



european Network on Extreme fiRe behaviOr
COST Action CA22164

Navigating the fire environment to ignite preparedness and readiness for extreme wildfires

DATA MANAGEMENT PLAN

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Revision History

Version	Date	Edited by	Description
0.1	07.06.2024	Nieves Fernandez Anez	First draft version
0.2	06.07.2024	Theodore M. Giannaros	Applied document template of NERO and revised content
0.3	05.09.2024	Theodore M. Giannaros, Akli Benali, Nieves Fernandez Anez, Mario Miguel Valero, Valentina Bacciu	Revised content
0.4	20.09.2024	Theodore M. Giannaros	Final draft version after accepting revisions
1.0	28.09.2024	Theodore M. Giannaros	Version 1.0 approved by the Action MC

Executive Summary

NERO is a COST Action (CA22164) that brings together wildfire researchers and practitioners to address the challenge of understanding and predicting extreme fire behavior. The Action aims to cultivate a European culture that fosters effective cross-boundary sharing of expert knowledge, including data and methods. Significantly, NERO aims to bridge the gap between scientific findings and practical application, advocating for efficient science-based fire management. Leveraging COST networking tools, NERO will train a new generation of highly qualified researchers and practitioners, specialized in addressing the challenges posed by extreme wildfires.

The Data Management Plan (DMP) of NERO provides the fundamental framework to manage all data collected, used, and generated throughout the Action lifetime, in full compliance with the FAIR (Findability – Accessibility – Interoperability – Reusability) principles¹. It is a living document that will be regularly updated to gain more precision and substance during the lifespan of the Action.

The Zenodo platform², a FAIR-compliant, general-purpose, and open-access repository developed under the European OpenAIRE programme and operated by CERN, will be employed for storing the data collected and generated by NERO.

IMPORTANT NOTICE

Within the Action, participants agree that only data generated by Action activities will be publicly shared and that data (re)distribution can take place in one of two ways under the Creative Commons License Attribution 4.0 International³. **NERO data can either be directly opened to everyone through the Zenodo repository or be uploaded with an embargo, waiting for a specific milestone (e.g., publication of a manuscript) before they are fully opened.** Intermediate data contributed to the Action by internal or external partners will remain the property of the contributor and will not be subject to this DMP -and, therefore, not shared- unless sharing the data is required to justify the methods and tools produced by the Action.

The current document is version 1.0 of NERO's DMP. It is based on the template provided by the European Commission (EC) on the Funding & Tenders Portal⁴.

¹ Wilkinson et al. (2016) The FAIR Guiding Principles for scientific management and stewardship. Scientific Data 3, 160018. <https://doi.org/10.1038/sdata.2016.18>.

² <https://zenodo.org>.

³ <https://creativecommons.org/licenses/by/4.0/deed.en>

⁴ https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/temp-form/report/data-management-plan_he_en.docx

The Zenodo community of NERO, where all collected and produced data will be uploaded, can be accessed at <https://zenodo.org/communities/nero-network/>.

1. Data Summary

1.1. Purpose of data collection, re-use, and generation

The overarching goal of NERO is to advance our scientific understanding of extreme fire behavior and to narrow the gap between science and practice, thereby promoting efficient science-based fire management. In pursuit of this goal, NERO will collect, re-use, and generate data to:

- Reconstruct the fire progression (spread) of wildfires
- Estimate fire behavior descriptors (e.g., rate of spread) for the reconstructed wildfires
- Develop storylines for the reconstructed wildfires
- Assess the influence of environmental parameters (fuels, topography, weather) on fire behavior development
- Examine the presence of tipping points (thresholds) related to the occurrence of extreme fire behavior
- Derive qualitative/quantitative relationships that describe the development of extreme fire behavior
- Evaluate the performance of fire spread modeling systems
- Establish an open-access data repository to support future analyses of fire behavior

To achieve the above goals, NERO will collect and re-use as much data as possible from its network members, as well as any data that may be publicly available under permissive licenses. Additional data required to support the systematic analysis of fire behavior (e.g., fire behavior descriptors) will be generated within NERO through the development and implementation of scientific methods and tools.

1.2. Data types and formats

Table 1-1 provides a summary of the different types and formats of the data that NERO anticipates collecting, re-using, and generating. This is indicative information that shall be updated, when necessary, during the lifetime of the Action to be more precise and gain more substance.

Table 1-1. Data summary information.

Type	Format	Origin ⁵	Expected Size
Images/photographs and videos	png, jpeg, mp4, mov	Secondary	Mb to Gb
Scripts	Python, R	Secondary	Kb to Mb
Geospatial	shapefile, gtiff, netCDF, geojson	Primary Secondary	Gb to Tb

⁵ Primary or secondary. Primary data are originally obtained and newly documented data, whereas secondary data rely on existing sources.

Tabular	csv, txt, xlsx	Primary Secondary	Mb to Gb
Models	netCDF, grib, gtiff	Secondary	Gb to Tb
Text and textual reports	docx, pdf	Primary Secondary	Mb to Gb

1.3. Data utility

The collected and re-used data of NERO will support collaborative research activities within the Action network. The data generated within the Action network will support research, educational, and capacity-building activities within and outside the Action network.

2. FAIR Data

NERO will focus on encouraging sound data management that complies with the FAIR (Findability – Accessibility – Interoperability – Reusability) principles⁶ as an integral part of research best practices.

2.1. Making data findable, including provisions for metadata

Datasets created within the Action network will be made identifiable by a persistent **Digital Object Identifier** (DOI), assigned to them on the Zenodo community of NERO⁷. Metadata, including search keywords, will follow Zenodo’s standards, with an example given in Annex 1 of the present DMP. To increase further the findability of the data, a **uniform data organization scheme**, introduced in Annex 2 of the present DMP, will be used. By following the above approach to define metadata for the datasets created within the Action network, we ensure that they can be harvested and indexed. Further, we intend to publish data products generated during the Action as part of research articles or in data-specific scientific journals to boost data findability within the broader scientific community. Similarly, Action-related workshops, conference presentations, and other outreach activities will support the dissemination of NERO data products among relevant stakeholders and the society.

2.2. Making data accessible

2.2.1. Repository

Datasets created within the Action network will be made **openly accessible** by deposition in the Zenodo platform, a FAIR-compliant, general-purpose, and open-access repository developed under the European OpenAIRE programme and operated by CERN. The Zenodo community of NERO, where all datasets will be deposited, can be accessed at this address: <https://zenodo.org/communities/nero-network/>. Opting for the use of the Zenodo platform ensures full compliance with the FAIR principles⁸, as well as that all datasets created within the Action network will be assigned to a persistent DOI.

2.2.2 Data

NERO distinguishes between three (3) distinct **categories of data**:

- Data collected and re-used within the Action network (**internal data**)

⁶ Wilkinson et al. (2016) The FAIR Guiding Principles for scientific management and stewardship. Scientific Data 3, 160018. <https://doi.org/10.1038/sdata.2016.18>.

⁷ <https://zenodo.org/communities/nero-network/>

⁸ Wilkinson et al. (2016) The FAIR Guiding Principles for scientific management and stewardship. Scientific Data 3, 160018. <https://doi.org/10.1038/sdata.2016.18>.

- Publicly available data collected and re-used under permissive licenses (**external data**)
- Data generated within the Action network through the development and implementation of scientific methods and tools (**NERO data**)

We classify the first two categories of data (**internal and external data**) as **intermediate**, intended to support research activities collaboratively undertaken by the Action members within the Working Groups (WGs) of NERO. We consider the third category of data (**NERO data**) as **newly documented** and **originally produced** through research activities collaboratively conducted by the Action members within the WGs of NERO.

IMPORTANT NOTICE

Intermediate data **will only be made public** –and thus subject to the DMP of NERO– **if necessary and subject to the data providers’ consent** to support the credibility of the methods and tools developed and applied within the Action network. All other data (**NERO data**) **will be open access under the Creative Commons License Attribution 4.0 International** and the DMP of NERO covers them in full.

Open datasets (**NERO data**) will be accessible **without restrictions**. Within the Action, participants agree that (re)distribution of open datasets can take place in one of two ways. Data can either be **directly opened without restrictions** on the Zenodo community of NERO or be **deposited with an embargo**, waiting for a specific milestone (e.g., publication of a manuscript) before they become fully open. If an embargo is applied, **this shall not exceed 6 months** from the deposition of the data on the Zenodo community of NERO. This limit may only be extended under special circumstances and by approval of the NERO Core Group.

Concerning **data access**, this will be granted through the **Zenodo community of NERO**. This access protocol ensures that the **identity** of the persons accessing the data **will not be ascertained**, as Zenodo logs only necessary information to prevent misuse and generate aggregated usage statistics. Since no personal data will be shared, **no data access committee** is planned at this stage.

2.2.3. Metadata

Metadata for the open datasets (NERO data) will follow the Zenodo guidelines (an example is available in Annex 1) and will be openly available. The open datasets created within the Action network will be stored indefinitely post-project on the Zenodo community of NERO. No peculiar software will be required to access the data, which will be deposited in standard formats (e.g., csv, pdf, xls, netCDF, etc.).

2.3. Making data interoperable

Standardized procedures for data collection (e.g., use of a data retrieval template) and management, including adherence to the **Zenodo metadata standards** and the implementation of a **uniform data organization scheme** (Section 2.1, Annex 2) will facilitate data exchange and re-use within and outside the Action network, thus enhancing **data interoperability**. Whenever applicable, relevant references will be made to other qualified data from NERO project or external open datasets.

2.4. Increase data re-use

To facilitate data re-use, methodological approaches will be shared through the public deliverables of the Action, which will be also openly available on the Zenodo platform of NERO⁹ (Section 3). Among other information, these deliverables will include detailed descriptions of the methods applied, the assumptions, and the limitations. Scientific publications documenting the research processes will also be prepared. All open datasets created with the Action network will be linked to scientific publications and public deliverables of NERO, thus ensuring that enough contextual information is provided to increase data re-use.

IMPORTANT NOTICE

Within the Action, participants agree that open datasets will be (re)distributed through the Zenodo community of NERO under the **Creative Commons License Attribution 4.0 International** (CC BY 4.0).

We will follow a **two-step approach** to ensure **data quality**. The first step will take place prior to finalizing the activities related to the generation of the data to ensure consistent metadata, keywords, data formatting and file naming, and data provenance. In this step, a dedicated Data Collection and Curation (DCC) team assembled by WG1 Leaders (who are responsible for the maintenance of the DMP of NERO) will consult with each Action network member to prepare, check, clean, and review the data. The second step will take place after the completion of the dataset preparation. The QC team carrying out the first step of the data quality assurance will review the quality and utility of each dataset, ensure consistency of metadata and keywords, and lock the datasets for deposition on the Zenodo community of NERO.

Quality-controlled open datasets will be immediately deposited on the Zenodo community of NERO. Dataset deposition will only be performed by authorized members of the QC team. Should modifications be necessary, the partner responsible for dataset (author) will be requested to

⁹ <https://zenodo.org/communities/nero-network/>

update the dataset. Ad hoc data quality management processes will be further elaborated for each dataset as part of the next updated of NERO's DMP.

3. Other Research Outputs

Once approved by the Action Management Committee (MC), public deliverables of the Action will be accessible on the Zenodo community of NERO¹⁰ and the NERO website¹¹ to ensure prompt access to the research outcomes of the Action network. Open-source software and documentation will be also available on the Zenodo community of NERO.

Our exploitation plan anticipates that datasets created within the Action network and other research outputs will be shared via other services like, for instance, the Firelogue platform¹² or/and the Union Civil Protection Knowledge Network¹³. Details on which outputs to share and the methods and timing of sharing will be determined at a later revision of NERO's DMP.

IMPORTANT NOTICE

Within the Action, participants agree that research outcomes of the Action network, other than datasets specified in previous sections, will be (re)distributed under the **Creative Commons License Attribution 4.0 International** (CC BY 4.0). Other licenses may be envisaged on a case-by-case basis.

¹⁰ <https://zenodo.org/communities/nero-network/>

¹¹ <https://nero-network.eu>

¹² <https://lessonsonfire.firelogue.eu>

¹³ <https://civil-protection-knowledge-network.europa.eu>

4. Allocation of Resources

The Action Chair assisted by the WG1 Leaders, and the QC team (Section 2.4) will be responsible for the overall coordination of data management within the Action network. Neither direct nor indirect costs are foreseen related to data storage, archiving, etc. The cost for the overall data management will be covered by own resources, not affecting the Action budget. Long-term preservation is ensured using the Zenodo platform that offers a data retention for the lifetime of the created community (repository).

5. Data Security

The Zenodo community of NERO¹⁴ will be used for the deposition and sharing of all open datasets and other research outcomes of the Action network. Zenodo's policies will be adhered to by all members of the Action network.

No special category data as defined by the GDPR (e.g., biometric data) will be collected. Personal data such as names, professional affiliations, and contact details will be collected through **informed consent forms** for participation in surveys, workshops, real-time collection of data, etc. These data will be stored securely in paper or digital format by the responsible or associated partner. Annex 3 introduces an example of the informed consent form that will be used for collecting real-time wildfire data during the lifetime of the Action through the use of a mobile application.

Data processing agreements with partners will be established on a case-by-case basis and be defined at later revisions of the DMP of NERO.

For partners outside the EEA, our Action will establish, if necessary, data processing agreements on a case-by-case basis.

¹⁴ <https://zenodo.org/communities/nero-network/>

6. Ethics

All members of the NERO COST Action (CA22164) shall adhere to the principles of the European Code of Conduct for Research Integrity. These principles include:

- **Reliability:** Ensuring high-quality research through careful design, methodology, analysis, and resource use.
- **Honesty:** Conducting, reviewing, reporting, and communicating research in a transparent, fair, thorough, and unbiased manner.
- **Respect:** Valuing colleagues, research participants, society, ecosystems, cultural heritage, and the environment.
- **Accountability:** Being responsible for the research from conception to publication, including management, organization, training, supervision, mentoring, and considering its broader impacts.

7. Other Issues

7.1. Intellectual property rights and copyright

Concerning intellectual property rights (IPR) and copyright, participants in the NERO COST Action (CA22164) agree on the following:

- All copyright and other IPR in **any data created or any work collaboratively undertaken within the Action network (NERO data; Section 2.2.2)** will vest in NERO and all authors (creators) who contribute data (Sections 1.2 and 2.2.2). Creative Commons Licenses will be employed on a case-by-case basis to give everyone, from individual authors (creators) to large institutions (organizations) a standardized way to grant the public permission to use their intellectual work under copyright law.
- All copyrighted and IPR-protected secondary data shared with the Action network (Sections 1.2 and 2.2.2) must comply with the **relevant copyright regulations of the countries of their origin**. Considering the most common and well-known regulations (e.g., EU copyright directives, US Copyright Act), we state and agree that limited and fair use of copyrighted material for research purposes is allowed when the copyrighted material is used by research entities (i.e., non-commercial/government scientific institutions, research institutes, and universities) and when complying with a list of relevant factors with respect to the purpose (i.e., non-commercial, education, research, etc.), the quantity (amount limited depending on purpose), acquisition, acknowledgement to creator(s) and so on.

7.2. Limitations

This initial version (1.0) of the DMP of NERO outlines the general principles for data management and adherence to the FAIR principles. While these principles are primarily supported by the Zenodo platform, their practical implementation is still in progress.

It shall be also noted that the currently identified data do not represent the complete selection of the data that NERO will collect, re-use and generate. Some relevant data might also remain unidentified. Nevertheless, the Action MC has made significant efforts to achieve an as much as possible comprehensive overview by the time the current DMP is published.

7.3. Further work

The DMP of NERO will be updated regularly as needed, with comprehensive updates aligned with any relevant decisions of the Action MC. Recognizing that some Action members may have less experience in data management, regular internal meetings will be organized to support these partners in operationalizing data management in the most effective way. Further elaboration is

required for data quality management processes, and detailed information for each dataset will be progressively included in the DMP of NERO. WG1 Leaders are responsible for the overall maintenance of NERO's DMP.

Annex 1. Example of a Dataset Presentation on the Zenodo Community of NERO

An example of a dataset generated within the Action network and recorded on the Zenodo community of NERO is given below. Note that this only an example and metadata may differ depending on the dataset characteristics.

Dataset Persistent Identifier (PID)	10.5281/zenodo.12625338
Resource Type	Dataset
Title	NERO_CA22164_Fire_Weather_EL
Publication Date	2024-07-02
Creators	Giannaros, Theodore (National Observatory of Athens)
Description	<p>This dataset contains fire weather data for wildfires in Greece from 2006 to 2023. It has been produced using...</p> <p>This dataset is based upon work from COST Action NERO, CA22164, supported by COST (European Cooperation in Science and Technology).</p>
Publisher	NERO COST Action (CA22164)
Keywords	wildfire, Greece, fire weather
Awards/Grants	European Cooperation in Science and Technology, CA22164, european Network on Extreme fiRe behaviOr, https://www.cost.eu/actions/CA22164/

Annex 2. Data Organization Scheme of NERO

NERO will follow a uniform data organization scheme with standardized naming conventions throughout the lifetime of the Action. This will allow to increase the findability of the data, both within and outside the Action network.

A2.1. General information

NERO distinguishes between three (3) levels of data:

- **L0:** Raw fire data and environmental drivers
- **L1:** Fire progression isochrones
- **L2:** Fire behavior descriptors linked with environmental drivers

IMPORTANT NOTICE

While the L0 data appear in the data organization scheme of NERO, these will only be published **if necessary** and subject to the data provider's consent to support the credibility of methods applied to derive L1+ data.

L1 data can be either of primary or secondary origin. L1 data of secondary origin will follow the rules of L0 data as regards their (re-)distribution.

L1 data of primary origin and L2 data, generated within the Action network, will be published open-access, subject to conditions described in the current DMP (Section 2).

A2.2. Folder structure, contents, and naming conventions

Data shall be structured in a consistent and logical hierarchical order, starting from a general, root folder and moving to more specific folders nested inside. For all levels of data, the **root folder** shall be “**NERO_CA22164_Fire_Dataset**”. Within the root folder, the following **subfolders** shall be present:

- **L0_Raw_Data**
i.e., *NERO_CA22164_Fire_Dataset/L0_Raw_Data*
- **L1_Fire_Progression_Data**
i.e., *NERO_CA22164_Fire_Dataset/L1_Fire_Progression_Data*
- **L2_Fire_Behavior_Environmental_Data**
i.e., *NERO_CA22164_Fire_Dataset/L3_Fire_Behavior_Environmental_Data*

A2.2.1. L0 – Raw data

The **L0_Raw_Data** subfolder shall contain the **raw fire progression data** and the **raw environmental data**. Here, raw data refer to information used for reconstructing the spatial and

temporal progression of a particular wildfire event, while raw environmental data refer to fuel- and weather-related data for the same wildfire event.

Within the **LO_Raw_Data** subfolder, data shall be organized by wildfire event using the following folder structure:

- **YYYY**
 - **YYYYMMDD_COUNTRYCODE_REGION**
 - **Photos**
 - **Videos**
 - **Satellite_Data**
 - **Fuels**
 - **Other**
 - **Weather**
 - **Observations**
 - **Model**

Where **YYYY** is the **year** of the wildfire event (e.g., 2023), **YYYYMMDD** is the **start date** of the wildfire event (e.g., 20230816), **COUNTRICODE** is the **two-digit country code** following Eurostat conventions¹⁵ (e.g., ES for Spain), and **REGION** is the name of the **region/municipality/location** where the wildfire took place (e.g., Athens).

EXAMPLE

NERO_CA22164_Fire_Dataset/LO_Raw_Data/2018/20180723_EL_MATI/Photos/

NERO_CA22164_Fire_Dataset/LO_Raw_Data/2018/20180723_EL_MATI/Videos/

NERO_CA22164_Fire_Dataset/LO_Raw_Data/2018/20180723_EL_MATI/Satellite_Data/

NERO_CA22164_Fire_Dataset/LO_Raw_Data/2018/20180723_EL_MATI/Fuels/

NERO_CA22164_Fire_Dataset/LO_Raw_Data/2018/20180723_EL_MATI/Weather/Observations

NERO_CA22164_Fire_Dataset/LO_Raw_Data/2018/20180723_EL_MATI/Weather/Model

Photos/Videos subfolders: Information related to the fire progression and/or fire behavior observed during a wildfire event. They shall be named in an as much as possible informative way.

Satellite_Data subfolder: Satellite remote sensing data, including but not limited to hotspots.

¹⁵ https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Country_codes

Fuels subfolder: Should contain fuel model map (geotiff or shapefile), a categorical integer map with corresponding fuel model descriptions (e.g., FARSITE/FLAMMAP table).

Weather/Observations subfolder: Minimum parameters shall include 2m air temperature (°C), 2m relative humidity (%), 10m wind speed (km/h), wind direction (°), and accumulated precipitation (mm). File naming shall follow the scheme *StationName_YYYYMMDDThhmm[1]-YYYYMMDDThhmm[2].csv*, where [1] denotes the start and [2] the end of the station reporting period. Metadata for the data files shall include the name, location (latitude and longitude), and altitude of the weather station. Measurement heights should be explicitly noted.

Weather/Model subfolder: Gridded data retrieved from a numerical weather prediction (NWP) model. Minimum acceptable grid resolution is 5 km x 5 km. Minimum surface parameters shall include 2m air temperature (°C), 2m relative humidity (%), 10m U and V components (km/h), wind direction (°), and accumulated precipitation (mm). Minimum upper-air parameters shall include temperature (°C), relative humidity (%), U and V components (km/h), geopotential height (m) at standard pressure levels (e.g., 1000 mb, 925 mb). File naming shall follow the scheme *ModelName_YYYYMMDDThhmm[1]-YYYYMMDDThhmm[2]*, where *ModelName* is the name of the model, and [1] and [2] denote the start and end datetime of the model data. Acceptable formats for model data are netCDF and Grib-2.

A2.2.2. L1 – Fire progression data

Within the **L1_Fire_Progression_Data** subfolder, data shall be organized by wildfire event using the following folder structure:

- **YYYY**
 - **YYYYMMDD_COUNTRYCODE_REGION**

Where **YYYY** is the **year** of the wildfire event (e.g., 2023), **YYYYMMDD** is the **start date** of the wildfire event (e.g., 20230816), **COUNTRYCODE** is the **two-digit country code** following Eurostat conventions¹⁶ (e.g., ES for Spain), and **REGION** is the name of the **region/municipality/location** where the wildfire took place (e.g., Athens).

EXAMPLE

NERO_CA22164_Fire_Dataset/L1_Fire_Progression_Data/2018/20180723_PT_LISBOA/

Inside each **YYYYMMDD_COUNTRYCODE_REGION** subfolder, the fire progression data should be in shapefile format, containing polygons with the associated fields listed in Table A2-1.

¹⁶ https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Country_codes

Table A2-1. Attribute fields of the fire progressions (L1)¹⁷.

Field	Description	Possible values
type	Type of Spread Polygon	p - wildfire progression ; z - ignition or active flaming zone ; a - previously burned area; zs - spot fire
date_hour	Approximate date and hour of the polygon	yyyy-mm-dd hh:mm; uncertain ; na (not applicable)
source	Source of the data	fserv - forest service ; sat - satellite data ; airb - airborne data; fops - fire personnel; ek - expert knowledge; rep - external reports
zp_link	Numerical link between an ignition or active flaming zone ("z") polygon and a wildfire progression ("p") polygon	1,2,3... - the link between types "p" and "z" with known dates and hours; 0 - used for type "a" or when progression is "uncertain" or when the link between "p" and "z" is unknown
burn_period*	Burning period	1,2,3,..; 0 for the same cases as "zp_link".

*optional, by default burn_period = 1

A2.2.3. L2 – Fire behavior data linked with environmental drivers

Fire behavior data will be derived from the fire progression data (L1) and additional, auxiliary fields (e.g., fuels, weather variables). Within **L2_Fire_Behavior_Data** subfolder, a single shapefile will be stored, containing the polygons of all wildfires in L1 and their associated fire behavior data and environmental drivers. The name of the single shapefile shall follow the scheme *NERO_CA22164_Wildfires_YYYY[1]_YYYY[2].shp*, where [1] denotes the year of the oldest wildfire and [2] denotes the year of the latest wildfire.

EXAMPLE

NERO_CA22164_Fire_Dataset/L2_Fire_Behavior_Data/NERO_CA22164_Wildfires_2015-2023.shp

Table A2-2 provides an **indicative list** of the parameters that will be reported for each wildfire in the L2 data.

¹⁷ <https://essd.copernicus.org/articles/15/3791/2023/>

Table A2-2. Indicative fields of the L2 data¹⁸.

Field	Description	Possible values
fid	Fire ID	1,2, 3, 4...
fname	Fire Name	Municipality_StartDate (e.g. Gouveia_10082015)
year	Year	2015, 2016...
type	Type of Spread Polygon	p - wildfire progression ; z - ignition or active flaming zone ; a - previously burned area; zs - spot fire
sdate	Start date and hour of the polygon	yyyy-mm-dd hh:mm; uncertain ; na (not applicable)
edate	End date and hour of the polygon	yyyy-mm-dd hh:mm; uncertain ; na (not applicable)
source	Source of the data	fserv - forest service ; sat - satellite data ; airb - airborne data; fops - fire personnel; ek - expert knowledge; rep - external reports
zp_link	Numerical link between a ignition or active flaming zone ("z") polygon and a wildfire progression ("p") polygon	1,2,3... - the link between types "p" and "z" with known dates and hours; 0 - used for type "a" or when progression in "uncertain" or when the link between "p" and "z" is unknown
burn_period	Burning period	1,2,3,..; 0 for the same cases as "zp_link".
area	Burned area extent (ha)	> 0 for progression polygons, -1 for ignition or active flaming zones.
growth_rate	Fire growth rate (ha/h)	>0 for progression polygons with zp_link value >0; -1 for previously burned areas or uncertain progression polygons

¹⁸ <https://essd.copernicus.org/articles/15/3791/2023/>

ros_i	Average rate-of-spread (m/h) calculated since ignition\active flaming areas or a progression marking the start of the burning period	>0 for progression polygons with zp_link value >0; -1 for previously burned areas or uncertain progression polygons
ros_p	Parcial rate-of-spread (m/h) calculated between consecutive ignition\active flaming areas and progression polygon, or between two consecutive progression polygons	>0 for progression polygons with zp_link value >0; -1 for previously burned areas or uncertain progression polygons
spdir_i	Spread direction associated with "ros_i" (° from North)	0 to 359.99; -1 for the same cases in "ros_i"
spdir_p	Spread direction associated with "ros_p" (° from North)	0 to 359.99; -1 for the same cases in "ros_p"
duration_i	Duration (hours) associated with the "ros_i" metric	>0 known progression polygons; -1 for ignition\active flaming zones, previously burned áreas or uncertain progression polygons
duration_p	Duration (hours) associated with the "ros_p" metric	>0 known progression polygons; -1 for ignition\active flaming zones, previously burned áreas or uncertain progression polygons
FRE	Fire Radiative Energy (TJ)	>0 for known progressions with at least 70% of FRE observations between "sdate" and "edate"; - 1 for the remaining polygons
FRE_perc	Percentage of FRE observations between "sdate" and "edate"	Between 0 and 100 for known progression polygons; -1 for the remaining.
FLI	Fire line intensity (kW/m)	> 0 for known progressions
fuel_model	Dominant fuel model	...

fuel_load	Average fuel load (ton\ha)	...
dfmc_avg	Average dead fuel moisture content (%)	...
dfmc_min	Min dead fuel moisture content (%)	...
lfmc	Live fuel moisture content (%)	...
wspeed_avg	Average wind speed (km/h)	...
wspeed_max	Max wind speed (km/h)	...
rh_avg	Average Relative Humidity (%)	...
tmp_avg	Average 2m air temperature (°C)	...
pblh_avg	Average Planetary boundary layer height (m)	...
pblh_max	Maximum Planetary boundary layer height (m)	...

Annex 3. Informed Consent Form for Wildfire Data Collection

Project Title: COST Action CA22164 – European Network on Extreme fiRe behaviOr

Repository Manager: Dr. Akli Ait Benali

Organization: School of Agriculture, University of Lisbon, Portugal

Contact Information: aklibenali@gmail.com

Purpose of the Study: To study fire behavior, it is absolutely crucial to delimit the spread of the wildfire, i.e. where and when it burned. The NERO fire collection app will allow NERO members to collect basic data on the field that will be essential to reconstruct the spread of wildfire. You are invited to participate in a data collection aimed at gathering real-time information on ongoing wildfires. The data, including shapes and images of fires, will be used to support research on fire behavior and prevention.

Procedures: If you agree to participate, you will be asked to collect and share images and data related to forest fires. This may include: (1) Taking photographs or videos of active fires, (2) Recording the shape, size, and behavior of fires, and (3) Providing GPS coordinates and timestamps.

Voluntary Participation: Your participation in this project is entirely voluntary. You may withdraw at any time without any penalty or loss of benefits to which you are otherwise entitled.

Withdrawal procedure: You have the right to withdraw your consent and participation at any time. If you choose to withdraw, please contact Dr. Akli Ait Benali at aklibenali@gmail.com to request the removal of all of your data or portion of the data you no longer wish to share. This includes, but not limited to, situations where confidentiality is requested upon the fire event in case of closed investigation. To withdraw, please send an email to aklibenali@gmail.com stating your request to withdraw already uploaded data from the dataset indicating the specificities of the request.

Confidentiality: All data collected will be kept confidential. Personal identifiers will be removed from the data to protect your privacy. Your identity information will be stored in a separate file and be available only to Dr. Akli Ait Benali (Principal Investigator of this initiative) and Mr. Marcos André Goulao Campos (Collaborator of this initiative). The anonymized data will be stored securely on ESRI cloud and will be only accessible to authorized personnel involved in the project (Dr. Akli Ait Benali, Mr. Marcos André Goulao Campos).

Data Usage: The data collected will be used for research, educational, and operational purposes. It may be published in scientific journals, presented at conferences, and shared with fire

management agencies. Your identity will not be disclosed in any reports or publications without your permission. Upon your explicit permission, proper acknowledgment to your contribution in a scientific publication or any other published work will take place.

Risks and Benefits: There are minimal risks associated with participation, primarily related to the physical hazards of being near a forest fire. Ensure you maintain a safe distance and follow local safety guidelines. There are no direct benefits to you; however, your participation will contribute to important research and fire management efforts.

Liability: By participating, you agree to do so at your own risk. NERO network is not liable for any injuries, damages, or losses that may occur during the data collection process. You are encouraged to take all necessary precautions to ensure your safety.

Duration of Data Storage: The data will be stored securely for the duration of the NERO COST Action, CA22164, (2023 - 2027) and will be used only for the purposes outlined in this consent form.

Rights of Participants: You have the right to withdraw your consent and participation at any time. If you choose to withdraw, please contact Dr Akli Ait Benali at aklibenali@gmail.com to request the removal of your data. Additionally, you have the right to be informed about the results of this study. Results will be shared in an open access scientific publication and participants will be informed about the publication via email once the publication is available. .

Accuracy of Data: By participating, you agree to provide accurate and correct data to the best of your ability. Any deliberate misinformation may compromise the integrity of the research and its outcomes.

Contact Information: If you have any questions or concerns about this study or your participation, please contact:

Dr. Akli Ait Benali

aklibenali@gmail.com

+351 964 291 869

Consent: I have read the above information and understand the purpose, procedures, risks, and benefits of this study. I voluntarily agree to participate in the Wildfire Data Collection Initiative.

Name of Volunteer: _____

Signature: _____

Date: _____