



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

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D5.10 – Report of FirEUrisk Pilot Site n° 5 Demonstration

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| Authors: | Vassiliki Varela, George Eftychidis, Dimitris Stavrakoudis, Ioannis Gitas |
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Executive Summary

On June 12, 2024, the Laboratory of Forest Management and Remote Sensing at Aristotle University of Thessaloniki (AUTH), in collaboration with the Municipality of Rafina-Pikermi, organized a pivotal demonstration event for the Greek Pilot Site (PS5) as part of the FirEURisk project. The event, held in Rafina-Attica, featured sessions designed to address stakeholder interests, focusing on fire behaviour, future risks, fuel and weather analysis, and wildland-urban interface challenges. This event marked the culmination of a series of activities, including two preparatory workshops conducted earlier in the year, which engaged stakeholders such as municipal authorities and civil protection representatives, emphasizing collaboration and training.

The event revealed several critical insights:

- **Focus on Fire Spread and Loss Prevention:** Stakeholders emphasized the necessity of prioritizing strategies that reduce fire spread and potential damage to communities and ecosystems.
- **Community Involvement and Education:** Effective fire risk management requires active community participation, increased risk awareness, and integration of cultural considerations.
- **Advancements in Predictive Tools:** Participants noted the need for improved predictive models for fire behaviour and climate adaptation to bolster risk mitigation efforts.
- **Real-time Data Utilization:** Calls for access to real-time data and community preparedness evaluations stressed the value of current, dynamic information for responsive fire management.

The event laid a solid foundation for ongoing collaboration, fostering further stakeholder engagement and discussions about the integration of FirEURisk products into local fire management practices.

The event showcased several key tools and methodologies, crucial for practical application and stakeholder feedback:

- Mapping of forest fuel and Wildland-Urban Interface (WUI) zones
- Methodology and mapping of priority intervention sites for vegetation management around critical infrastructure
- Assessment and mapping of seasonal fire risk for the 2024 fire season
- Analysis of climate change impacts on forest fire risk in the area
- Evaluation of socio-economic conditions related to fire risk and forest fire management in Eastern Attica, and potential cooperation between authorities and citizens
- Guidelines and policies to reduce anthropogenic fires and extreme fire incidents.

Feedback collected using the Mentimeter tool indicated stakeholders' needs for refined, localized assessments, better training for practitioners, enhanced data accessibility, and improved public awareness campaigns. These insights will be used by project partners to adapt and enhance the tools, aligning them with operational needs.

The outcomes and activities from this demonstration align closely with FirEURisk's project deliverables:

D5.1 User Requirements Data Base and Report

D5.2 Portfolio of Demonstration Products for PS and Pan-European Demos

D5.3 Report on the Standardisation of the Demonstration Products

D5.4 Management and Action Plan for End-user Involvement

D5.5 Design Plan for Pilot Sites and Pan-European Demonstrations

The PS5 demonstration showcased a strategic integration of research, stakeholder collaboration, and practical tool evaluation, paving the way for future advancements and improvements in wildfire management practices.

D5. 10 – Report of FirEURisk Pilot Site 5 Demonstration Event

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Figure 2: WUI map of Attica region and examples of WUI patterns (highlighted in red circles)

List of Acronyms

Table 1: List of Acronyms

| List of Acronyms | |
|------------------|--|
| BFB | Basic Fire Behaviour |
| BP | Burn Probability |
| DA | Demonstration Area |
| DE | Demonstration Event |
| FL | Flame Length |
| FMD | Fuel Model |
| FMC | Fuel Moisture Content |
| FPI | Fire Potential Index |
| FWI | Fire Weather Index |
| GIS | Geographic Information System |
| HNMS | Hellenic National Meteorological Service |
| IP | Ignition Probability |
| ISIG | Istituto di Sociologia Internazionale di Gorizia |
| LBP | Landscape Burn Probability |
| LFMC | Live Fuel Moisture Content |
| LMS | Land Management Strategies |
| MTT | Minimum Travel Time Fire Spread |
| PS5 | Pilot Site 5 |
| WRF | Weather Research and Forecasting Model |
| WUI | Wildland-Urban Interface |

1 Introduction

The Pilot Site 5 demonstration event in Attica, Greece, provided the FirEURisk project with an opportunity to showcase a selection of products and tools chosen for their relevance to the attending stakeholders and the issues identified in the region. These tools represent a subset of the project’s extensive outputs, and aim to enhance fire danger assessment by incorporating multiple dimensions of risk (Chuvieco et al., 2023). These components constitute part of the FirEURisk integration scheme, which aims to support the implementation of an integrated approach for addressing fire risk assessment and management needs, as illustrated in Figure 1.

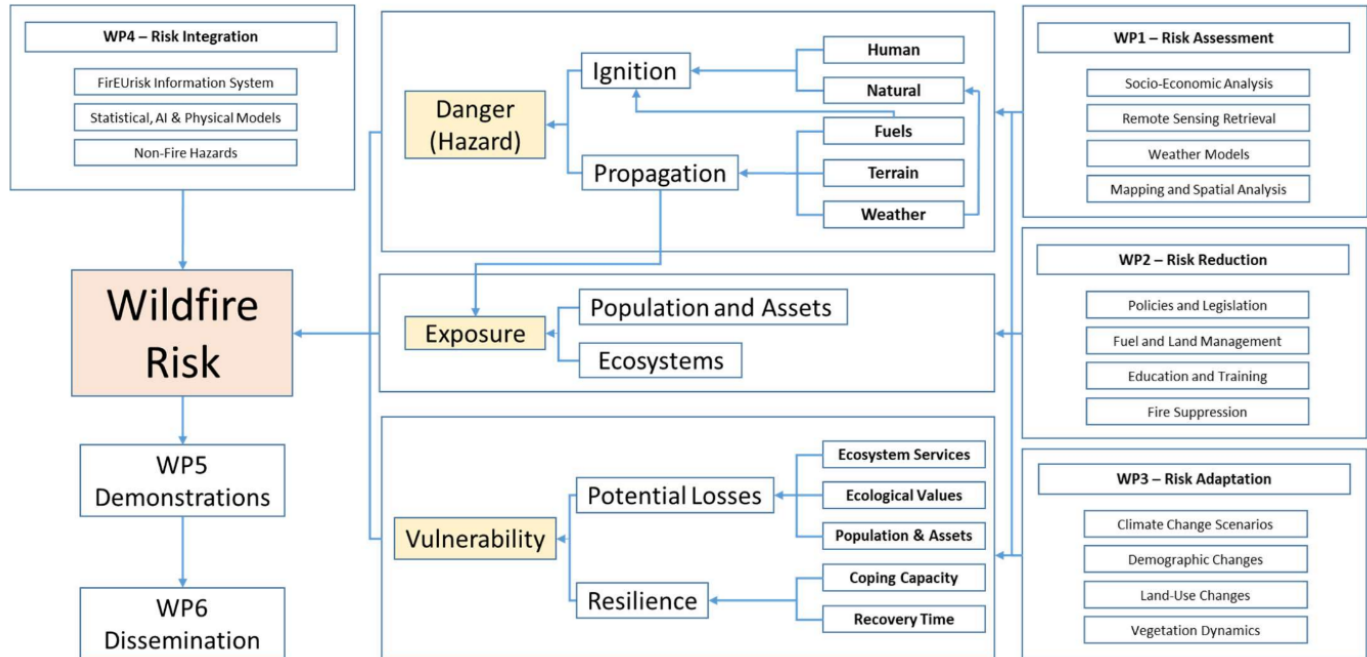


Figure 1: Conceptual Integration Diagram of Fire Risk Components within the FirEURisk Project

1.1 Purpose of the document

This document presents a comprehensive analysis of the Pilot Site 5 demonstration event, encompassing its planning, implementation, feedback, and evaluation of the selected products and tools for demonstration. These products and tools represent a subset of the broader outputs from FirEURisk’s Work Packages 1-4, collectively contributing to a comprehensive assessment of integrated wildfire risk, as previously described. The final selection was determined based on initial stakeholder consultations, including a questionnaire administered at the project’s inception, preliminary meetings, and workshops. The primary issues addressed include fire propagation potential, extreme fire behaviour and smoke dispersion modelling, fire behaviour in the Wildland Urban Interface (WUI), fuel management, risk assessment, and the future risk of fires within the context of climate change.

1.2 Structure of the Document

The document is structured in a logical flow to facilitate clear understanding, from site description to feedback and conclusions, starting with a description of Pilot Site 5 (PS5) (Attica region) to establish context (Section 2). It then details the implementation of the demonstration event, including preliminary workshops, the final event, and the meeting agenda (Section 3). The core section (Section 4) focuses on product descriptions. This is followed by a validation protocol and the results of validation, evaluating the products and platform used at PS5 (Section 5). The document concludes with stakeholder feedback, lessons learned from the event (Section 6), and supplementary materials, including the evaluation questionnaire for collecting stakeholder input.

2 Description of Pilot Site 5: Attica region.

The Attica region is characterized by a heterogeneous landscape comprising dense residential areas, agricultural lands, and extensive forests, particularly pine forests, which are highly susceptible to combustion. The Wildland-Urban Interface (WUI) areas throughout Attica are in a state of constant flux and are distributed around the densely populated suburbs of Athens, at the foothills of the mountains surrounding the capital's basin, and in proximity to coastal settlements.

Figure 1 illustrates the Wildland-Urban Interface (WUI) areas in PS5 situated at the foothills of the mountains surrounding Athens basin (examples 1& 2), in proximity to the densely populated suburban area of Athens (example 3), and around the coastal settlements (example 4)

The region's hot, and dry summers with strong winds create conditions conducive to wildfire propagation. These meteorological patterns can facilitate rapid fire spread and exacerbate the vulnerability of the WUI areas.

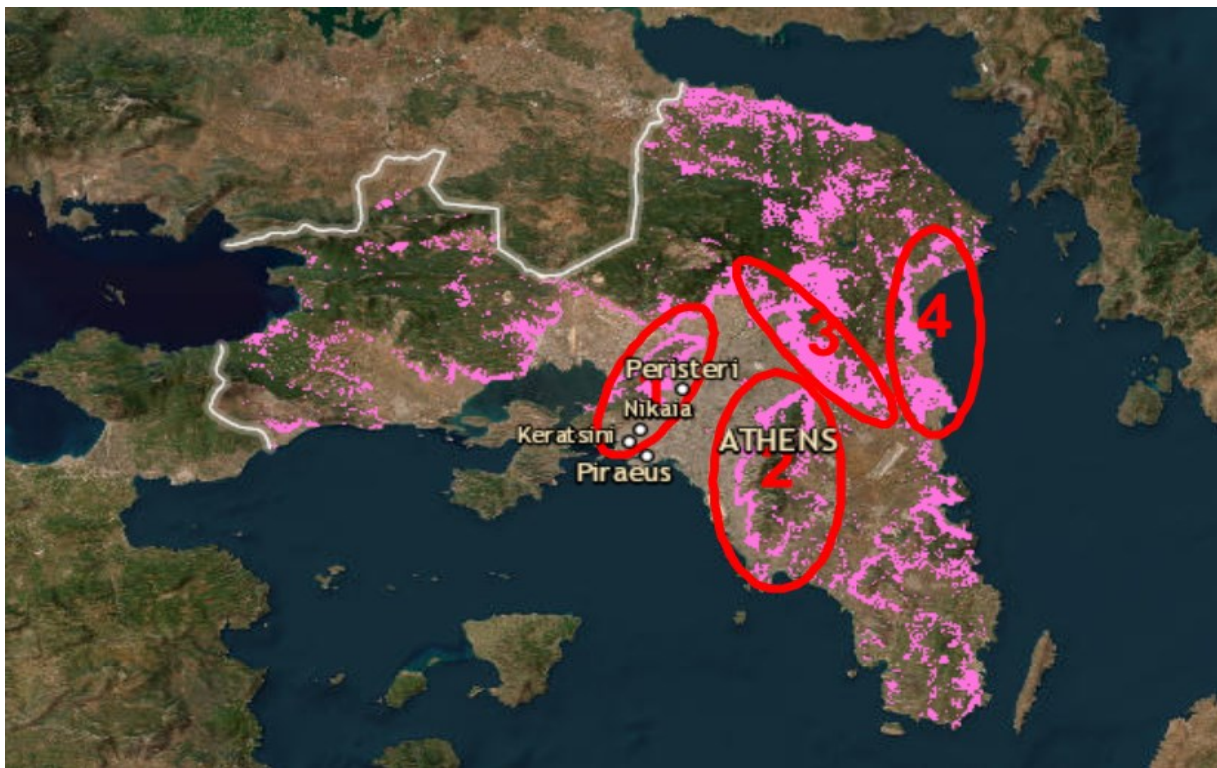


Figure 2: WUI map of Attica region and examples of WUI patterns (highlighted in red)

3 Implementation of the Demonstration Event

3.1 Preliminary Workshops

Workshop #1:

Date and Location: Held on February 26, 2024, at the premises of the Municipality of Rafina-Pikermi.

Participants: The Mayor and individuals from the Civil Protection domain of the Municipality.

Agenda:

- Introduction to the FirEURisk project.
- Presentation of products under development for the Greek Demonstration Area (DA) and PS5.
- Preparation for the next workshop and the final event.

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Workshop #2:

Date and Location: Conducted on March 5, 2024, at the same premises.

Participants: Representatives of local Authorities and citizens

Agenda:

- Practical training on the usage of FirEURisk products for the upcoming 2024 fire season.
- Discussion of technical details and requirements with stakeholders.
- A specific session dedicated to the Citizen Scientist Network and Engagement Plan (A2.4.3) in collaboration with ISIG.

Key Points of the preliminary workshops:

- Engagement: Both workshops emphasised stakeholder engagement, with the first workshop focusing on introducing the project and preparing for future events, and the second workshop providing hands-on training and detailed discussions.
- Preparation: The first workshop set the stage for the second workshop by introducing the project and its products, ensuring participants were well-informed and ready for the more technical discussions in the second workshop.
- Collaboration: The involvement of various stakeholders, including the Mayor, Civil Protection domain, and ISIG, highlights the collaborative approach of the FirEURisk project.
- Focus on Practical Application: The second workshop's laboratory format ensured that stakeholders were equipped with the necessary knowledge and tools to effectively use FirEURisk products during the fire season.

These workshops were crucial in building awareness, preparing stakeholders, and ensuring the effective implementation of FirEURisk products in the Municipality of Rafina-Pikermi.

3.2 Final Demonstration Event

Event Title: 'Demonstration of the FirEURisk Products in Attica Pilot Site'

Date and Location: Held in June 2024 at the hotel conference room in the Municipality of Rafina-Pikermi.

Hybrid format: 22 participants present, about 20 participants online

Invitation: The invitation was sent by e-mail from the Mayor of the Municipality of Rafina-Pikermi to a list of local and regional stakeholders

Participants: Representatives from the civil protection departments of two municipalities, the Ministry of Civil Protection, the Ministry of Climate Change, the Forest Service, local volunteer firefighter teams, and active citizens/volunteers

Objectives:

- Demonstration: Presentation of the FirEURisk products to the attendees.
- Discussion: Engaging stakeholders and project partners in discussions about their needs, how to integrate the products into regional and local fire management procedures, and potential future developments.
- Evaluation: Participants evaluated the products, providing feedback for further refinement.

Meeting Agenda: The meeting Agenda is presented in Annex A1

Key Points:

- Stakeholder Engagement: The event facilitated active participation from stakeholders and project partners, ensuring their needs and perspectives were considered.
- Product Integration: Discussions focused on practical applications and integration of FirEURisk products into existing fire management frameworks, highlighting the project's relevance and utility.

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- **Future Developments:** The event provided a platform for identifying future development opportunities, ensuring the continuous improvement of the FirEURisk products.
- **Feedback Mechanism:** The evaluation session allowed participants to provide valuable feedback, which will be used to enhance the products and better meet the operational needs of the area.

This final event was crucial in demonstrating the practical applications of FirEURisk products, fostering collaboration, and gathering insights for future improvements.

4 Product Descriptions

4.1 Fuel Types, Models, and Mapping Products for the Attica Pilot Area

- **Developer:** UAH/ AUTH (Dimitris Stavrakoudis and Ioannis Gitas).
- **Activity:** A1.1.4 Risk-wise landscape and fuel models development
- **Product description:** The product include the fuel type and parameters following the standard classification of fuels for the European territory. The final output – fuel classes and static fuel map with the spatial resolution of 20 m² for Pilot Site 5.
- **Methodology:** Sentinel-2 time series for the years 2020 and 2021
Six cloud-free images for each year approximately at two-month intervals
Bands used: Blue, Green, Red, RedEdge2, NIR (8A), SWIR1, SWIR2
- **FirEURisk component of the integrated strategy:** Propagation (fuel)
- **Technical characteristics:**

| Characteristics | Description |
|--|---|
| Type of product: | Geospatial |
| Units: | Fuel classes |
| Update Frequency: | Static layer |
| Accuracy: | 88.4%. |
| Output Format: | .tiff |
| Fire risk component (accordingly to the Integrated Scheme of the FirEURisk project): | Propagation (fuel) |
| Temporal coverage: | Developed for 2020 |
| Spatial resolution: | 1 km ² |
| Availability on FirEURisk platform: | https://fireurisk.satways.net/datasets/62d662b9e4b0b33bb117b801 |

4.2 Wildfire Risk Assessment and Propagation Potential Mapping

- **Developer:** FESB SPLIT/ AUTH (Dimitris Stavrakoudis)
- **Activity:** A1.3.1. Risk assessment integration
- **Product description:** This product includes a set GeoTIFF raster maps of propagation potential indicators for Pilot Site 5. Propagation potential maps have been created using FlamMap based on historical past fires in analysed area (Pilot Site 5) for the last 20 years having as outputs: Rate of Spread (m/s), Flame Length (m), Fireline Intensity (kW/m), Crown Fire Activity and Burn Probability.

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- **Methodology:** Software for wildfire behaviour simulation FlamMap was used for propagation potential: a) Basic Fire Behaviour (BFB) or Landscape Fire Behaviour (Basic), b) Minimum Travel Time Fire Spread (MTT) and c) Landscape Burn Probability (LBP).
- **FirEURisk component of the integrated strategy:** Propagation
- **Available here:** FirEURisk DataHub (public link not available yet)
- **Technical characteristics:**

| Characteristics | Description |
|--|---|
| Type of product: | Geospatial |
| Units: | Not applicable |
| Update Frequency: | If needed |
| Accuracy: | To be defined |
| Output Format: | .tiff |
| Fire risk component (accordingly to the Integrated Scheme of the FirEURisk project): | Propagation |
| Temporal coverage: | Static layers |
| Spatial resolution: | 100 m x 100 m |
| Availability on FirEURisk platform: | FirEURisk DataHub (public link not available yet) |

4.3 Mapping Wildland-Urban Interface (WUI) and its risk

- **Developer:** UH (Avi Bar-Massada).
- **Activity:** A1.2.2 Societal vulnerability and resilience assessment
- **Product description:** This product identifies the locations of wildland - urban interfaces (WUI) of two types, interface (where human settlements adjoin flammable vegetation) and intermix (where human settlements are interspersed within a matrix of flammable vegetation)
- **Methodology:** The mapping method builds upon the approach of Bar-Massada et al. (2012). This is a point-based (i.e., buildings) approach, which was converted here to a raster approach due to data availability on settlements. For WUI mapping purposes, only two classes of this dataset were considered: forests and shrublands.
- **FirEURisk component of the integrated strategy:** Exposure/vulnerability (Population-Assets)
- **Available here:** <https://fireurisk.satways.net/collection/62bab3dee4b0b33bb116f8ea>
- **Technical characteristics:**

| Characteristics | Description |
|----------------------|---|
| Type of product: | Geospatial |
| Units: | Categorical: 0 - non WUI, 1 - intermix WUI, 2 - interface WUI |
| Update Frequency: | Static layer |
| Accuracy: | 80-90% |
| Output Format: | .tiff |
| Fire risk component: | Exposure/vulnerability (Population-Assets) |
| Temporal coverage: | 2020 |

| | |
|-------------------------------------|---|
| Spatial resolution: | 10m |
| Availability on FirEURisk platform: | FirEURisk DataHub (public link not available yet) |

4.4 Framework for Fuel Management to Reduce Operation-based Ignitions

- **Developer:** AUTH (Vassiliki Varela)
- **Activity:** A2.1.2 – Reducing operations-based fire ignitions
- **Product description:** The Product is a fuel management framework including procedures, rules-of-thumb, methods and spatial data layers specifications, for the reduction of operation-based ignitions. The framework has been implemented in Pilot Site 5 for the creation of “fuel reduction priority” map
- **Methodology:** The Product is based on a methodology developed in the PREFER project . Methodology is properly adapted to operation-based ignitions (critical infrastructures and essential networks (lifelines), such as power grid, road and railway networks, which are linked with several ignitions of wildfires.
- **FirEURisk component of the integrated strategy:** Propagation / Fuel
- **Technical characteristics:**

| Characteristics | Description |
|-------------------------------------|---|
| Type of product: | Document / Geospatial data-set |
| Units: | not applicable |
| Update Frequency: | Static (can be subsequently updated) |
| Accuracy: | not applicable |
| Output Format: | .tiff & .PDF |
| Fire risk component: | Propagation / Fuel |
| Temporal coverage: | The outputs will be valid until significant changes in the input data occur (e.g., significant changes in fuel types and/or load, infrastructure, land use etc.) in the area of interest. |
| Spatial resolution: | 1 ha < (1–20 m). |
| Availability on FirEURisk platform: | FirEURisk DataHub (public link not available yet) |

4.5 Predictive Models for Fire Behaviour and Smoke Dispersion

- **Developer:** UAVR (Tobias Osswald).
- **Activity:** A2.3.2 Smoke Modelling and Health Impacts
- **Product description:** This product estimated 3D air pollution concentrations (e.g., PM10, PM2.5, NO2, CO) at a local scale based on dispersion modelling. The final output will be the gridded time-dependent ground-level concentrations of relevant gases/aerosols ($\mu\text{g}/\text{m}^3$) of each wildfire with a spatial resolution better than 1km.
- **Methodology:** The methodology to estimate the gas/aerosol concentrations is based on the outputs of the smoke emission forecast. Disperfire is a local lagrangean air-pollutant dispersion model and is being adapted and implemented for this purpose. It does not consider chemical reactions within the atmosphere allowing it to run in forecast mode even at finer scales. The simulation period will span the whole fire duration and eventually also the subsequent days (until only residual air-pollutant concentrations are found in the simulated region).
- **FirEURisk component of the integrated strategy:** Exposure
- **Technical characteristics:**

| Characteristics | Description |
|-----------------|-------------|
|-----------------|-------------|

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| | |
|--|---|
| Type of product: | Geospatial |
| Units: | $\mu\text{g.m}^{-3}$ |
| Update Frequency: | Near-real time after wildfire ignition |
| Accuracy: | Uncertainty: 50% to 100% |
| Output Format: | .shp, .tif |
| Fire risk component (accordingly to the Integrated Scheme of the FirEURisk project): | Exposure |
| Temporal coverage: | Fire duration (see Methodology) |
| Spatial resolution: | <1 km |
| Availability on FirEURisk platform: | FirEURisk DataHub (public link not available yet) |

4.6 Advanced simulator for extreme and WUI fires

- **Developer:** METEOGRID: David Caballero
- **Activity:** A2.3.3 Curricula for extreme fires and WUI
- **Product description:** WUI Fire Modelling-Landscape scale
- **Methodology:** 2D & 3D Fire spread models based upon topography, vegetation, wind
- **FirEURisk component of the integrated strategy:** Propagation
- **Technical characteristics:**

| Characteristics | Description |
|--|----------------------|
| Type of product: | Empirical models |
| Units: | not applicable |
| Update Frequency: | not applicable |
| Accuracy: | not applicable |
| Output Format: | not applicable |
| Fire risk component (accordingly to the Integrated Scheme of the FirEURisk project): | Propagation |
| Temporal coverage: | not applicable |
| Spatial resolution: | >1ha (30m) |
| Availability on FirEURisk platform: | still in development |

4.7 Citizens/scientist Network and Engagement Plan

- **Developer:** ISIG: Ramona Velea
- **Activity:** A2.4.3 – Citizen’s involvement in wildfire risk reduction
- **Product description:** This product proposes a structured framework for establishing citizens networks/groups at local level. In this sense it supports the design and implementation of participatory and engagement strategies by mapping and analysing local stakeholders according to their level of relevance and interest towards the issue at stake (i.e., local strategies for wildfire risk reduction). It envisages the Elaboration of an Engagement Plan for the establishment and functioning of the network making use of several communication channels and tools, from face-to-face interaction in public events and initiatives, to social media, and capitalising the existing knowledge and resources within and outside the partnership (e.g., promote synergies with other networks of citizen-scientist, with events and initiatives dedicated to scientific promotion).

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- **Methodology:** The Tool builds on the methodology for identification of engagement strategies proposed by the Civil Participation Toolkit for Decision Making of the Council of Europe (CoE/ISIG, 2020).
- **FirEURisk component of the integrated strategy:** Coping capacity

- **Technical characteristics:**

| Characteristics | Description |
|--|----------------------------------|
| Type of product: | Document/Guidelines and training |
| Units: | not applicable |
| Update Frequency: | Yearly |
| Accuracy: | not applicable |
| Output Format: | .pdf |
| Fire risk component (accordingly to the Integrated Scheme of the FirEURisk project): | Coping capacity |
| Temporal coverage: | not applicable |
| Spatial resolution: | not applicable |
| Availability on FirEURisk platform: | still in development |

4.8 Curriculum Development for Extreme Fires and WUI

- **Developer:** SAFE : Sébastien Lahaye
- **Activity:** A2.3.3 Curricula for extreme fires and WUI
- **Product description:** This product in a form of curriculum provides firefighters and managers an appropriate understanding of extreme fire behaviour and WUI challenges. This Product considers the evolution of fire risk and the transferability of strategies used in Mediterranean countries to fight fires in northern/higher elevation contexts.
- **Methodology:** Product based on regional experiences (together with Australian and North-American practices), elaborate on the way and context to use alternative techniques such as backburning, which could help addressing escalation of wildfire size and limit challenges of extreme fire behaviour. Materials were customised for the different types of users throughout Europe and to their languages (Spanish, Portuguese, Greek, French).
- **FirEURisk component of the integrated strategy:** Coping Capacity/Vulnerability

- **Technical characteristics:**

| Characteristics | Description |
|--|--|
| Type of product: | Guidelines product |
| Units: | not applicable |
| Update Frequency: | Years |
| Accuracy: | not applicable |
| Output Format: | .pdf |
| Fire risk component (accordingly to the Integrated Scheme of the FirEURisk project): | Coping capacity/ Vulnerability (population & assets) |
| Temporal coverage: | not applicable |
| Spatial resolution: | not applicable |
| Availability on FirEURisk platform: | still in development |

4.9 Fire Weather Projections in the Context of Climate Change Scenarios

- **Developer:** NCSR: Nandia Politi
- **Activity:** A3.1.1 Climate change scenario data
- **Product description:** This Product includes a) high resolution future climate (maximum and minimum temperature, precipitation, relative humidity, wind speed) datasets in daily temporal resolution for MED-Greece at 5 km resolution, using dynamic downscaling methodology and b) maps of future changes in Fire Weather Index (FWI) system parameters.
- **Methodology:** The climate simulation data and model setup is based on a number of extensively attentive validation studies of the application of the regional model (WRF) with the reanalysis datasets of ERA-Interim and the GCM (EC-Earth). Those studies demonstrated the capability of the downscaling process of capturing the spatial and temporal patterns of precipitation, temperature and wind speed for Greece by comparing the WRF historical simulations with available meteorological data from the Hellenic National Meteorological Service (HNMS). Estimation of Future Fire Weather changes were based on the Canadian FWI System equations.
- **FirEURisk component of the integrated strategy:** Weather (Climate change scenarios)
- **Technical characteristics:**

| Characteristics | Description |
|--|--|
| Type of product: | Geospatial |
| Units: | depends on climate variable / FWI classes |
| Update Frequency: | no update |
| Accuracy: | not applicable |
| Output Format: | Raster data formats (Tiff & csv files) |
| Fire risk component (accordingly to the Integrated Scheme of the FirEURisk project): | Weather |
| Temporal coverage: | historic (1980–2004), midcentury (2025–2049), and end of century (2075–2099) periods |
| Spatial resolution: | 5 km |
| Availability on FirEURisk platform: | FirEURisk DataHub (public link not available yet) |

4.10 Seasonal Fire Weather products

- **Developer:** NCSR (Nadia Politi)
- **Activity:** A3.1.1 Climate change scenario data.
- **Product description:** This Product includes a) high resolution seasonal meteorological datasets (maximum and minimum temperature, precipitation, relative humidity, wind speed) in daily temporal resolution for MED-Greece at 5 km x 5 km resolution, using dynamical downscaling methodology and b) maps of seasonal changes in Fire Weather Index (FWI) system parameters.
- **Methodology:** Product based on regional seasonal meteorological data sets
- **FirEURisk component of the integrated strategy:** Weather (Climate change scenarios)
- **Technical characteristics:**

| Characteristics | Description |
|--|---|
| Type of product: | Geospatial |
| Units: | depends on climate variable / FWI classes |
| Update Frequency: | seasonal |
| Accuracy: | not applicable |
| Output Format: | .pdf |
| Fire risk component (accordingly to the Integrated Scheme of the FirEURisk project): | Weather |

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| | |
|-------------------------------------|--|
| Temporal coverage: | season (2024 fire period) |
| Spatial resolution: | 5 km |
| Availability on FirEURisk platform: | FirEURisk DataHub (link not available yet) |

4.11 Social Adaptation Strategies for Future Fire Regimes

- **Developer:** ISIG : Ramona Velea
- **Activity:** A3.3.2 Implications of changes in future fire regimes for fire prevention and preparedness planning
- **Product description:** Guidelines
- **Methodology:** Product based on regional data
- **FirEURisk component of the integrated strategy:** Coping capacity and population & assets vulnerability
- **Technical characteristics:**

| Characteristics | Description |
|--|--|
| Type of product: | Guidelines product |
| Units: | not applicable |
| Update Frequency: | Years |
| Accuracy: | not applicable |
| Output Format: | .pdf |
| Fire risk component (accordingly to the Integrated Scheme of the FirEURisk project): | Coping capacity/ Vulnerability (population & assets) |
| Temporal coverage: | not applicable |
| Spatial resolution: | not applicable |
| Availability on FirEURisk platform: | still in development |

4.12 FirEURisk Online Platform demonstration

- **Developer:** ARBONAUT / AUTH (presenter: Dimitris Stavrakoudis)
- **Activity:** A4.3.2 Open platform of models, data and knowledge
- **Product description:** The tool allows visualising pre-defined spatial datasets through a WebGIS interface. It gives a possibility for providing access to the same datasets through an Android app interface. The mobile datasets can be used in offline mode when the selected layers have been downloaded to the device in advance.
- **Methodology:** Implementation of a web-GIS application based on the specifications developed in FirEURisk
- **FirEURisk component of the integrated strategy:** not applicable
- **Available here:** *still in development*

5 Validation

5.1 Validation protocol

The questionnaires aimed to achieve the following:

- High-Level Evaluation and Feedback: Gather a high-level valuation of the products and feedback about the demonstration event using Mentimeter. This interactive tool engages attendees but does not allow for full traceability of responses to individual participants.

The questions should remain high-level (not overly technical) and focus on collecting key information such as:

- Clarity of Information: Assess the clarity of the information provided by the presenters and the content.
- Product Usability: Evaluate the usability of the presented products in the daily work of the attendees.
- Quality and Methodology: Obtain general feedback on the quality and methodology aspects of the products.
- Self-Contained Information: Determine if the product information is comprehensive and self-contained.

5.2 Results of Validation

The results of the questionnaires collected during the event and after considering the user needs are presented in Annex A2. The evaluation of the participants is presented on a scale from 0 to 5 when the question requires a numerical rating.

6 Conclusions and lessons learned

6.1 Stakeholders Feedback on FirEURisk Products for PS5

Key Components of Wildfire Risk

Stakeholders emphasised *fire propagation* (23%) and *potential losses* (23%) as the top wildfire risk factors. This highlights the critical need to understand how fires spread and their socio-ecological consequences. *Ignition causes* (20%) and *population/assets exposure* (20%) were also deemed important, underscoring the necessity to manage both fire sources (natural and human) and the risks posed to human life and property.

Lesson 1: Risk management strategies must prioritize controlling fire spread and mitigating potential losses. Efforts should focus on fire prevention, community preparedness, and resilience, while considering both ecological and socio-economic impacts.

Other Fire Risk Components Encountered

Stakeholders highlighted the importance of *local population culture and mindset*, *fuel condition*, and *risk awareness* among communities, indicating that community engagement and education play a vital role in fire risk reduction. *Prevention measures* and concerns for *cultural heritage sites* also emerged, stressing the need for a broader focus on social, cultural, and environmental aspects in fire management.

Lesson 2: Effective fire risk management should integrate targeted education programs, enhanced risk communication, and strategies that involve local communities, while protecting cultural and ecological assets.

Assessment of Fire Management Products

Products related to *fuel types*, *models*, and *mapping*, *wildfire risk assessment*, and *Wildland-Urban Interface (WUI)* mapping received high ratings (4.5-4.9/5), indicating that these tools are well-suited and comprehensive for stakeholders' needs.

Lesson 3: While these tools demonstrate efficacy and widespread acceptance, ongoing refinement and updates are imperative to ensure their continued applicability and utility across diverse fire-prone regions.

Fire Reduction Products Feedback

The *framework for fuel management* and *citizens/scientist network engagement* received positive ratings (4.5-4.7/5), as well as the *advanced simulator for extreme and WUI fires* (4.7-4.8/5). However, lower ratings were given to *predictive models for fire behaviour and smoke dispersion* (3.5-3.9/5), signalling areas for improvement.

Lesson 4: Although fire reduction tools and fire simulators are generally well-regarded, there is room for enhancement, particularly in predictive models. More accurate, user-friendly tools for fire scenarios are needed.

Fire Adaptation Products Feedback

Products, including seasonal fire weather (4.3/5) and fire weather projections associated with climate change (3.7/5), received lower ratings, indicating a requirement for more accurate and adaptable tools for assessing climate-related fire risks.

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Lesson 5: Adaptation strategies must incorporate long-term fire–weather projections within the context of climate change. Furthermore, enhancing social adaptation strategies (rated 4.0/5) is essential for bolstering community resilience to future fire events.

Need for Additional Information

Stakeholders articulated the necessity for real-time fire propagation monitoring, assessments of community preparedness, and data on population density fluctuations. Furthermore, they advocated for the harmonization of data across regions to enhance fire management strategies.

Lesson 6: The enhancement of fire risk management can be achieved through the integration of real-time data, assessments of community preparedness, and the implementation of consistent and harmonised data-sharing protocols across regions.

Suitability and Usability of Products

Stakeholders reported elevated levels of interest and usability across all product categories. This observation suggests that the tools provided are pertinent and efficacious for addressing the requirements of individuals involved in fire management.

Lesson 7: Fire management tools are valuable and efficacious. Continuous innovation, in conjunction with stakeholder feedback, ensures the sustained effectiveness of these instruments.

Overall Lessons Learned

- Focus on Fire Spread and Loss Prevention: Stakeholders identified fire propagation and potential losses as the most crucial wildfire risk factors. Future efforts should focus on reducing fire spread and minimizing damage to both communities and ecosystems.
- Community Involvement and Education: Engaging local populations, enhancing risk awareness, and incorporating cultural considerations are essential for effective fire risk management.
- Improving Predictive Tools: There is a clear need for better predictive models, particularly for fire behaviour and climate-related adaptations, to improve fire risk mitigation.
- Real-time Data and Preparedness Monitoring: The call for real-time data and community preparedness assessments underscores the importance of dynamic, up-to-date information to inform fire response strategies.

6.2 Organisation of the Pilot Site 5 Demonstration Event

The conclusions and lessons learned can be summarised as follows:

The demonstration event held on June 12 2024 showcased the project’s results effectively despite some setbacks. While the preliminary event in March attracted considerable interest from local stakeholders and citizens, the unexpected extreme fire conditions on the day of the June event led to reduced participation. However, key stakeholders, including civil protection authorities, municipal representatives, and volunteers, were present and actively engaged.

The hybrid format allowed for smooth interactions between in-person and virtual participants, and the presentations were delivered without technical issues. The meeting’s organisation facilitated productive discussions with the available stakeholders, who provided valuable insights.

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However, the long duration of the event (9am-4.30 pm) may have been a restriction, particularly for those working in the municipalities and other public organizations with conflicting schedules. The lower attendance in the afternoon sessions, and the incomplete participation during the final product evaluation, reduced the feedback.

Despite this, the event served as a good foundation for further contact with stakeholders to continue the discussion on potential product use, paving the way for follow-up engagements.

Lessons Learned:

- Hybrid Format Success: The hybrid event format proved effective in ensuring the event proceeded smoothly and allowed for interactive discussions. Future events should continue to offer virtual attendance options to accommodate those who face sudden disruptions.
- Shorter, More Targeted Sessions: The length of the event was a challenge, particularly for stakeholders with conflicting schedules, such as those from municipal services. Future events should consider shorter, more focused sessions that align with the working hours of key stakeholders or offer flexibility in attendance to ensure all interested parties can engage throughout.
- Contingency Planning: Develop alternative plans such as small pre or post-event meetings to address potential disruptions due to extreme weather or other unforeseen circumstances, ensuring continued stakeholder participation.
- Strategic Scheduling of Key Activities: Ensure that key activities, such as the product evaluation, are scheduled at times participants attend. This ensures comprehensive feedback is gathered from all interested stakeholders, particularly those with a specific interest in certain project aspects.
- Ongoing Engagement: While the June event successfully demonstrated the products, further engagement is needed to discuss their practical application. Follow-up meetings with stakeholders should be prioritised to build on the interest shown and deepen the conversation around the potential use of these products. Maintain ongoing communication with stakeholders for further discussions and potential use of the project products, leveraging the interest generated during the preliminary event.

7 References

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8 Annex A

8.1 Annex A1: Meeting Agenda

Greek Pilot Site Demonstration Event, Wednesday 12 June, 2024

| Timeslot | Action | Presenter | Organisation |
|-------------|--|---|--------------|
| 8.45-9.00 | Registration | | |
| 9.00-9.10 | Welcome | Ioannis Gitas | AUTH |
| 9.10-9.25 | Introduction to the FirEURisk Project | Domingos Viegas | ADAI |
| 9.25-9.40 | Scientific overview of FirEURisk | Emilio Chuvieco | UAH |
| 9.40-9.55 | Presentation of Attica Pilot Site (PS5) | Georgios Eftychidis | AUTH |
| 9.55-10.10 | Fuel Types, Models, and Mapping Products for the Attica Pilot Area | Dimitrios Stavrakoudis/ Ioannis Gitas | AUTH |
| 10.10-10.30 | Wildfire Risk Assessment and Propagation Potential Mapping | Dimitrios Stavrakoudis/ Vassiliki Varela | AUTH |
| 10.30-10.40 | Q & A | | |
| 10.40-11.00 | Coffee break | | |
| 11.00-11.15 | Mapping Wildland-Urban Interface (WUI) and its risk | Avi Bar Massada | UH |
| 11.15-11.30 | Framework for Fuel Management to Reduce Operation-based Ignitions | Vassiliki Varela | AUTH |
| 11.30-11.45 | Predictive Models for Fire Behaviour and Smoke Dispersion | Tobias Osswald | UAVR |
| 11.45-12.00 | Advanced simulator for extreme and WUI fires | David Caballero | Meteogrid |
| 12.00-12.15 | Q & A | | |
| 12.15-12.50 | Citizens/scientist Network and Engagement Plan | Ramona Velea | ISIG/AUTH |
| 12.50-13.00 | Q & A | | |
| 13.00-14.00 | Lunch Break | | |
| 14.00-14.20 | Curriculum Development for Extreme Fires and WUI | Sebastien Lahaye | SAFE |

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| | | | |
|-------------|---|---------------------------------------|-------|
| 14.20-14.40 | Fire Weather Projections in the Context of Climate Change Scenarios | Nadia Politi | NCSRd |
| 14.40-15.00 | Seasonal Fire Weather products | Nadia Politi | NCSRd |
| 15.00-15.15 | Social Adaptation Strategies for Future Fire Regimes (Mentimeter/Participant Interaction) | Ramona Velea | ISIG |
| 15.15-15.30 | Q&A | | |
| 15.30-15.40 | Coffee break | | |
| 15.40-16.00 | FirEURisk Online Platform demonstration | Dimitrios Stavrakoudis | AUTH |
| 16.00-16.15 | Evaluation and Q&A | Julia Yagüe | GMV |
| 16.15-16.30 | Wrap-up and Open Debate | Ioannis Gitas/ Georgios Eftychidis | AUTH |
| 16.30 | Closing | | |

8.2 Annex A2 : Results of the questionnaire

8.2.1 Evaluation of FirEURisk products for PS5

1. What is your organisation's name?

- Municipality_of_Rafina
- Forest_Service
- Private (Volunteer)
- NCSR_DEMOKRITOS
- GMV
- AUTH
- SATWAYS
- ISIG

2. What component of wildfire risk is most important for your activity?

- a. Ignition causes (natural/human) - 20%
- b. Fire propagation (fuels, terrain, and weather) - 23%
- c. Population/assets exposure - 20%
- d. Ecosystem exposure - 6%
- e. Potential losses (Ecological/Socio-economic assets) -23%

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- f. Resistance and response capacity -9%
- g. Other -0%

3. What other fire risk components do you encounter within your activity? (e.g: land mang. plans, fighter's training, residents' education) (open question)

- a. Local population culture and mindset
- b. Fuel condition
- c. Risk awareness & perception among citizens/communities
- d. Biotic damage
- e. Property vulnerability
- f. Ecosystem dynamics
- g. Smoke
- h. Prevention measures
- i. Cultural heritage sites / protected sites

4. Was the explanation of the fire risk ASSESSMENT products sufficient?

- a. Fuel types, models, and mapping products - rate 4.7/5
- b. Wildfire risk assessment and propagation potential mapping - rate 4.5/5
- c. Mapping Wildland-Urban Interface (WUI) - rate 4.7/5

5. Was the explanation of the fire risk REDUCTION products sufficient?

- a. Framework for fuel management to reduce operation-based ignitions -rate 4.7/5
- b. Predictive models for fire behaviour and smoke dispersion – rate 3.5/5
- c. Advanced simulator for extreme and WUI fires – rate 4.7/5
- d. Citizens/scientist network and engagement plan– rate 4.5/5
- e. Curriculum development for extreme fires and WUI– rate 4.3/5

6. Was the explanation of the fire risk ADAPTATION products sufficient?

- a. Seasonal fire weather products– rate 4.3/5
- b. Fire weather projections in the context of climate change– rate 3.7/5

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- c. Social adaptation strategies for future fire regimes– rate 3.8/5

7. How suitable do you find these fire risk ASSESSMENT products?

- a. Fuel types, models, and mapping products– rate 4.9/5
- b. Wildfire risk assessment and propagation potential mapping– rate 4.5/5
- c. Mapping Wildland-Urban Interface (WUI) – rate 4.8/5

8. How suitable do you find these fire risk REDUCTION products?

- a. Framework for fuel management to reduce operation-based ignitions– rate 4.7/5
- b. Predictive models for fire behaviour and smoke dispersion– rate 3.9/5
- c. Advanced simulator for extreme and WUI fires– rate 4.8/5
- d. Citizens/scientist network and engagement plan– rate 4.7/5
- e. Curriculum development for extreme fires and WUI– rate 4.6/5

9. How suitable do you find these fire risk ADAPTATION products?

- a. Seasonal fire weather products– rate 4.5/5
- b. Fire weather projections in the context of climate change– rate 3.9/5
- c. Social adaptation strategies for future fire regimes– rate 4.0/5

10. Is the approach of fire risk ASSESSMENT products comprehensive?

- a. Fuel types, models, and mapping products– rate 4.7/5
- b. Wildfire risk assessment and propagation potential mapping– rate 4.5/5
- c. Mapping Wildland-Urban Interface (WUI) – rate 4.7/5

11. Is the approach of fire risk REDUCTION products comprehensive?

- a. Framework for fuel management to reduce operation-based ignitions– rate 4.5/5
- b. Predictive models for fire behaviour and smoke dispersion– rate 3.8/5
- c. Advanced simulator for extreme and WUI fires– rate 4.8/5
- d. Citizens/scientist network and engagement plan– rate 4.5/5
- e. Curriculum development for extreme fires and WUI– rate 4.1/5

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12. Is the approach of fire risk ADAPTATION products comprehensive?

- a. Seasonal fire weather products– rate 4.4/5
- b. Fire weather projections in the context of climate change– rate 4.5/5
- c. Social adaptation strategies for future fire regimes– rate 4.0/5

13. What other information about fire risk would you need? (open question)

- Assessment of levels of preparedness of the local community living in the target area
- Realtime fire propagation monitoring
- Population density (changes during the year)
- Harmonisation of data and products.
- Local fire protection plans

14. How interesting and usable are these products?

- a. Fuel types, models, and mapping products - high interest & high productivity
- b. Wildfire risk assessment and propagation potential mapping - high interest & high productivity
- c. Mapping Wildland-Urban Interface (WUI)- high interest & high productivity
- d. Framework for fuel management to reduce operation-based ignitions - high interest & high productivity
- e. Predictive models for fire behaviour and smoke dispersion - high interest & high productivity
- f. Advanced simulator for extreme and WUI fires - high interest & high productivity
- g. Citizens/scientist network and engagement plan - high interest & high productivity
- h. Curriculum development for extreme fires and WUI - high interest & high productivity
- i. Seasonal fire weather products - high interest & high productivity
- j. Fire weather projections in the context of climate change - high interest & high productivity
- k. Social adaptation strategies for future fire regimes - high interest & high productivity

8.2.2 Evaluation of FirEURisk platform and Demonstration Event

1 . Please value the following characteristics of FirEURisk Platform

- a. Platform design – rate 4.3/5
- b. Complete product description – rate 3.7/5
- c. Accessibility (easy to navigate) – rate 4.3/5

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- d. Product mapping display – rate 4.4/5
- e. Clear legends – rate 4.1
- f. Clear metadata – rate 3.1

2. To what extent do you agree with the following questions?

- a. Was FirEURisk project well presented at the start of the demonstration? – rate 4.8/5
- b. Were products described in sufficient detail for your needs?- rate 4.5/5
- c. Did you understand the use of the products? – rate 4.3/5
- d. Did you understand the questions about the product(s)? – rate 4.5/5
- e. Were questions answered satisfactorily?- rate 4.6/5
- f. The online experience was sufficient to validate the product? – rate 3.5/5

3. Please let us know items to improve or any question to be answered (open question)

- Is there a portfolio of services accessible?
- How the products could be integrated into a joint toolbox?
- Are there users defined that are ready to use the developed products after the end of the project?
- Cascading effects?

9 Annex B. Mentimeter questionnaire

[PDF of the questionnaire](#)

10 Annex C: PS5 Demonstration Event Presentations.

PDF of the Event Presentations