Extreme Wildfire Events Data Hub for Improved Decision Making

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List of Acronyms

CLASS	Chemistry Land Atmosphere Soil Slab model
EWED	Extreme Wildfire Events Data Hub for Improved Decision Making
WDP	Wildfire Data Portal
WMO	World Meteorological Organisation

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Executive Summary

This document explains the purpose, structure, and operation of the Wildfire Data Portal (WDP), the central platform created as part of the EWED project. The WDP functions as an open, central location for storing and sharing data related to wildfires, fire behaviour, and advanced modelling tools.

The platform is built with two primary goals in mind. Firstly, the main objective is to create an open and robust repository where all data (including both observations and model outputs) collected during the EWED project are archived and can be easily used and shared. Secondly, the WDP is designed to provide operational emergency managers with user-friendly software and specific materials for dedicated training. This training focuses on helping them understand the complex link between fire behaviour and atmospheric conditions, which is essential for making better decisions during critical incidents.

A long-term sustainability plan is integrated into the initial design, ensuring the platform can continue to operate and evolve after the EWED project officially concludes in December 2025. The portal uses a system of user profiles to maintain high standards of data quality and integrity. Through its different sections, the WDP provides both operational staff and the wider research community with access to necessary empirical data, scientific resources, and simplified models, thereby supporting work throughout the entire fire risk management cycle.

1. Introduction

This document provides a comprehensive overview of the Wildfire Data Portal (WDP), a key deliverable developed within the framework of the EWED project. This platform is established as a centralised, open data repository, designated to function as a European resource for the collection, archiving, and dissemination of observations related to wildfires and atmospheric conditions, alongside advanced modelling outputs. Prior to being uploaded to the WDP, all observations undergo quality control and are classified into standardised categories.

The WDP thus supports both fundamental and applied research on the increasing occurrence of extreme wildfires, and provides a framework to classify and categorise wildfire events. This enables fire analysts to better assess ongoing situations and supports decision-making during fire operations.

2. The Wildfire Data Portal

2.1. Concept and objectives

The fundamental concept behind the WDP is to develop a complete, comprehensive and user-friendly platform capable of serving fundamental research, technical and an operational user base. This primary concept underpins the fulfilment of three core objectives established for the platform:

- **Design and Implementation of a Novel Repository**: Design, develop, and deploy a completely new, open-access data repository. This system is dedicated to the systematic collection, archiving, and sharing of data collected during both live wildfire events and prescribed burns across Europe.
- **Modelling Accessibility**: To integrate and facilitate access to the most advanced wesather-fire coupled simulation tools available for the critical purpose of analysing the potential for extreme wildfire behaviour.
- **Knowledge Transfer and Decision Support**: To allow end-users, particularly emergency managers, to effectively gain knowledge and insight into the complex interactions between fire dynamics and atmospheric conditions, thereby enabling improved strategic and tactical decision-making.

2.2. Target audience

The WDP is a resource explicitly designed to meet the distinct and evolving needs of two primary user categories: operational personnel (including at the national and EU institutional levels, such as the Emergency Response and Coordination Centre and the Joint Research Centre) and the scientific research community.

The **operational users**, including decision makers, fire services, first responders, and emergency managers, are provided with a dedicated environment for training, knowledge acquisition, and analysis. The WDP offers key resources structured to enhance their understanding and preparedness:

- **Knowledge enhancement**: Users can access high-value training materials, such as self-explanatory videos and detailed documentation, specifically designed to expand their knowledge base and deepen their comprehension of EWEs and the underlying scientific principles that govern their behaviour.
- **Fire and atmospheric observational data**: The platform supplies essential ground-level and vertical profile data collected from wildfire events and prescribed burns, alongside analytical models. These tools allow operational personnel to better understand the complex behaviour of EWEs.
- **Data contribution**: Users are also provided with protocols and instructions to contribute with their own field observations, following established project methodologies to ensure consistency and data quality across the repository.

On the other hand, the platform functions as a vital resource for the **research community**. Researchers gain access to high-quality empirical data that has been collected in the field by operational staff. This collection process adheres to specific, standardised protocols that guarantee the data's robustness and reliability. The availability of this real-world, standardised dataset is essential, enabling researchers to validate their models and benchmark their theoretical outputs directly against real observations.

2.3. Sides of reference

The Cloud Atlas, a platform developed by the World Meteorological Organisation (WMO), serves as the primary structural reference for the WDP. This reference website functions as a validated data archive that successfully organises complex information into discrete case studies.

The WDP adopts this methodology for the organisation of its own data archives. The core structure for handling case studies is referenced from the WMO model, but it is adapted to align with the specific kind of data collected by the EWED project, in particular the extreme wildfires following a classification by Castellnou et al. (2022). Furthermore, the WDP places a strong emphasis on improved visual design and usability compared to the reference, ensuring high accessibility for the operational user base.

A key functional feature derived from the Cloud Atlas is the filtering capability. These filters enable users to efficiently select and isolate case studies within the repository based on key variables. Crucially, the WDP enhances this functionality by permitting users to download only the specific data files corresponding to the variables they select, improving user efficiency and data management. This capability helps identify similar cases that may serve as prototypical or archetypal examples, supporting their simulation and aiding fire analysts in making informed decisions in situ.

It is important to note that while the structure for case studies takes inspiration from the WMO Cloud Atlas, the WDP significantly expands its scope. The platform includes other sections that provide additional, complementary information, as well as integrating the modelling capabilities of the land-fire-atmosphere CLASS model, which is detailed further in Section 4.2 of this document.

2.4. Design and conception process

The EWED partners go through the design and conception process since the beginning of the project. Two external companies are hired to support the development and the different components of the portal.

Some of the aspects that are considered during the process:

- The portal is designed to be static, only updated by the portal administrators periodically (e.g. addition of new wildfire data, modelling tools, training materials or publications).
- The portal is not named after EWED, as other projects can contribute to it in the future. A specific logo is designed for independent identification.
- Three distinct access profiles are established to manage permissions and functionalities: User, Administrator, and Editor.
- The users are able to navigate through the different sections, use the modelling tools and download resources.
- Downloading of resources is made simple and easy for the user.
- If somebody wants to upload more data or resources, they contact the administrators, and they are responsible for uploading the new contents. This allows for a quality control on the resources to be added to the portal, done by the EWED partners.
- The WDP is only in one language: English.
- The data available on the WDP can be reused following a copyright licence and the appropriate referencing. This follows the EU regulations and FAIR principles.

The design process involves continuous, periodic meetings between the EWED partners and the external development companies to review progress and refine specifications. The development follows an iterative prototype methodology, which allows for continuous testing of functionalities and user experience until the final version is reached. The key development stages include: 1) the creation of the initial prototype; 2) the launch of the advanced prototype; 3) the migration of the website from the testing environment to the final hosting server; 4) the upload of the wildfire data; 5) the integration of the modelling tools; 6) a comprehensive testing phase that includes a training course; and 7) the final public release of the validated version.

3. Site specifications

The aim of this section is to provide de details of all specifications needed to develop and define the WDP, and the different sections.

3.1. General information of the WDP

Title of the site: Wildfire Data Portal

Domain: https://wildfiredataportal.eu/

Logo:

Figure 1. WDP logo.

3.2. Contents of the WDP

By the time of launching the portal, the site offers a significant amount of novel content on extreme wildfire behaviour. This includes:

- Empirical data from 27 fire cases, including wildfires and prescribed burns in Spain, Greece, The Netherlands and Chile. For each case, the user can navigate and download:
    - The technical description about the event
    - The radiosounding data includes wind speed, wind direction, temperature, relative humidity and rate of ascending
    - Complementary resources: official report, related publications
    - Images and videos of the fire behaviour
    - Cartography
    - Modeling toolkit to reproduce the case and support the analysis of data
- Case study modelling tools to analyse the empirical data and create permutations based on fire, mixed layer, time and wind variables, enabling to understand and anticipate potential changes in fire behaviour and the physical processes behind it.

- A total of 10 videos for understanding the science of pyroconvection, presented as training and capacity building resources
- 1 scientific publication on the understanding of extreme wildfire behaviour, which is submitted to a peer-review journal.
- 2 modeling visualisations
- 1 protocol for data collection, for those organisations that want to collaborate collecting data¡

3.3. Functionalities and tools

The WDP is designed to offer novel and very specific functionalities and tools on site. This includes:

- Navigate empirical datasets on extreme wildfire behaviour
- Explore novel modelling tools and visualisations (the CLASS model)
- Download the data and the models to analyse the data
- Access scientific literature of reference
- Access other learning materials
- Adopt standardised protocols
- Collaborate and contribute

3.4. Site structure

The site map used for the WDP considers the different aspects discussed by the partners at the design and conception of the portal (see Section 2.4 Design and conception process). This leads to three main sections included in the menu: Data, Science and About, with multiple subsections each. The menu can be easily accessed from the homepage, and the header of all subpages.

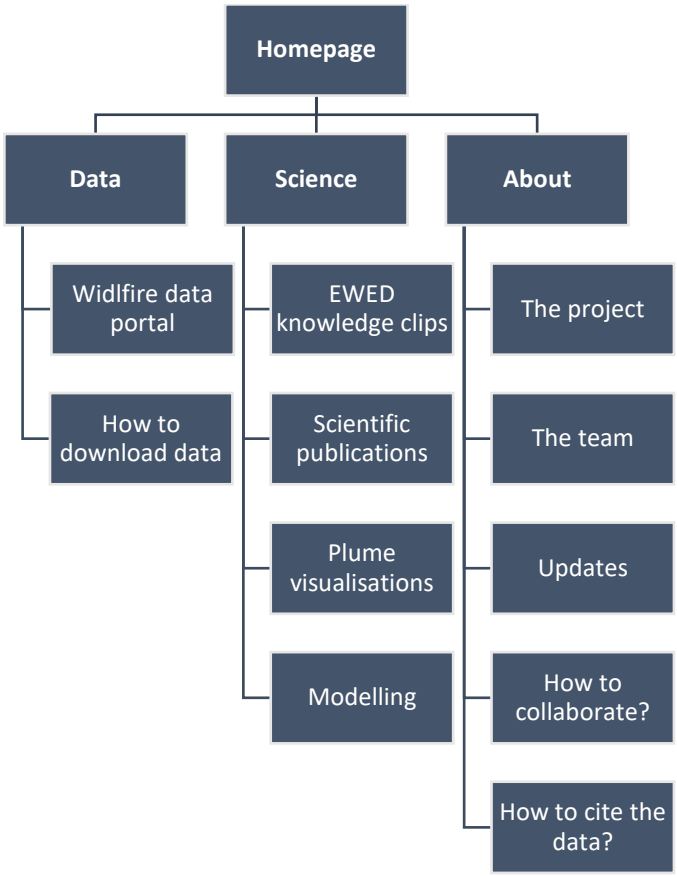


Figure 2. WDP sitemap.

3.4.1. Homepage

The Homepage is conceived as the primary gateway to the WDP, designed to provide direct access to all core functionalities and essential legal information.

The homepage contains:

- Logo
- Menu
- Search function
- Short definition of the portal
- Direct access to the two main sections of the portal: Data and Science
- Highlighted access to science and updates
- Contact details
- Footer and legal and privacy notice
- Acknowledgement to the EU commission and disclaimer

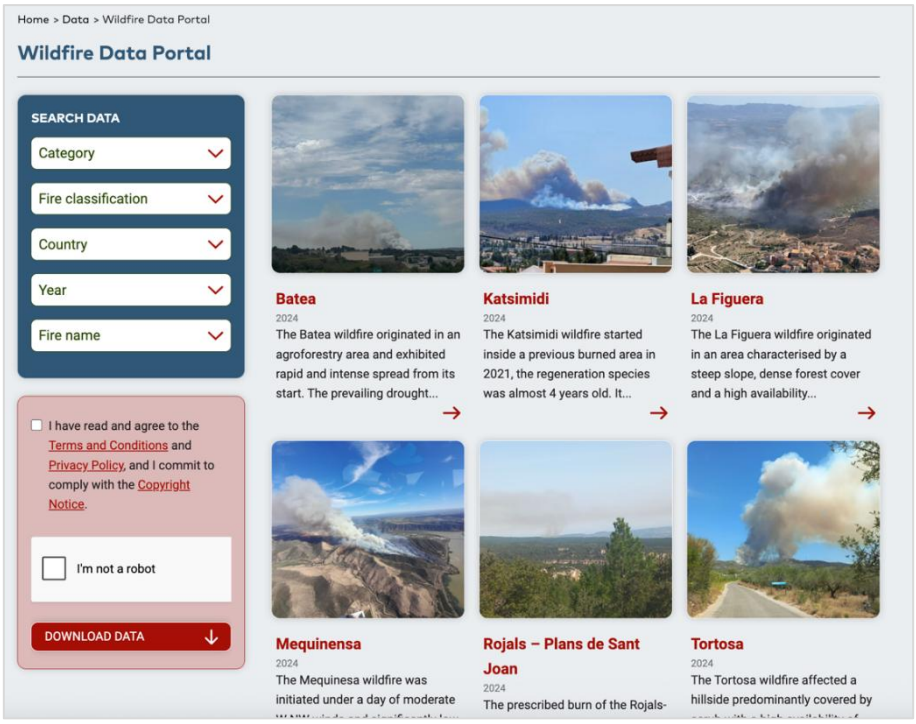
Figure 3. WDP homepage.

3.4.2. Data section

This section has two subsections:

3.4.2.1. Wildfire Data Portal

This page provides access to wildfire data. The data is organised through different wildfire and prescribed burning cases. At time of the release of the portal, this page contains 27 cases, and it is envisioned to increase the number of cases with ones in an archive and new ones. The data from those cases is published in *D3.2 Case studies* and *D3.4 Case studies updates* from the EWED project.



The page includes a specific search function (top left), which enables users navigate the different cases using specific filters. The user can download the complete data archive or, if preferred, only the data subset that has been selected through the filters.

Clicking on a specific case study opens a dedicated window that displays all associated data in a detailed and visually clear format, organised by thematic sections. For each case, the following information is provided:

- General information: Classification and description of the fire or prescribed burn, accompanied by a dedicated photographic and video gallery.
- Fire behaviour and surface observations: Key metrics on fire behaviour recorded at the surface level.
- Balloon soundings: Data recorded from radiosondes launched during the fire event.
- Fire surface data: Visualisation of the fire's hourly perimeter.
- Modelling: Direct link to the integrated CLASS model, alongside the associated sounding data.
- Publications: Any scientific or technical publications specifically associated with the case study.
- Download data: Direct option to download all data files related specifically to that individual case.

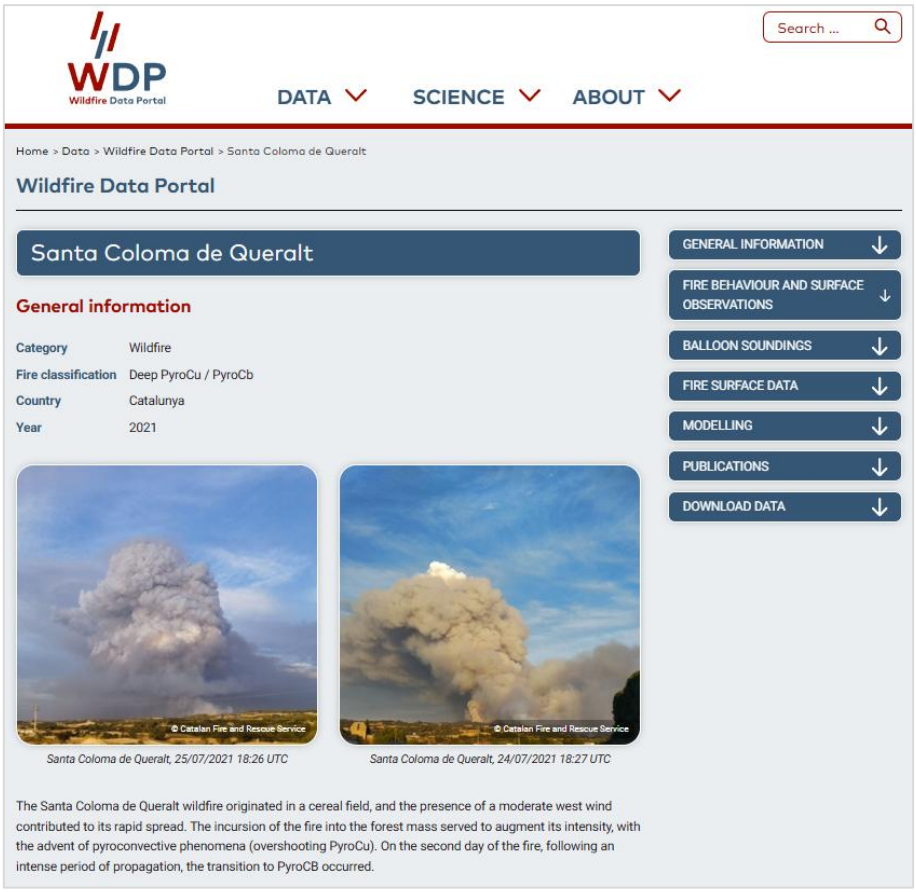


Figure 4. Case study example.

3.4.2.2. How to download the data

This section provides clear instructions regarding the process for downloading the data sets contained within the Wildfire Data Portal (WDP). As previously outlined, the data can be downloaded using two methods: directly from the Main Data Page (after applying filters) or from the Fire Detail Page (for a specific case study).

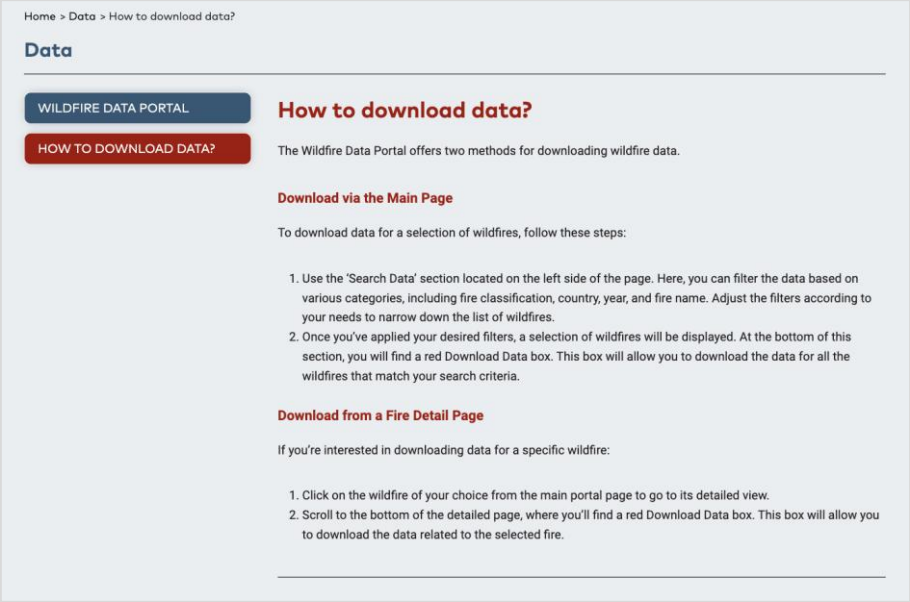


Figure 5. Instructions on how to download data.

In either scenario, the download generates a single compressed ZIP file. This archive contains all the raw data, organised into clearly labelled folders to facilitate its use. The specific content is as follows:

- fire behaviour media: Contains images of the hourly perimeter boundaries (isochrones).
- fire surface data files: Includes the KML file detailing the hourly perimeters (isochrones).
- general extra media: Houses additional images and videos related to the wildfire case.
- general images: Contains the main images for the case study.
- raw sounding data: Provides the raw data from the launched sondes in CSV format.
- sounding files: Includes the KML file showing the sonde's flight path, along with the launch and landing locations.
- surface observations: Contains the observational data pertaining to surface-level fire behaviour.

3.4.3. Science section

3.4.3.1. EWED Knowledge Clips

This section hosts a dedicated repository of video content aimed at transferring knowledge about advanced fire meteorology to the operational community. This series consists of ten short videos, each approximately ten minutes in length. The series provides a step-by-step course into the physics and prediction of pyro-convective plumes and subsequent pyro-clouds that manifest during EWEs. It can be very useful to get acquainted with fundamental concepts and for training courses.

The content is structured starting with the fundamental physics and environmental conditions associated with pyro-convective plumes (Videos 1 to 3). To facilitate prediction, the series then introduces the use of the Skew-T diagram, demonstrating its interpretation through real-world case studies and advising users on where to access this data (Videos 4 to 7). The final segment shifts focus to the actual measurement of pyro-convection

using soundings (Video 8), introduces the necessary concept of conserved variables (potential temperature, specific humidity) for interpreting sounding data (Video 9), and concludes with an analysis of authentic pyro-convection observations (Video 10).

3.4.3.2. Scientific Publications

This is a summary of relevant scientific articles. This compilation includes publications that form part of the results of the EWED project and others that may be relevant and linked to the data available through the EDP. The content of this section is dynamic and subject to future updates to incorporate new research related to pyro-convection and other similar topics deemed beneficial to the user base.

3.4.3.3. Plume visualisations

This section provides visualisations of wildfire plumes generated using 3D simulations run on the MicroHH model. These visualisations are provided to represent the complex interaction between fire behaviour and the atmosphere, thereby assisting users in better understanding the coupling processes and their impact on fire dynamics.

3.4.3.4. Modelling

This section is dedicated to providing additional modelling resources that complement the specific fire models associated with each individual case study in the database. These complementary versions are simplified for training purposes, allowing users to gain a clearer understanding of the underlying model functionalities. These resources are updated on an as-required basis.

3.4.4. About section

3.4.4.1. The project

This subsection outlines the general objective of the WDP, focusing on its role as an open data platform and training resource. It summarises the portal's content, its usability to the different target audiences (operational and research), and its origin as a key output of the EWED project. The WDP is specifically designed with a long-term vision, with the intention of remaining active and developing further beyond the scheduled conclusion of the EWED project in December 2025.

3.4.4.2. The team

The success of the WDP is founded on the importance of the multidisciplinary collaboration between researchers and operational personnel. This partnership is fundamental to ensuring the platform is both scientifically rigorous and operationally practical. This section describes the role of each EWED partner in the project, detailing their specific involvement in the development and content management of the WDP, and outlining their respective fields of expertise.

3.4.4.3. Updates

The 'Updates' section serves as an archive for the latest news and developments related to the WDP. This includes information on newly integrated data sets, recent relevant publications, or other materials of interest to the community. At the time of writing this document, the section includes three entries, corresponding to three key deliverables from the project.

3.4.4.4. How to collaborate?

This section is dedicated to fostering synergies with the WDP by providing straightforward channels and contact details for collaboration. It invites individuals, organisations, or other projects to engage with the portal in various ways, such as sharing data, participating in research initiatives, contributing constructive feedback, or developing tools.

3.4.4.5. How to cite the data?

Clear guidance is provided here on the correct procedures for citing the data and the portal itself when used in publications, presentations, or any other open-access context. This section also confirms the copyright notice applicable to the WDP data, which is the Creative Commons Attribution 4.0 International (CC BY 4.0) license.

3.5. Profiles and roles

The WDP has a structure based on three user profiles, each assigned specific roles, permissions, and responsibilities. This hierarchical structure ensures strict control over data integrity, content quality, and platform maintenance, while maintaining open access for the general user base.

3.5.1. Administrator

The Administrator profile possesses the highest level of permissions and responsibility within the WDP. In addition to the capabilities held by other roles, the Administrator can:

- User management: Create and modify new Editor profiles.
- Platform structure: Implement changes to the portal's core structure, add new functionalities, and create new content sections.
- Monitoring and metrics: Measure traffic through Google Analytics (visits, data download, etc.).
- General editing: Perform general editing tasks across all areas of the portal.

This role is intended to be held primarily by PCF, with additional profiles assigned as required by specific project needs. Should external personnel be contracted to implement necessary technical modifications, admin and editor access is granted.

3.5.2. Editor

The Editor role is primarily responsible for the management of the portal's data and content. This profile is designed to have the necessary capacity to:

- Data management: Upload new data sets and modify existing ones.
- Content editing: Edit the content within the various thematic sections of the portal.

3.5.3. User

The User profile represents the generic end-user of the platform. This profile does not require login credentials to access the content. Users are able to fully engage with the portal's resources, including viewing and downloading data, utilising the tools and resources, and consulting all provided content. This profile's primary function is content consumption, without the ability to upload, modify, or edit any content.

4. Sustainability and exploitation plan

4.1. Sustainability

This section explains how the Wildfire Data Portal will continues to operate, evolve, and generate value after the EWED's project funding ends.

The EWED consortium ensures the site's sustainability by securing funding. This includes ensuring the visibility of the website, operationalising data, tools, and resources available, engaging with the target audience, and ensuring accessibility to the portal.

- Content ownership: the EWED consortium is the owner of the content, and more particularly the organisations that have contributed to it: Catalan Fire and Rescue Service, Wageningen University, The Netherlands Institute of Public Safety, Grenland Fire and Rescue Service IKS, Hellenic Fire Service, and Pau Costa Foundation.

  These organisations will be responsible for providing updates and validating the content of the WDP. PCF will host the administration roles, while the other partners will have editor roles, to be able to upload contents and data, and update it if necessary.

- Technical maintenance owner: PCF will be responsible for hosting, periodically updating and backing up the portal to ensure it is operational in the long term.

- Design/UX owner: the EWED consortium. The portal was designed to be static to facilitate its maintenance and sustainability.

- Communication manager: PCF will be responsible for disseminating and engaging with the target audience through social media and other communication channels.

Two actions are foreseen to be developed as part of the sustainability plan of the WDP:

- The ODET project (UCPM-2025-KAPP-PVPP – 101253519), continues using the site as the main repository of data and tools for understanding and operationalising the knowledge on extreme wildfire behaviour. The project runs from the beginning of 2026 to the beginning of 2028.

- Engage in discussions with UPCM and JRC for the potential integration of the portal to the institutional portals offered by those organisations (e.g. GWIS, EFFIS).

4.2. Exploitation

This section explains how the tools and content of the WDP will be used, shared, and leveraged. There is no expected monetisation from the Portal.

All the results from the Portal are shared in open access and is licensed under the Creative Commons Attribution 4.0 International (CC BY 4.0) license.

The primary target audience of the WDP is two-fold: wildfire practitioners and the scientific research community. The platform's utility extends further to personnel involved in wider wildfire risk management, supporting activities across the entire wildfire life cycle, including long-term planning and preparation.

The following exploitable assets have been identified:

- **Training materials**: empowers operational users to deepen knowledge on EWE science and fire-atmosphere interactions, enhancing preparedness and decision-making capabilities.
- **Datasets**: provides standardised, robust empirical data from real wildfires and prescribed burns for use in research, model validation, training, and planning.
- **Modelling tools**: offers accessible analytical models (e.g., CLASS) that enable users to simulate and understand potential extreme wildfire behaviour.
- **Visualisations**: presents complex 3D plume simulations and fire perimeter data in a clear, visual format to aid understanding of fire-atmosphere coupling processes.
- **Scientific Publications, Guidelines and Reports**: centralises relevant academic and technical documentation, bridging the gap between cutting-edge research and operational application.
- **Key performance indicators (KPIs)**: data downloads, CLASS links opened, visits to the portal and its pages, user demographics.
- **Communication and Dissemination plan**: a specific campaign has been developed to communicate and disseminate the WDP, through social media, email and the website. Launch phases:
    - I. Curiosity and awareness: to reveal what's in the portal. November 2025.
    - II. Countdown to launch: to build anticipation. Early December 2025, and adaptable to D3.3 approval.
    - III. Launch and engagement: to announce, showcase, and engage users: Mid December 2025, and adaptable to D3.3 approval.

4.3. Associated risks

Periodic evaluations and monitoring of the functioning and the sustainability of the site are carried out to ensure the optimal implementation of the sustainability and exploitation plans, as well as the review of the risks identified and any other unforeseen risks.

The following threats are identified:

Table 1. WDP associated risks.

Risk	Impact	Mitigation
The development of the WDP fails due to technological limitations or capacity issues	The WDP cannot be developed according to the initial plan and does not meet the consortium's expectations	Close monitoring of the process and identification of all required steps before the development of the Portal, assuring that its feasibility can be checked beforehand
Long term sustainability	WDP cannot be updated or hosted either through project funding or through integration into institutional EU portals	Consider diversification of the financial model
Technological obsolescence	Breakdowns / vulnerabilities	Regular updates, tech audits and migrating to a new technology
Low engagement	The portal fails its purpose	Strong promotion strategy + UX improvements

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