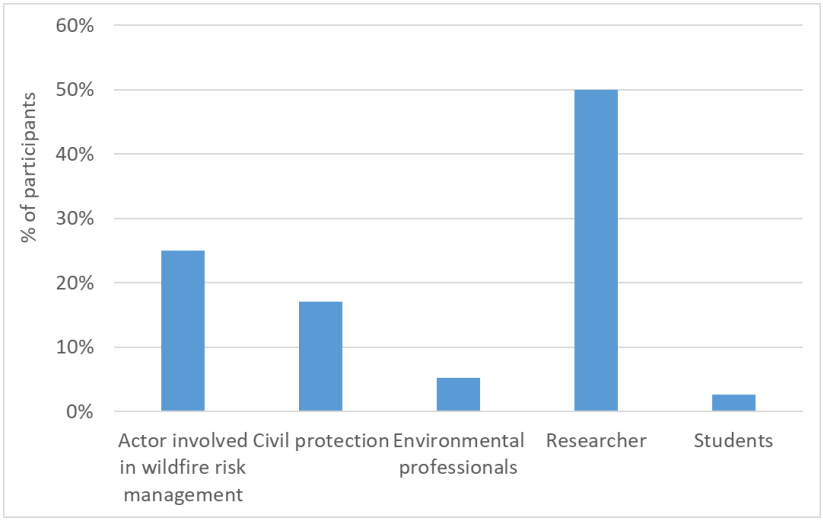


Figure 8. The percentage (%) of participants per target group during the fourth training

During the fourth training event, the three most represented countries were Italy (25%), Portugal (19%), and France (13%), followed by Spain in fourth place with 11% and UK with 8%. Other countries accounted for another 23%.

The training event participants (excluding the organizers and speakers) were not limited to those involved in the FirEUrisk project. This time, the most frequently cited project, with 10 mentions, was the NERO Cost Action project followed by FirEUrisk with five mentions. Six participants informed the organizer that they were engaged in one or more projects funded under the topic LC-GD-1-1-2020 (Preventing and fighting extreme wildfires with the integration and demonstration of innovative means), such as FIRE-RES and FIRELOGUE. Two participants referenced the FIRE-

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ADAPT MCSE RISE project. Finally, 10 other participants indicated their involvement in various national or regional fire-related projects.
Regarding how participants learned about the webinar, about 56% received information via email from CNR, 30% were informed by a friend or colleague, 4% learned about it through the FirEUrisk website, and 10% were reached through social media. The remaining participants received this information through other sources.
The registration of the fourth training event is publicly available at the FirEUrisk website, section "Resources": *https://fireurisk.eu/training-event-materials/*. Unfortunately, given the short time since the video was uploaded, there are currently no available data that provide meaningful insights regarding views and the download of training materials.

4.3 FirEUrisk webinar/training event #5 – Information, Data and Visualisation Tools

As previously mentioned, the last event webinar/training event was organized under the premises of WP4 by TUD, who contacted speakers, organised the agenda, managed registrations and the webinar itself. CNR provided support to the organizers in the promotion of the event, which was further publicized through the CEIF-ADAI channels.
The fifth event took place online on March 10, 2025, from 11:00 AM to 12:00 AM CET (Figure 9 and Figure 10).

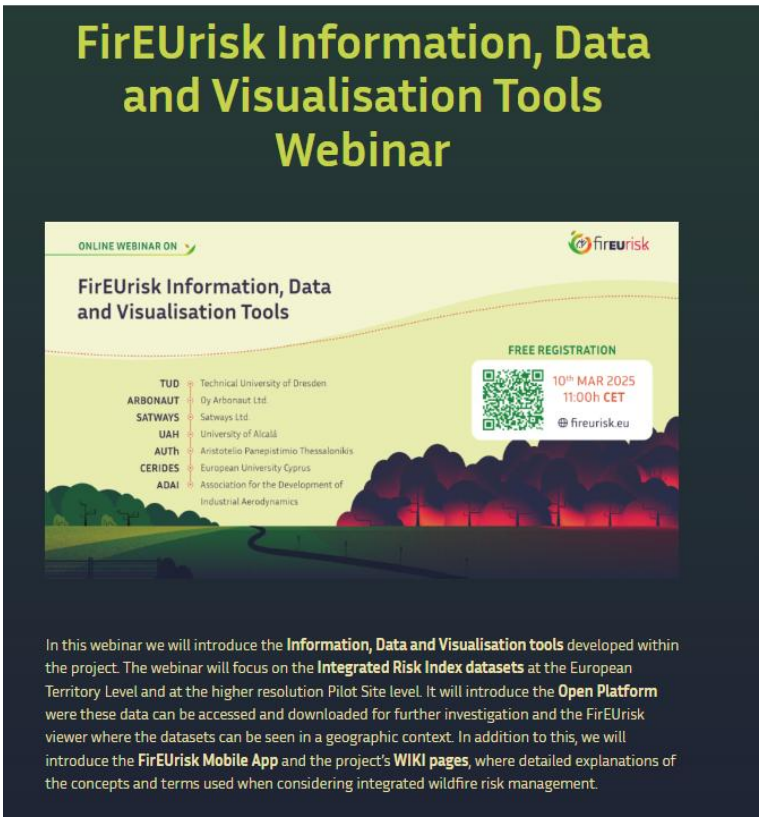


Figure 9. The description of the fifth webinar/training on the FirEUrisk event page at https://fireurisk.eu/events/

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Figure 10. Christopher Marrs (TUD) presenting the contents of the fifth online webinar/training event (Mar. 10, 2025)

549 people signed up for the training event before the deadline; of these, 356 attended. Approximately 34% of the attendees were in the "Research/Education" target group, followed by 15% of "Actors involved in wildfire risk management" and 12% representing "Civil Protection". During the fifth training event, the three most represented countries were Poland (50%), Italy and Spain (8 and 7%), and Greece (4%). Other countries accounted for another 31%. The registration of this event is publicly available at the FirEURisk YouTube channel, https://www.youtube.com/watch?v=kUlBdpfgZ90. Although only a few days have passed since it was uploaded, the video has already been viewed 112 times.

5 Concluding remarks

Deliverable 6.5 – *Training organisation - v.2* updates D6.4 presenting the results of the last three training events, organised from M25 to M48. The events gathered in total about 514 attendees and the material shared with the audience is publicly available on the FirEURisk website, section "Resources": *https://fireurisk.eu/training-event-materials/*, and on the FirEURisk YouTube channel: *https://www.youtube.com/@fireurisk9834/videos*. All together, by M48, the three event recordings had more than 158 views.

Overall, considering also the first two events, we reached 954 participants (Table 2), the event recordings had more than 900 views, while the presentation slides had more than 500 downloads, and the other produced material (e.g., scripts, maps, articles, methodological schemes, interpretation keys) had about 470 downloads.

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Table 2 – Overview of the training activities organised in the framework of A6.2.2

ACTIVITY N°	WP	TRAINING ACTIVITY	FORMAT	TARGET	MONTH	RESPON. PARTNER(S)	N° PARTECIPANTS
1	1	The FirEUrisk fuel classification system and the European fuel map	Webinar + hands-on experience	Graduate and PhD students, researchers, and actors involved in wildfire risk management	M23	UAH	240
2	1	Mapping the Wildland-Urban Interface (WUI)	Webinar + hands-on experience	Graduate and PhD students, researchers, and actors involved in wildfire risk management	M23	UH	200
3	2	New Challenges for Responders: Guidelines and Tools for Extreme Fire and fire in WUI Management	Webinar + tool presentation	Civil protection and actors involved in wildfire risk management, environmental, and health professionals	M44	SAFE, UA, ADAI, Meteogrid	70
4	3	Understanding Climate Scenarios and Data for Wildfire Studies: Key Concepts and Best Practices	Webinar + hands-on experience	Researchers, PhD students, fire management operatives, civil protection professionals, and environmental experts	M47	Meteogrid	88
5	4	FirEUrisk Information, Data and Visualisation Tools	Webinar + tool presentation	All target groups	M48	UAH, SATWAYS, ARBONAUT, TUD	356

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Based on the data collected, we can make several types of conclusive considerations.

- **Participation**. After the first two events, which were very well attended, the next two events recorded a lower number of participants. These data alone could lead us to attribute this decrease to several key factors, including the organization of a large number of online events by the project consortium (but also from other projects funded under the topic LC-GD-1-1-2020, such as FIRE-RES, FIRELOGUE, and SILVANUS) and the definitive return of physical meetings after the years of COVID-19. Indeed, the prolonged period of remote working, online meetings and virtual socialising during the pandemic led to 'zoom fatigue' - a term used to describe the exhaustion caused by prolonged screen time and digital interactions. However, it's important to note that the third training event (*New Challenges for Responders: Guidelines and Tools for Extreme Fire and fire in WUI Management*) was aimed at specific categories of stakeholders (i.e., civil protection and actors involved in wildfire risk management, environmental, and health professionals), who were therefore primarily targeted by the initial promotion actions of the event. On the other hand, the latest event (*Information, Data and Visualisation Tools*), which was open to all categories of stakeholders and publicized through a variety of channels, had a very good turnout. In any case, the number of participants in online events never fell below 70. Therefore, it can be concluded that when events offered valuable content even for a reduced number of target groups, they attracted good participation rates. In this case, to broaden the audience, more general or introductory sessions could be combined with more technical ones.
- **Target Groups**. One of the key objectives of the training events was to reach new target groups, particularly decision and policy-makers, including representatives from national, regional, and local governments responsible for environmental management, disaster response, forestry, and land-use planning. Figure 11 illustrates the distribution of participant profiles across the four FirEUrisk training events (TR#1 to TR#5).

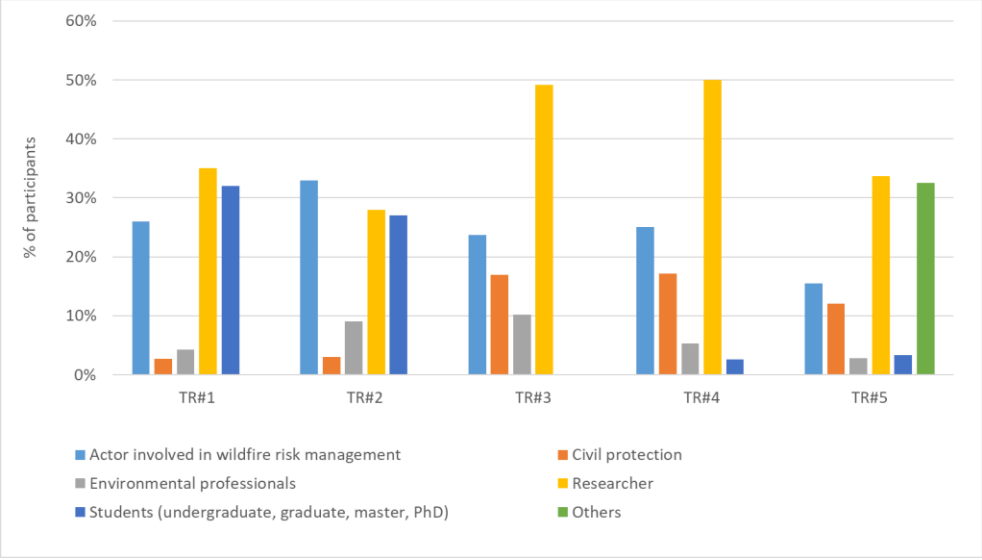


Figure 11. Comparison of the percentage (%) of participants per target group in the five training events

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Stakeholders involved in wildfire risk management, spanning roles from operational firefighting to strategic decision-making, consistently demonstrated strong participation, peaking in TR#2 (33%). Civil protection professionals experienced a notable rise in TR#3 and TR#4 (from 3% in TR#1 to 17% each), suggesting increased interest from emergency response sectors, particularly concerning topics focused on the fire management response phase. Environmental professionals maintained modest yet stable representation, with the highest participation in TR#3 (10%), which was specifically tailored to this group. Conversely, researchers consistently made up a substantial portion of the attendees, especially in TR#3 (49%) and TR#4 (50%), indicating significant engagement from the scientific community. Finally, students showed strong attendance in TR#1 (32%) and TR#2 (27%), but their participation dropped sharply in TR#4 and TR#5 (3%), which were designed to engage other specific target audiences.

- **Geography**. The risk of forest fires in northern and eastern European countries is expected to increase as a result of climate change. Therefore, one of the main objectives in organising the training events was to increase the participation of target groups from these regions. However, when analysing the distribution of participants between Eastern, Northern and Southern Europe during the five training events (TR#1 to TR#5) as illustrated in Figure 12, it can be seen that Southern Europe - especially Portugal, Spain and Italy - consistently showed the highest levels of participation, ranging from 75% to 85%, with the exception of TR#5, where Eastern European participation reached 57%.

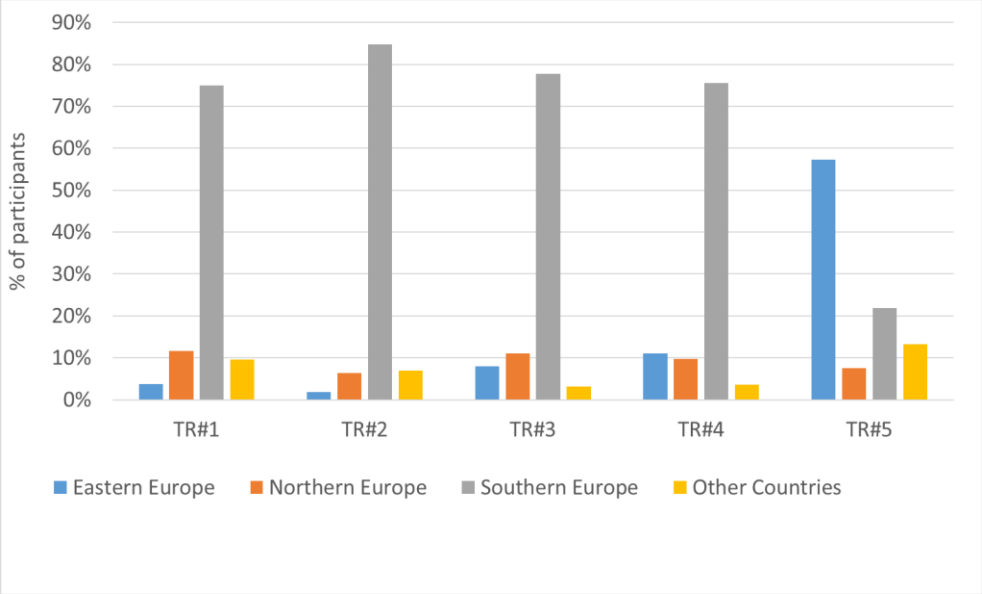


Figure 12. Comparison of the percentage (%) of participants per geographic area in the five training events

Southern Europe's strong engagement likely reflects both the high wildfire risk in these areas and the presence of a well-established network of stakeholders interested in wildfire management as a key preventive tool. In

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contrast, the participation from Northern Europe averaged just 9%, indicating either a continued lack of perceived relevance or a belief that wildfire risk remains relatively low compared to Southern Europe. This demonstrate that there is a greater need for future projects/events to develop targeted communication and outreach strategies aimed at raising awareness in European regions that are currently less affected by wildfires but are expected to face increasing risks due to climate change.

Finally, participation from Eastern Europe was generally the lowest, with a notable increase in TR#5 (57%). The fluctuating engagement hints that there may have been factors—such as increased awareness or changes in the relevance of training topics—that stimulated greater interest at that time. However, their overall lower participation suggests a need for ongoing efforts to engage these regional stakeholders more consistently.

This suggests that future similar training content by other projects/actions may need to be tailored to better align with the specific interests and knowledge levels of participants in Northern and Eastern Europe. Also, future projects should pose a particular attention in building networks similar to those existing in Southern Europe also in Northern and Eastern Europe, to bolster engagement and prepare these areas for increasing wildfire risks.

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Annex A: Factsheet outlining the training event structure

Annex A presents the factsheets used to detail the three training activities organised from M25 to M48 (Table 3, Table 4, Table 5). The factsheet structure, developed by CNR in M19, served as a framework for designing each training activity and was also used to disseminate the events, ensuring clarity for trainees by outlining objectives, key topics, session organization, and presentation methods.

Table 3 - Factsheet of the training event #3 related to WP2

	New Challenges for Responders: Guidelines and Tools for Extreme Fire and fire in WUI Management
General description	Past events and research have highlighted weaknesses in responders' ability to face extreme fires and fires occurring in the Wildland-Urban Interface (WUI) areas. Furthermore, scientific projections suggest that the frequency of such fires is likely to increase in the future, making it essential for responders to be equipped with a solid understanding of extreme fire behavior and the specific challenges posed by WUI environments. This workshop is designed for civil protection, environmental, and health professionals, focusing on the rapidly evolving challenges in Europe. It aims to bridge the gap between research and operational practices by sharing the knowledge and tools developed through the FirEUrisk project. Participants will gain valuable insights and practical guidance to improve their preparedness and response capabilities in facing the new challenges of extreme fires and fire in WUIs. If you're interested in attending, please complete the registration form: https://forms.gle/XpxdkiPoRgWBwVwb9
Main objectives	• To provide participants with an overview of extreme fires and fires in WUI (definition and challenges on response) • To share practical guidelines and tools developed through the FirEUrisk project to improve preparedness and response against extreme fires and fire occurrences in WUI • To get some feedback from the practitioners regarding the guidelines and the tools that have been developed
Expected results/outcomes	• Participants will leave with a better understanding of the dynamics of extreme fires and the specific risks associated with Wildland-Urban Interface (WUI) areas. • Attendees will learn about support decision tools for fire propagation and smoke dispersion developed through the FirEUrisk project to improve their ability to prepare for and respond to extreme fires and fires in WUI areas.

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	• Obtaining input or feedback from professionals related to the provided guidelines and tools	
Format	*2.0 hr*	The webinar will be based on three components: general presentation, demonstration of decision support tools, interactive discussion, and feedback.
Audience	Civil protection and actors involved in wildfire risk management, environmental, and health professionals	
Date	**8 November 2024 – 10.30-12.30 (CEST)**	
Speaker(s)	Sébastien Lahaye (SAFE, France), Ana Miranda (UAVR, Portugal), Domingos X. Viegas, Carlos Viegas (ADAI, Portugal), David Caballero (Meteogrid, Spain)	

Agenda	**10.30 – 11.30 Introduction**
	• **Guidelines for firefighters to face extreme fires** - characterization and adverse developments for responders **Sebastien Lahaye (20min)**
	• **Fire at Wildland Urban Interface** – challenges and factors for the future **David Caballero (20min)**
	• **Extreme fire behaviour modelling** – an update on the state-of-the-art **Domingos Xav Viegas (20min)**
	11.30 – 12.00 Demonstration of decision support tools (30min)
	• **Integrating fire behaviour models with smoke dispersion models**
	  • *Fire propagation* ***Carlos Viegas***
	  • *Forest fire smoke emission and dispersion* ***Ana Miranda***
	12.00 – 12.30 Interactive discussion (Q&A) and feedback (30min)	

Slides	Presentation slides (in pdf)	
Q&A Transcript	Report on the question-and-answer session	

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Table 4 - Factsheet of the training event #4 related to WP3

fireurisk	**Understanding Climate Scenarios and Data for Wildfire Studies: Key Concepts and Best Practices**	
General description	This training will provide participants with a comprehensive understanding of climate scenarios, key terminology, and best practices for using climate data in wildfire studies. It will cover the differences between climate models and scenarios and their implications for fire risk assessment. Participants will also explore methods for integrating climate projections into wildfire research and adaptation planning, equipping them with the knowledge to make informed decisions in fire-prone landscapes. Indeed, the training will offer practical guidance on accessing and downloading climate data, introducing key software tools for data manipulation, such as CDO. A hands-on tutorial with dummy data and scripts will be provided, allowing participants to practice data processing and analysis on their own. If you're interested in attending, please complete the registration form: https://forms.gle/XMz1LLjUwedb9yKr8	
Main objectives	The main objective of this training is to equip participants with the knowledge and practical skills needed to effectively use climate data in wildfire studies. Specifically, the training aims to: • Explain the differences between climate models and climate scenarios and their implications for wildfire studies. • Provide attendees with guidance and tools to understand future fire risk. • Guide participants on how and where to access and download climate data.	
Expected results/outcomes	• Participants will be able to differentiate between climate models and climate scenarios and understand their implications for wildfire studies • Practitioners will gain a better understanding of future fire risk scenarios and learn how to interpret the results effectively • Participants will learn how and where to access and download relevant climate data for their research or practice	
Format	*1.30 hr*	The webinar will be based on two components: general presentation (e.g., overview of climate models and scenarios, including key terminology and concepts, explanation of the differences between climate models and scenarios, and how they inform fire risk assessments) and Hands-on Practical Session (e.g., guided tutorial on how to access and download climate data from trusted sources, step-by-step demonstration of data processing using dummy data and sample scripts)
Audience	Researchers, PhD students, fire management operatives, civil protection professionals, and environmental experts	

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Date	**25 February 2025 – 11.00-12.30 (CET)**
Speaker(s)	**Carlos Prado Lopez (METEOGRID)**
Agenda	**11.30 – 11.50 Practical Tools for Working with Climate Data** • **Overview of available resources for downloading climate data** • **Introduction to software tools for data manipulation** • **Key features and capabilities of selected tools for climate data analysis** **11.50 – 12.15 Hands-on Exercise: Data Download and Manipulation** • **Step-by-step guide to downloading climate data** • **Hands-on tutorial with dummy data and basic script usage** **12.15 – 12.30 Interactive discussion (Q&A) and feedback** •
Slides	Presentation slides (in pdf)
Scripts (if any)	.tif and .nc (NetCDF) files
Data and tools	R, Rstudio, CDO, QGIS, Panoply
Q&A Transcript	Report on the question-and-answer session

Table 5 - Factsheet of the training activity #5 related to WP4

	FirEURisk Information, Data and Visualisation Tools
General description	This webinar/training will introduce the Information, Data and Visualisation tools developed within the project. The webinar will focus on the Integrated Risk Index datasets at the European Territory Level and at the higher resolution Pilot Site level. It will introduce the Open Platform where these data can be accessed and downloaded for further investigation and the FirEURisk viewer where the datasets can be seen in a geographic context. In addition to this, we will introduce the FirEURisk Mobile App and the project's WIKI pages, where detailed explanations of the concepts and terms used when considering integrated wildfire risk management. Link to the session will be sent to the registrants of the webinar via email. Register for free here: https://us06web.zoom.us/webinar/register/WN_JYL9l9h7RKaJfu_ff7gZlQ#/registration
Main objectives	The main objectives of this webinar/training are:

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	• Introduce participants to the developed tools – Present the information, data, and visualization tools created within the project, with a focus on the Integrated Risk Index datasets at the European level and high-resolution Pilot Sites. • Demonstrate access to and use of the Open Platform and FirEURisk viewer – Guide participants in using the Open Platform for data access and analysis, as well as the FirEURisk viewer for visualizing datasets in a geographic context. • Showcase the FirEURisk Mobile App and project resources – Introduce the FirEURisk Mobile App and the project's WIKI pages, providing participants with detailed explanations of key concepts and terms related to integrated wildfire risk management.	
Expected results/outcomes	• Participants will gain a clear understanding of the Integrated Risk Index datasets, their structure, and their application at both the European and Pilot Site levels. • Attendees will learn how to navigate the Open Platform to access and download data, as well as how to use the FirEURisk viewer to explore datasets in a geographic context. • Participants will be introduced to the FirEURisk Mobile App and the project's WIKI pages, equipping them with valuable resources for further learning and application in wildfire risk management.	
Format	*1 hr*	The webinar will be based on four components: Open Platform of Data, Models; FirEURisk Viewer; FirEURisk WIKI; and FirEURisk Mobile App
Audience	Researchers, PhD students, fire management operatives, civil protection professionals, and environmental experts, NGO	
Date	**10 March 2025 – 11.00-12.00 (CET)**	
Speaker(s)	**Prof. Emilio Chuvieco (UAH), Aggelo Aggelis (SATWAYS), Tuomo Vuorenpää (ARBONAUT), Christopher Marrs (TUD)**	
Agenda	• **11:00 Short Introduction |** Emilio Chuvieco (UAH) • **11:05 – Open Platform of Data, Models etc. |** Aggelo Aggelis (SATWAYS) • **11: 15 – FirEURisk Viewer |** Tuomo Vuorenpää (ARBONAUT) • **11:25 – FirEURisk WIKI |** Christopher Marrs (TUD) • **11:35 – FirEURisk Mobile App |** Emilio Chuvieco (UAH) • **11:45 – Questions and Answers (All)** • **12:00 – End of Webinar**	
Data and tools	*https://fireurisk.wiki.satways.cloud/en/public* - *https://fireurisk.satways.net/* - *https://play.google.com/store/apps/details?id=com.uah.fireurisk&hl=en&pli=1*	
Q&A Transcript	Report on the question-and-answer session	

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Annex B: Q&A Transcript

Annex B presents the transcripts of the "Question & Answer" sections of the three training events organised from M25 to M48.

FirEURisk Training event #3 – New Challenges for Responders: Guidelines and Tools for Extreme Fire and fire in WUI Management

The training event concluded with an open Q&A session, allowing participants to ask questions and discuss tools and strategies presented during the event. Following, please find the transcription.

- **Would you like to share with the participants one or two suggestions concerning the most important elements that you feel is extremely urgent to transfer and implement, from a fire management and planning perspective.**

In response to the question, **Domingos Viegas** emphasized that fire dynamics are crucial to planning and management. He discussed how fire behavior interacts with both the atmosphere and the ground, leading to rapid changes in fire speed, which can surprise responders. He stressed that this dynamic behavior, especially in large fires, often causes fires to accelerate unexpectedly. Viegas pointed out that while this is not well captured in existing models, ongoing research aims to refine predictive models using better data and simulations. He stressed the importance of integrating these insights into real-time fire management systems to help responders act proactively rather than react to unpredictable fires. **Sebastien Lahaye** highligheted that science has made significant advancements in the last 20 years, particularly in the areas of extreme fire behavior and smoke modelling. It is now time for responders to adapt operational strategies and incorporate this knowledge into how they approach wildfire management. Additionally, **David Caballero** emphasized the importance of addressing social component in risk assessment, especially in Wildland Urban Interface (WUI) areas. Additionally, we must take into account light residential fuels and their significant role in energy release and the destruction of homes, an area that requires further research. Another important aspect is the study of the transition from wildfire to urban conflagration, or a combination of both, as our understanding in this area is still limited. Equally important is focusing on self-protection for the public, ensuring they know how to react in the event of a wildfire affecting a large area, as well as emphasizing prevention. We must also rethink and redesign risk mapping, incorporating these new considerations discussed today. Finally, Caballero strongly believed that virtual reality tools are an excellent way to convey complex messages to both the public and responders in an intuitive and direct manner. **Carlos Viegas** comment aligned with the others, particularly in emphasizing the importance of using technology to manage wildfires. The efforts demonstrated during the presentations highlighted the incredible progress made. It is our responsibility to promote and ensure these innovations are applied in the field to improve fire management. We absolutely need to emphasize the critical role of technological support in addressing this fire pressing issue. **Ana Miranda** stressed once more the relevance of the technologies we have today, along with the modelling skills that can greatly assist in the management of wildfires. Of course, communication is also crucial.

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While we have made significant progress in science and technology, it seems that communication is still not functioning as effectively as it should. We need to communicate in a simple and efficient way so that people can easily understand the risks and know what actions to take to protect themselves.

- **To what geographic locations are the tools developed in the project applicable?**

Domingos Viegas explained that the tools are physically usable anywhere in the world since they are based on universal physical laws. However, their application depends on having appropriate input data, such as topography, weather, and fuel maps. He noted that while the project mainly focused on European countries, particularly pilot sites in southern, central, and northern Europe, the tools can be adapted for other continents as well.
Ana Miranda added that although the platform has been tested for Portugal, it can be replicated elsewhere, provided the necessary input databases are available.
David Caballero highlighted that while the models and tools are technically applicable worldwide, practical implementation requires proper fuel characterization and harmonized descriptions of forest fuels, particularly ground fuels, which remain a challenge at a global scale. He suggested that platforms like Destination Earth and tools such as Cesium 3D (https://cesium.com/) provide frameworks to integrate and deliver models globally as microservices. These platforms allow interoperability and visualization through digital twins, which can help scale the solutions effectively.

- **How do you expect to implement these technological solutions on a practical scale? Who will actually use them?**

In terms of smoke forecasting, Ana Miranda believed the ability to predict the movement of smoke and air quality levels in the coming hours and days is crucial. This information is vital for municipalities, which can use it to inform citizens, advising them to stay indoors or urging vulnerable individuals to avoid going outside. Municipalities play a key role in this. Moreover, environmental agencies at both national and regional levels are very interested in smoke forecasting because they want to use this data to issue alerts and keep the public informed. Health authorities also need to be prepared for smoke events, as they need to be ready to treat people with respiratory issues and other related problems. Similarly, civil protection agencies must be informed so they can respond effectively. Miranda can envision this forecasting system being used by all these different entities, and I would like to see it implemented widely.
David Caballero remarked the role of artificial intelligence, also in the FirEUrisk context. We have been exploring how HPC (High-Performance Computing) resources help us produce operational results in real-time, which can be challenging to achieve. Our approach is that artificial intelligence, particularly neural networks, can partially or fully replace complex numerical models, making them more operationally feasible. This is a promising direction because, in many cases, the complexity of modelling can be simplified by using a neural network trained with HPC machines. Ultimately, using a neural network makes these large-scale simulations or complex models immediately available and operational, providing a much more straightforward path to applying them in real-world scenarios.

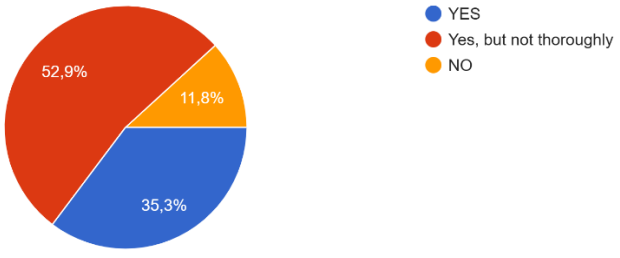
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- **How important is fuel in northern Europe's transition areas in the context of climate change? Could it become more significant than weather or topographic factors, especially when an abundance of fuel becomes available for fires due to changing climatic conditions?**

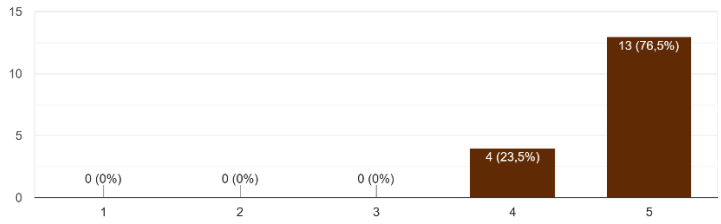
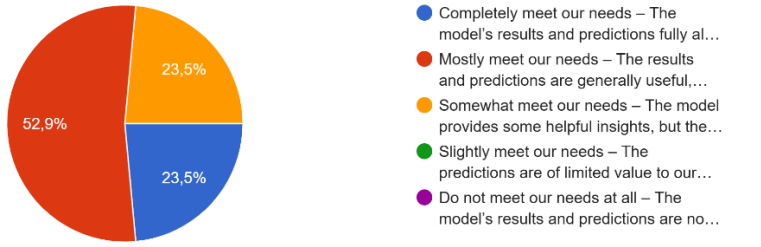
Sebastien Lahaye mentioned that there is indeed an evolution of fire risk in northern Europe as well. As discussed during the training event, we've covered various extreme fire behaviors that are more commonly associated with southern Europe or other fire-prone regions. However, this does not mean that northern Europe is free from fire risks. The challenges in northern Europe are likely to be somewhat different, and this is something we've tried to address in the guidelines for fighting fires across Europe. We've talked about extreme fires, fires in urban interfaces, and even fires in high-altitude regions like the Alps. Additionally, fires in high-latitude areas, such as those in northern Europe, present unique challenges. Responders in these regions will need to adapt their strategies to address these distinct types of fires effectively.

Domingos Viegas added that the ongoing process of climate change will undoubtedly continue to have significant effects. We are already noticing these impacts in southern Europe, particularly in Portugal, where we've been monitoring the moisture content of wildland fuels for over 30 years. We've observed a consistent decline in precipitation, which is directly linked to lower moisture content in the fuels, making them more prone to ignition and contributing to more intense fires. This trend is evident in the work we've done on fire risk, which shows that both climate evolution and vegetation cover changes follow the same pattern. We can expect similar trends in northern Europe, though perhaps not as intense as in southern regions. However, even relatively smaller changes will be significant, as they will still lead to considerable shifts in fire behavior.

At the end of the Q&A session, the organizer scheduled a feedback session to gather input and insights from professionals regarding the presentations concerning the guidelines and tools. Due to time constraints, the questions prepared for the feedback session were sent via email through a Google Form. Out of 66 participants, only 17 responded. The questions and answers are presented below.

1. Were you aware of extreme behaviours, such as "vorticity-driven lateral spread" and slope attachment, before today's presentation?	

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2. Would you consider/recommending the integration of knowledge from FirEURisk's Guidelines to Address Extreme Fires into firefighter training programs?	
3. Were you aware of the effects of smoke on the health of the exposed population?	
4. How important do you think it is to alert people about smoke exposure and recommend preventive or mitigation behaviors?	
5. To what extent do the results or predictions provided by the integrated model meet the decision-making needs of your business?	
6. Which aspects of the integrated model do you find most useful, and which would you improve to achieve your goals better?	• Forecasting the extreme fire behaviour • Possibility to enter the fire ignition point online • I believe that the model can be usefully used for fire planning, and in some cases also to provide useful information during active fighting, but above all for evacuation and alerting populations. In this last respect, I would develop in particular the aspects relating to the urban-forest interface. • The model can be used across borders BUT requires accurate data for more reliable results. The model is only as good as the data that is input. I think that the change is more at country level - i.e. doing more research on fuels and systematically retrieving data for each wildfire event to increase data reliability rather than changing the model. • Fire spread rate • Smoke component is something we are most interested • Community awareness!

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	• The results and predictions need to be tested in different biogeographical regions with indescribable fire regimes. • I think every aspect is important, but above all the risk reduction. • The advancement of technology and the use of social media for transmitting alerts have diminished the importance of traditional communication methods. As a result, a significant portion of the population, especially those who do not use social media, does not receive these critical alerts, leaving them unprotected and poorly informed in emergency situations. • A good update of information about the land status and characteristics. • I find the integrated model's focus on anticipation and prevention, as well as its effectiveness during a possible fire event, to be particularly useful. To improve the model and achieve our goals better, I would suggest further enhancements in the areas of real-time monitoring and response. • *Modelo integrado é muito util por considerar todos os aspetos, mas simplificar o que é mais complexo, melhorarando a aplicação prática produz um aumento da eficácia*. (The integrated model is very useful for considering all aspects, but simplifying what is most complex, improving practical application producing an increase in effectiveness.) • *Informação de antecipação* (Advance information) • Accuracy

FirEURisk Training event #4 – Understanding climate scenarios and data for wildfire studies: Key concepts and best practices

The training event concluded with an open Q&A session, allowing participants to ask questions and discuss tools and strategies presented during the event. Following, please find the transcription.

- **Is the evolution of Forest Vegetation raster produced from your previous work or is provided by a European body such as Copernicus?**

Carlos Prado explained that it was their own work, created using bioclimatic indices. He was unsure if similar data could be found on the Copernicus website due to its vast data repositories.

- **It seems to get good results we would need to work with downscale input data. You talked of 9km resolution. It would be possible and easy to find those data in that resolution and even smaller or do we need to perform other processes?**

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Another question focused on the downscaling approach used to develop data at a 1 km or 9 km resolution. **Carlos Prado** explained they used a statistical downscaling method with machine learning models that considered various factors like altitude, distance to the sea, longitude, and latitude. The process from 9 km to 1 km utilized these models, while the reverse used statistical downscaling.

- **There were questions about accessing the 9 km resolution data and whether further processing was needed.**

Carlos Prado shared a link to the repository, assuring that the data could be directly downloaded and no additional processing was required.

- **Some concerns were raised about the policy for sharing the data beyond the Fire Risk consortium, given that many participants were not part of it.**

Carlos Prado explained that the data was primarily meant for fire risk purposes, and he would need to verify if it could be shared more broadly.

- **Could you better explain the methodology behind defining lower, medium, and upper scenarios?**

Carlos Prado explained that they categorized 32 model-scenario combinations based on an index called "drought code." These combinations were ranked, and three representative scenarios (10th, 50th, and 90th percentiles) were selected to balance data accuracy and computational limitations.

FirEUrisk Webinar/Training event #5 – Information, Data and Visualisation Tools

During the webinar, a Q&A session was held, providing participants with the opportunity to ask questions and engage in real-time discussions about the tools presented during the event. Below, you will find the transcription of that session.

- **Can the project area be expanded? In other words, will other countries be included in the project, like Turkey?**

The project is coming to an end, at the end of March actually. Turkey was not part of the project. However, all of the tools and products developed in the project can be applied to Turkey, or anywhere else for that matter. Applying it to other regions just requires using datasets that apply to those areas, such as fuel maps and ignition data.

- **Is there possibility to integrate or upload data with some public data of for example forest agency?**

No, as indicated it is a prototype, and it was focused on the variables that were developed within FirEurisk.

- **Is the APP available for download?**

Yes, it is in the Google play store.

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- **I was wondering if it was possible to expand on the fuel load management, how is it modelled? Is it done through introducing firebreaks in key areas or is it done through decreasing removing fuels from the fuel map?**

At this point, and for the whole European territory we just modelled reduction of fuel loads, but the same approach can be adapted to finer scales if the geographical datasets are available.

- **Are you considering to make free available the information provided by users (i.e. info and photos of fuel types and severity/recovery)?**

The datasets are already available, photos are not, because we have very few, but will do it in the future.

- **Will the data hub remain available after the project (funding) ends?**

Only a few months. We are trying to pass some of the functionalities and datasets to EFFIS.

- **What is the discretization (i.e.2km x 2km) for the Maps you showed to us?**

The spatial resolution is 1 km^2 for the whole European Territory and 1 ha for the pilot sites.

- **ACCORDING TO FULS MODELS, WHAT MODEL ARE ASSIGNED TO CROPS?**

You have all the technical information here:

https://essd.copernicus.org/articles/15/1287/2023/essd-15-1287-2023.pdf

- **Is the data hub cross-referenced in a repository such as Zenodo for retrieveability? And will the meta data sections be completed for better understandsbility of the data sets?**

The Metadata will be added to the datasets over the next couple of weeks.

- **is there a future plan of incorporating future climate change that might "alter" the fire risk maps?**

Yes, there is a group working on fire scenarios for future conditions, including climate and land use models.

- **Obviously your product have alot more variables and parameters but how do you forsee the coexistance of firEUrisk products and the datahub, with already existant systems such as the EFFIS (EGFF/JRC) and the national forest fire information systems European countries have for example? Are they in colision? Is it meant to suplement them? Is it meant to replace them, etc... How do you envisage the future in this regard?**

More complementing than conflicting. In fact, we have direct conversations with EFFIS managers to transfer some of the variables there, and also we do have conversations with national fire services in a similar line.

- **On future potential: can the impact of energy transition, notably, electrification on fire risk be shown in a geospatially explicit way, i.e. along existing and to be developed transmission and distribution electricity grids?**

Good thought! but we have not modelled that aspect. Even land use transitions are challenging to model, but we are using Clumondo models on this regard and linked them to DGVM to consider climate and socio-economic potential changes.

- **Is there any plan for updating the fuel maps (yearly or so)?**

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The project ends in a few weeks, so we cannot guarantee that, but we will try to transfer our methods to EFFIS, so they can do it operationally.

- **What is the unit of measurement of ecological value?**

For ecological vulnerability we normalized all values to a single 0-1000 scale using principal component analysis, while for socio-economic services we used monetary units.

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