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

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Executive Summary

This report on the standardisation of demonstration products is presented in two parts. The first part deals with the products themselves and the project standards for Conceptual, Data, Model and Knowledge integration. It provides an overview of the products' spatial coverage in relation to the Project Pilot sites and their place in the Conceptual Framework for Integration. The second part presents the Standard Reporting Template for use in the Pilot Site Demonstration events. The reporting from the Demonstration Events is also two-fold. Firstly, a questionnaire will be directly accessible to attendees at the demonstration, who will then be invited to complete a more detailed questionnaire following the event. The Standard Reporting Template contained within this document is the basis for those two questionnaires.

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List of Acronyms

Table 1: List of Acronyms

List of Acronyms	
CFFDRS	Canadian Forest Fire Danger Rating System
DA	Demonstration Area
DMP	Data Management Plan
DRMKC	Disaster Risk Management Knowledge Centre
EFFIS	European Forest Fire Information Service
ET	European Territory
GIS	Geographic Information System
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
ISO	International Organisation for Standardisation
KPI	Key Performance Indicator
LMS	Land Management Strategies
NA	Not Applicable
NetCDF	Network Common Data Form
PDF	Portable Document Format
PS	Pilot Site
RDH	Risk Data Hub
SHP	ShapeFile
sld	Styled Layer Descriptor
tif	Tagged Image File
WMS	Web Mapping Service
WP	Work Package
WUI	Wildland Urban Interface

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1 Introduction

This document is a result of the activity A5.1.3 Scaling from DA to PS and ET Demonstrations undertaken in Task 5.1 Selection of Products for PS Scalability Demos in Work Package 5 – Pilot Sites and Demonstration Areas. It builds upon earlier activities within Work Package 5, namely A5.1.1 End-User Requirements Definition for PS and A5.1.2 Selection of Fire Risk Assessment, Reduction and Adaptation Products for Demonstrations as well as the Product Portfolio developed in the early stages of the project. It feeds into and informs later activities, namely A5.2.2 Organising and implementing tests in Pilot Sites and A5.2.3 Validation and exploitation (protocols and results).

1.1 Purpose of the document

The purpose of this document is to ensure that product/tools/datasets developed in the FirEUrisk project and selected for demonstration at the Pilot Site and European Territory Level are fit for purpose, meet specific standards related to, concept, data, modelling and knowledge and to enable Pilot Site Leaders to understand the availability and traceability of the various products.

1.2 Structure of the Document

This document is comprised of two parts. The first part will report on the availability, coverage scales of products/tools/datasets produced in the FirEUrisk project to be tested at the Pilot Site and European Territory level. Not all products developed in the project at the demonstration site level will be tested in all Pilot Sites and/or European Territory Level. It will consider the project's conceptual scheme for integration and how each of the products/tools/datasets sits within the scheme. The scheme can be seen below in Figure 1. It will also provide the basic standards expected of those products in relation to *Conceptual*-, *Data*-, *Model*- and *Knowledge* Integration.

The second part of the document is the Standard Validation Reporting Template for Product Performance. This is intended for use during the product demonstrations in the Pilot Sites and European Territory demonstration event. The reporting template is for those end-users attending demonstration events to provide feedback on the product/tools/datasets, their relevance, usability, accuracy and usefulness. The feedback will then be used to improve those products/tools/datasets, this will be an iterative process beginning with the first pilot site demonstration to be held in June 2023. This reporting of products' performance is a two-stage process. Firstly, the demonstration event attendees will be invited to complete a short questionnaire during the event. Secondly, they will be then given the opportunity to complete another more detailed version on-line. The questions in the second part of this document are the basis of these two questionnaires.

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2 Standards Applied to Products/Tools/Datasets

In the first part of this section, the products are assessed in terms of their connection and role in the Integrated Conceptual Diagram and the data selected for Pilot Site demonstrations, including the European Territory demonstration. The second part details the data standards, the third model standards and finally the last part deals will knowledge integration standards.

2.1 Conceptual Integration

As mentioned above in Section 1.2 each product/tools/datasets selected for testing in the Pilot Sites will be assessed in respect of its relationship to the Conceptual Integration Diagram (Figure 1). In the following section the products selected for testing in the Pilot Sites and at European Territory are listed for each individual component of the Conceptual Integration Diagram. Only those components of the diagram which currently have products available are listed. Additional products which cover those missing components will be added in subsequent versions of this report.

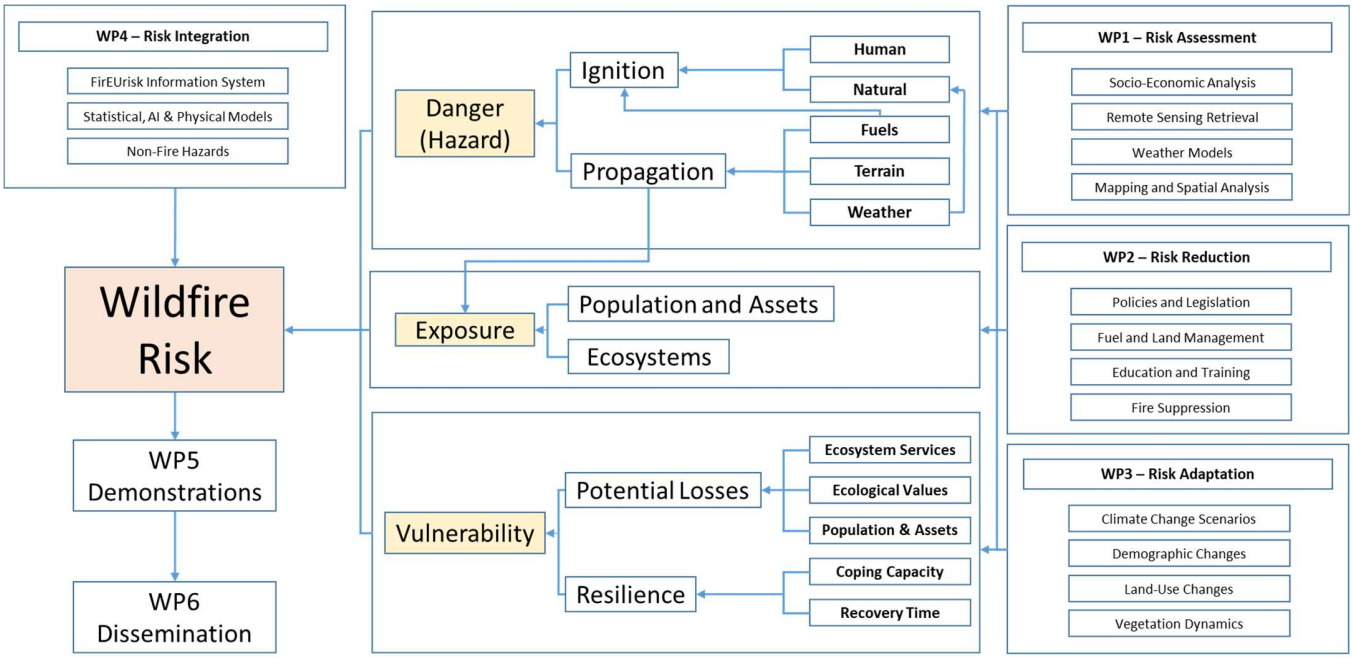


Figure 1: Conceptual Integration Diagram of Fire Risk Components within the FirEURisk Project

2.1.1 Danger > Ignition > Human

Product No.	Product Name	Product Developer	Scale/Resolution	Activity
1	Human Ignition Probability Map	UAH	1km^2	A1.1.3
63	Human Ignition Probability Map	UdL	100m	A1.1.3
65	Live Fuel Moisture Content Database	UdL	500m	A1.1.1

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2.1.2 Danger > Ignition > Natural

Product No.	Product Name	Product Developer	Scale/Resolution	Activity
66	Natural Ignition Probability	UdL	100 m	A1.1.2

2.1.3 Danger > Ignition > Fuels

Product No.	Product Name	Product Developer	Scale/Resolution	Activity
16	Daily Fire Danger Index (DFDI)	SIA	300 m / 10 m	A1.1.1
58	Fire Danger Metric	UdL	500 m	A1.1.1
64	Live Fuel Moisture Content	SIA	300 m / 10 m	A1.1.1

2.1.4 Danger > Propagation > Fuels

Product No.	Product Name	Product Developer	Scale/Resolution	Activity
4	Live Fuel Moisture Content Climate Archive	TUD	0.25°	A1.1.1
5	Fuel type and model map	UAH	1 km^2	A1.1.4
31	Propagation potential indicators for European Territory (ET)	FESB	1 km^2	A1.1.5
32	Propagation potential indicators for Pilot Sites (PS)	FESB	1 ha	A1.3.1
40	Fire danger index classification for Chernobyl Exclusion Zone	REEFMC	1 km^2	A1.1.1
55	Fuel Management Framework for Reducing Operation-based Ignitions (FuMaF_ROI)	AUTh	1-20 m	A2.1.2
60	Custom Fuel Characterisation	UdL	131 plots	A1.1.4
62	Fuel type, fuel model, canopy metrics and landscape file	FESB	100 m / 1 ha	A1.1.4
70	Wildfire spread and behaviour outputs, "basic mode"	UdL	100 m / 1 ha	A1.1.5
75	Continental land-use change scenarios and stylised fuel management scenarios	Stichting VU	9 km^2	A3.1.2
78	Fuel models (Behave) for European boreal forests	RISE	NA	A1.1.4
80	Effect of deciduous tree inclusion in coniferous forests	RISE	NA	A2.2.1

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2.1.5 Danger > Propagation > Weather

Product No.	Product Name	Product Developer	Scale/Resolution	Activity
3	GIS Geodatabase for meteorological variables and related danger indexes	METEOGRID	1 km^2	A1.1.1
9	Fire risk & strength predictions, (i) short-term, (ii) long-term	FMI	3° temporal prediction downscaled to 0.1°	A3.1.1
36	Future fire regime data base	PIK	27 km^2	A3.2.1
69	Fire danger model for North spring grasslands	RISE	2.4 km^2	A1.1.1
73	High resolution future climate information for Greece	NCSR	5 km	A3.2.1
74	160 years of fire danger in Sweden	RISE	9 examples	A3.2.1

2.1.6 Exposure > Population and Assets

Product No.	Product Name	Product Developer	Scale/Resolution	Activity
18	Wildland Urban Interface Map	HU	10 m	A1.2.2
20	Forest Fire Emission Forecast	UAVR	100 m	A2.3.2
24	Forecast of health impacts of wildfire smoke	UAVR	100 m	A2.3.2
25	Smoke dispersion forecast	UAVR	100 m	A2.3.2
29	Analysis of potential socio-economic barriers, constrains and enables of LMS uptake to reduce fire risk	JHI	NA	A2.2.2
59	Fire emission potential	UAVR	100 m	A1.1.5
76	Maps of exposure metrics	UAVR	100 m	A1.2.1
78	Smoke potential	UAVR	100 m	A1.1.5
79	Population assets	UdL	1:5,000 – 25,000	A1.2.1

2.1.7 Exposure > Propagation

Product No.	Product Name	Product Developer	Scale/Resolution	Activity
12	GIS database of fire risk reduction strategies	UAH	NA	A2.5.1
13	Maps of suitable areas for Land Management Strategy (LMS) use	Stichting VU	1 km^2	A2.2.4
21	FPP (Fire Propagation Probability)	SIA	30-250 m	A2.1.1
22	PBM (prescribed burning map)	SIA	30-250 m	A2.1.1
23	Fire behaviour predictive models	ADAI	>1 ha	A1.1.5
39	Suppression difficulty index evaluation	UCO	100 m	A1.1.5
45	LMS strategies for Adriatic area	FESB	NA	A2.2.4

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2.1.8 Vulnerability > Potential Losses > Ecosystem Services

Product No.	Product Name	Product Developer	Scale/Resolution	Activity
37	Effective adaptation to changed future fire regimes	PIK	27 km^2	A3.3.1
38	Potential Losses on Ecosystem Services affected by wildfires	UCO	1 km^2	A1.2.4

2.1.9 Vulnerability > Potential Losses > Ecological Values

Product No.	Product Name	Product Developer	Scale/Resolution	Activity
7	Fire effects on biodiversity database	CSIC	NA	A1.2.4
8	Future climate information	METEOGRID	12.5 km^2 for ET, down scalable to 1 km^2	A3.3.1
10	Evaluation of the ecological effects of LMS to reduce wildfire risk	CSIC	NA	A2.2.3

2.1.10 Vulnerability > Potential Losses > Population and Assets

Product No.	Product Name	Product Developer	Scale/Resolution	Activity
27	Guidelines to reduce communities' vulnerability to extreme fires and fires in WUI	METEOGRID	NA	A2.4.2
72	Factors for building survivability in Scandinavia	RISE	NA	A2.4.1
77	Socio-economic vulnerability	UAH	1 km^2	A1.2.4

2.1.11 Vulnerability > Resilience > Coping Capacity

Product No.	Product Name	Product Developer	Scale/Resolution	Activity
6	Plant trait database for European species (EuroTraits)	CSIC	NA NA	A1.2.3
11	Database of global change effects on vegetation resilience to disturbance	CSIC	NA	A3.2.3
19	Curricula for extreme fires and WUI	SAFE	NA	A2.2.3
47	Citizens/scientist network and Engagement Plan	ISIG	NA	A2.4.3
67	Persistence Index Map	UdL	NA	A1.2.3
68	RESVI - Relative Societal Vulnerability Index (at community level)	ISIG	NA	A1.2.2

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2.1.12 Coverage by Pilot Site and European Territory

The following table details the coverage of the products and their scales produced within the FirEURisk Project.

PS1 - Northern Europe Pilot Site – PS Leader RISE

PS2 - Central Europe Pilot Site – PS Leader TUD

PS3 - Central Portugal Pilot Site – PS Leader ADAI

PS4 – Barcelona Pilot Site – PS Leader UdL

PS5 – Attica Greece Pilot Site – PS Leader AUTh

ET – European Territory

No.	Product Name	PS1	PS2	PS3	PS4	PS5	ET
1	Human Ignition Probability Map	1 km^2	1 km^2	1 km^2	1 km^2	1 km^2	1 km^2
2	GIS Geodatabase for exposure, vulnerability and risk	-	-	-	-	-	-
3	GIS Geodatabase for meteorological variables and related danger indexes	-	-	-	-	-	-
4	Live-fuel moisture content climate archive	0.25°	0.25°	0.25°	0.25°	0.25°	0.25°
5	Fuel type and model map	1 km^2	1 km^2	1 km^2	1 km^2	1 km^2	1 km^2
6	Plant trait database for European species (EuroTraits)	✓	✓	✓	✓	✓	✓
7	Fire effects on biodiversity database	✓	✓	✓	✓	✓	✓
8	Future Climate Information	1 km^2	1 km^2	1 km^2	1 km^2	1 km^2	12.5 km^2
9	Fire risk & strength predictions, (i) short-term, (ii) long-term	0.1°	0.1°	0.1°	0.1°	0.1°	3°
10	Evaluation of the ecological effects of LMS to reduce wildfire risk	✓	✓	✓	✓	✓	✓
11	Database of global change effects on vegetation resilience to disturbance	✓	✓	✓	✓	✓	✓
12	GIS database of fire risk reduction strategies	✓	✓	✓	✓	✓	✓
13	Maps of suitable areas for Land Management Strategy (LMS) use	1 km^2	1 km^2	1 km^2	1 km^2	1 km^2	1 km^2
14	Multidimensional GIS viewer	-	-	-	-	-	-

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No.	Product Name	PS1	PS2	PS3	PS4	PS5	ET
15	Downscaling tool	NA	NA	NA	NA	NA	NA
16	Daily Fire Danger Index (DFDI)	300 m / 10 m	300 m / 10 m	300 m / 10 m	300 m / 10 m	300 m / 10 m	-
17	Smoke Impact from Prescribed Fires	✓	✓	✓	✓	✓	✓
18	Wildland - Urban Interface map	10 m	10 m	10 m	10 m	10 m	-
19	Curricula for extreme fires and WUI	✓	✓	✓	✓	✓	✓
20	Forest fire emission forecast	-	-	100 m	-	100 m	-
21	FPP (Fire Propagation Probability)	-	-	30-250 m	30-250 m	30-250 m	-
22	PBM (Prescribed Burning Map)	-	-	30-250 m	30-250 m	30-250 m	-
23	Fire behaviour predictive models	-	-	>1 ha	>1 ha	-	-
24	Forecast of health-impacts of wildfire-smoke	-	-	100 m	100 m	100 m	-
25	Smoke dispersion forecast	-	-	100 m	-	-	-
26	Catalogue of WUI mesoscale types	✓	✓	✓	✓	✓	✓
27	Guidelines to reduce communities' vulnerability to extreme fires and fires in WUI	✓	✓	✓	✓	✓	✓
28	Fuel type and model map	-	✓	-	-	-	-
29	Analysis of potential socio-economic barriers, constrains and enables of LMS uptake to reduce fire risk	✓	✓	✓	✓	✓	✓
31	Propagation potential indicators for European Territory (ET)	1 km^2	1 km^2	1 km^2	1 km^2	1 km^2	1 km^2
32	Propagation potential indicators for Pilot Sites (PS)	1 ha	1 ha	1 ha	1 ha	1 ha	-
33	Geospatial integrated eruptive fire risk map and merging fires risk map	-	-	-	-	-	-
34	Forest condition: biotic damages	-	10 m	-	-	-	✓

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No.	Product Name	PS1	PS2	PS3	PS4	PS5	ET
35	Awareness tool/Visual analysis tool	-	-	-	-	-	-
36	Future fire regime data base	27 km^2	27 km^2	27 km^2	27 km^2	27 km^2	27 km^2
37	Effective adaptation to changed future fire regimes	27 km^2	27 km^2	27 km^2	27 km^2	27 km^2	27 km^2
38	Potential Losses on Ecosystem Services affected by wildfires	1 km^2	1 km^2	1 km^2	1 km^2	1 km^2	-
39	Suppression Difficulty Index Evaluation	100 m	100 m	100 m	100 m	100 m	-
40	Fire danger index classification for Chernobyl Exclusion Zone	-	-	-	-	-	-
41	Program of prescribed burnings	-	-	-	-	-	-
42	Fuel Sampling Protocol	✓	✓	✓	✓	✓	✓
43	Guidelines for on-site surveys and subsequent data processing	✓	✓	✓	✓	✓	✓
44	Tool for displaying outputs from the internal platform and external platforms customised for the FirEURisk needs	✓	✓	✓	✓	✓	✓
45	LMS strategies for Adriatic area	-	-	-	-	-	-
46	Guidelines for citizens involvement in wildfire risk reduction	-	-	-	-	-	-
47	Citizens/scientist network and Engagement Plan	✓	✓	✓	✓	✓	✓
49	Laws, regulations, plans and programmes on fire prevention, preparedness and resilience	-	-	✓	-	-	-
52	Conceptual Framework for integrating risk assessment, reduction and adaptation	✓	✓	✓	✓	✓	✓
53	Internal Cooperative Platform	-	-	-	-	-	-
54	Open Platform of models, data and knowledge	✓	✓	✓	✓	✓	✓

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No.	Product Name	PS1	PS2	PS3	PS4	PS5	ET
55	Fuel Management Framework for Reducing Operation-based Ignitions (FuMaF_ROI)	-	-	-	-	✓	-
57	Roadmap for developing an integrated fire risk management strategy	✓	✓	✓	✓	✓	✓
58	Fire danger metric	500 m	500 m	500 m	500 m	500 m	500 m
59	Fire emission potential	-	-	20 m	100 m	-	1 km
60	Custom fuel characterisation	-	-	-	131 plots	-	-
61	Canopy metrics and landscape file	25/100m	-	-	-	-	-
62	Fuel type, fuel model, canopy metrics and landscape file	-	100 m	100 m	10 0m	20 m	100 m
63	Human ignition probability	100 m	100 m	100 m	100 m	100 m	-
64	Live Fuel Moisture Content	300 m	300 m	300 m	300 m	300 m	-
65	Live Fuel Moisture Content database	500 m	500 m	500 m	500 m	500 m	-
66	Natural ignition probability	100 m	X	100 m	100 m	-	-
67	Persistence Index Map	-	-	-	✓	-	-
68	RESVI - Relative Societal Vulnerability Index (at community level)	-	-	-	✓	-	-
69	Spring grass fire model for the north	2.4 km	-	-	-	-	-
70	Wildfire spread and behaviour outputs, "basic mode"	-	100 m	100 m	100 m	100 m	1 km^2
71	Eruptive fire handbook	-	-	-	-	-	-
72	Factors for building survivability in Scandinavia	✓	-	-	-	-	-
73	High resolution future climate information for Greece	-	-	-	-	5km	-
74	160 years of fire danger in Sweden	Points	-	-	-	-	-
75	Continental land-use change scenarios and stylised fuel management scenarios	9 km^2	9 km^2	9 km^2	9 km^2	9 km^2	9 km^2
76	Maps of fire exposure metrics	-	-	20 m	100 m	-	1 km^2
77	Socio-economic vulnerability	1 km^2	1 km^2	1 km^2	1 km^2	1 km^2	1 km^2
78	Smoke Potential	-	-	20 m	100 m	-	1 km

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No.	Product Name	PS1	PS2	PS3	PS4	PS5	ET
79	Population Assets	-	-	-	1 km^2	-	-
80	Effect of deciduous tree inclusion in coniferous forests	✓	-	-	-	-	-

2.2 Data Integration

The FirEURisk project has a Data Management Plan (DMP) Deliverable 4.2, produced by Project Partner 27 Aristotle University of Thessaloniki (AUTh) and was submitted and approved in August 2021. The document outlines the necessary steps required to ensure that data generated, shared and employed during the project meets specific standards to ensure interoperability. The document is a 'living' document, in that it will be, and has been updated, throughout the project. Within the project, data is shared between partners via the Internal Cooperative Platform Deliverable D4.3 developed and hosted by Project Partner 28 SATWAYS that was delivered in March 2022. This internal platform will be the basis of the Open Platform of Models, Data and Knowledge, which will be delivered in the autumn of 2024. As the platform will open and accessible by users outside of the project partnership rigorous data standards are necessary to be employed in the project from the beginning and FirEURisk's Data Management Plan outlines these standards and how data should meet the FAIR (Findability, accessibility, interoperability and reusability) standards. This includes aspects of file-naming, licencing, access rights and so on. In addition to this, some data/mapping will be integrated into other external legacy systems such as EFFIS and/or DRMKC.

2.2.1 Coordinate Systems

Within the FirEURisk project datasets, where applicable, should conform to specific requirement related to coordinate systems. The preferred coordinate systems for datasets are as follows;

a) For ET datasets, the ETRS89 Lambert azimuthal equal-area (ETRS89-LAEA; EPSG: 3035) projection must be used. As an exception, large datasets already produced operationally in WGS84 geographic coordinate system (EPSG: 4326)—namely, the meteorological variables and any direct derivatives of those—do not need to be converted to ETRS89-LAEA. The rationale for the latter choice is that: i) it would be extremely inefficient and costly to do so; and ii) all contemporary software implementations of geographic coordinate transformations employ a ballpark transformation (i.e., no transformation) between WGS84 and the INSPIRE-proposed ETRS89-GRS80 (EPSG:4258) geographic coordinate system.
b) For PS and DA datasets, the following options are permitted:
    a. ETRS89 Lambert azimuthal equal-area (ETRS89-LAEA; EPSG: 3035) projection, which is the preferred option for PS products.
    b. ETRS89 Transverse Mercator projections of the proper for the area zone. Dataset creators can use either the TM definitions, i.e., ETRS89-TM26N (EPSG: 3038) – ETRS89-TM39N (EPSG: 3051), or the UTM ones, i.e., ETRS89-UTM28N (EPSG: 25828) – ETRS89-UTM37N (EPSG: 25837). The latter are not included on INSPIRE officially yet, but it is planned to be included (and practically replace the former).

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c. WGS84 (EPSG:4326) for large datasets already produced operationally in this geographic reference system, similarly to the exception permitted for ET-level datasets.

2.2.2 Cooperative Platform Requirements – General Information

In line with the Data Management Plan, producers should provide, as a minimum, the following information when uploading a dataset to the Internal Cooperative Platform;

a) **Product name** – As shown in the Product Portfolio
b) **Short description** – Brief outline of what the data contains e.g. Wildfire Exposure to smoke
c) **Type/format of the dataset/product** – e.g. NetCDF, tif, SHP, PDF, etc.
d) **Origin and accessibility of the input data used** – What data was used and what, if any, are the licencing restrictions? (See Data Management Plan for more information about licencing).
e) **Intended use of the dataset** - e.g. this dataset can be used to predict the health impact on communities resulting from a wildfire.
f) **Quality assurance process** – How has this been conducted? e.g. Peer review, internal institutional quality control processes and so on.

2.2.3 File naming Convention

Datasets should also have a filename that follows the protocol set out in the Data Management Plan. For the purpose of this report the above standards will be assessed for each dataset that has been identified for testing in the Pilot Site demonstrations which begin in June 2023. The file-naming protocol was updated following the fifth Plenary Meeting in Lleida, Spain. Provisionally, each file should be named as follows:

FirEURisk_<*Variable*>_<*Alg*>_<*Region*>_<*Epoch*>_<*Ver*>.<*ext*>

where:

a) <*Variable*>: a compact form of the variable name (e.g., “LFMC”, “DFMC”, “FuelType”).
b) <*Alg*>: an algorithm-specific identifier (e.g., “S2-20m”, “FireLineIntensity”, “SY-2-SYN”).
c) <*Region*>: the region code, which is “ET” for European territory datasets, in the form PS-NN-XX for PS-level datasets (e.g., “PS-01-SE”) and in the forma DA-NN-CC for DA-level datasets (e.g., “DA-01-IT”).
d) <*Epoch*>: the time period the dataset is defined at (e.g., “2022”, “20220324”, “20220324-20220331”).
e) <*Ver*>: a version tag (e.g., “v1” or “v2”).
f) <*ext*>: the datatype extension.

No underscore or whitespace characters are permitted for the above filename parts, i.e., only alphanumeric characters and the hyphen “-” and period “.” characters are permitted.

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2.2.4 Cooperative Platform Requirements – Metadata

In the FirEUrisk project Metadata standards should follow INSPIRE and adhere to ISO 19115 & 19139. Below are the main categories requirements, further details and examples can be found in the Data Management Plan in the template is available in Annex C of the data management plan, pages 30-33.

a) Identification
b) Classification of Data and Services
c) Keyword
d) Geographic Location
e) Temporal Reference
f) Quality and Validity
g) Conformity
h) Constraints Related to Access and Use
i) Responsible Organisation
j) Metadata on Metadata

2.2.5 Cooperative Platform Requirements – Data Viewer

A key element of the FirEUrisk is the ability to display and interrogate data within a viewing platform, hosted on the Internal Cooperative Platform and the Open Platform. A viewer has been developed by Project Partner 18 ARBONAUT and at the time of writing this viewer is still in a draft format and undergoing further testing and development. In order for the viewer to seamlessly display data the following requirements should be met.

a) If the data does ***not*** have a WMS connection
    a. Data must be in GeoTIFF format for rasters
    b. A styling file must be included. This should preferably be in .sld format, but ESRI ArcMap styling files can also be used
b) If there is already a WMS connection for the data, this could be in FirEUrisk Cooperative Platform or another source.
    a. The data should be styled
    b. The styling requires a legend
c) For WMS-T layers, i.e. those with a time dimension
    a. Data must be based on the ISO-8601 standard and support interval requests made by the user.

2.3 Model Integration

By their very nature and specifically that of the programmer, models are structured differently as programmers have their own way of designing a model and writing script. However, there is still a need for traceability with regards the authorship, versioning and type of model etc. As a minimum the “Block Script” or information at the beginning of a script should contain, as a minimum the following information;

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a) Author – Who wrote the script? This could include an email address
b) Version of the Model – e.g. Version 1.0, Version 1.1 etc.
c) The language in which the model is implemented - e.g. Python, R (including version)
d) Dependencies - e.g. Operating system, packages etc.
e) Structure and type of model – e.g. Physical model, machine-learning, deep learning
f) Pre-processing requirements for the input data – e.g. Normalisation, parameterisation
g) Input Data – e.g. Type, value range, units and parameters
h) Output Date – e.g. Type, value range and units
i) Licencing Condition – e.g., What are the restrictions, if any, on sharing/reproduction etc.?

The above are considered the minimum standards within the project and should accompany ay scripts/models that are shared internally on the Cooperative Platform and/or during the later stages of the project on the Open Platform.

As an optional addition to the above standards, and if applicable, it is desirable although not mandatory to provide some information regarding the changes since the last version. An example could be that certain value ranges have changed or additional input data can now be added.

2.4 Knowledge Integration

Each product developed should demonstrate how it has been based on previous research and/or how it was developed jointly with other consortium members or indeed with external knowledge such as the FirEUrisk Observatory. This information should be contained either in the Deliverable Document, if it was in fact a deliverable, or within a paper detailing the research undertaken to produce the product. All data sources used in the development of the product must be identified and properly referenced. Each product should also have its own accompanying product card uploaded to the Project SharePoint page.

3 Standard Validation Reporting Template

3.1 Purpose

The purpose of this section, and subsequent on-line and digital versions of it, is to enable consistent and comparable reporting on the performance of products that will be tested within one or more of the five FirEUrisk's Pilot Sites and at the European Territory scale. Those products are in fact a mixture of tools e.g. models, datasets e.g. fuel maps, and documents e.g. Guidelines to reduce communities' vulnerability to extreme fires in the WUI. For the remainder of this document these outputs from the project will be referred to as products for ease of reading.

As mentioned above the products will be demonstrated to stakeholders within the project's pilot sites. The project is approaching the issue of wildfire risk from an integrated and holistic perspective meaning that the wishes, needs and expectations of a range of stakeholders need to be taken into account. Those stakeholders were identified as belonging to the following eight target groups; Landowners/managers, risk prevention, industry, scientific community, civil

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society organisations, first responders and the wider public. A full break down of the responses to the user-needs survey and the themes identified as relevant to each pilot site can be found in the Deliverable D5.1 User Requirements Data Base and Report produced by project partner GMV. Furthermore, the selection of products to be tested in the pilot sites was carried out in the Activity A5.1.2 Selection of Fire Risk Assessment, Reduction and Adaptation products for demos, led by project partner REEFMC. In addition to that this, products have been selected based on the prior and extensive knowledge of the consortium members, who have an in-depth understanding of wildfire issues within their regions and an established communication with the relevant stakeholders.

The information gleamed from the validation exercises during the pilot testing events is an important element of being able to report on how the project has met its objectives. This will be accomplished through the reporting of Key Performance Indicators (KPIs) that were achieved over the course of the pilot site demonstrations. A full list of the objectives and KPIs can be found in the Annex.

3.2 Considerations

In developing this Standard Validation Reporting Template it was necessary to consider a number of different factors. They are, the target audience, the products themselves and the types and level of information the project needs to extract from the reporting. This information is vital in order to improve the products and/or adjust them to specific needs/issues identified during testing. It is neither efficient nor sensible to have a different reporting template for each target group and each type of product. However, nor can the scope of template be so narrow that essential information needed to improve products is lost or rather not recorded in the first place. In addition to this, multiple products will be tested at the demonstration events, this has a bearing on the amount of effort placed on stakeholders to report on the products demonstrated. Whilst it is unlikely that *all stakeholders* will feel the need to comment on *all of the products* at a demonstration due to the different interests of the target groups, we still need maintain the interest of the stakeholders in reporting and thus the template should not require a large investment of time by those providing feedback.

The reporting itself should also ***not*** be seen as 'box-ticking' exercise and should enable the collection of useful information to guide product improvements. It is important that stakeholders do not perceive it in that way too and should feel that their opinions are valued and able to be recorded within the template. To this end, the template allows the audience the freedom to express their opinions in more detail, as well as product performance.

The pilot site demonstrations are staggered in terms of when they will be held, with each demonstration held three months after the previous one starting in Month 27 in Pilot Site 4 – Barcelona, Month 30 - Pilot Site 3 Central Portugal, Month 33 – Central Europe Brandenburg, Saxony (Germany), Northern Bohemia (Czech Republic) and Silesia (Poland) Month 36 – Kalmar County Sweden and Month 39 – Attica Greece. The exception being the demonstration at the European Territory level, which is held in Month 47 coinciding with closing stages of the project. This staggered timing of the demonstrations will allow for an iterative development and improvement of the products based on the responses of the stakeholders, further reinforcing the need for a standard and comparable approach to validating the products.

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Finally, the template should not be seen as just a measure of the products' usability, usefulness and comprehensiveness. It should also measure and enable the assessment of how we as product developers and the project as a whole present the products to what is a variety of different stakeholders with equally varied expectations and prior knowledge. It would be folly and somewhat arrogant to assume that because we developed those products during months of research and understand them inside and out that the stakeholders will do the same within the comparatively short time allocated for demonstrations. If we fail to communicate succinctly and clearly the use, innovative nature and necessity of the product for stakeholders we will have failed at the last hurdle to deliver the products and achieve the goals of the project. To reduce the likelihood of this happening, the template allows for the audience to provide feedback on the way in which a product was demonstrated. With this feedback, those demonstrating the products are able to reflect on and improve the way the project and the products are communicated to the audience in subsequent demonstration events.

3.3 Structure of the Standard Validation Reporting Template

In order to address the issues, requirements and responsibilities outlined in the previous section the template is presented in four sections as follows;

1) Demonstration Details
2) Attendee Information
3) Assessment of the Demonstration
4) Assessment of the Product(s) – Usability, Usefulness, Relevance to the Pilot Site

3.3.1 Demonstration Details

This section, which is automatically filled in prior to the demonstration event, is necessary for the traceability of the reports and organisation of the analysis of response following a demonstration. The information will be used to create a unique identification number for each response (Pilot Site Number – Date – Number) e.g. PS1-12032023-001, PS1-12032023-002 and so on. This section contains the following information;

1) Pilot Site Name and Number e.g. Barcelona PS4
2) Date of Demonstration Event e.g. 07.06.23
3) Location of Event e.g. Barcelona
4) Language of Questionnaire (ES, EN)

3.3.2 Attendee Information

One of the key aspects of the reporting is to understand and if necessary improve the usefulness and usability of the products for the various target groups. For example, one target group or particular sector may require a product to have more detailed resolution and updated on a daily basis, whereas others can still make informed decisions based on coarser data, less-frequently updated information. With this in mind it is necessary to identify the particular target group and where possible patterns and similarities between their responses in order to improve the usefulness and usability of a specific product for a specific target group.

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The respondents will have the opportunity to specify to which target group they belong based on the categories identified in Deliverable D5.1 User Requirements. This allows a direct comparison and potential validation of the choice of products to be demonstrated within a particular pilot site and following the first pilot site demonstration the opportunity to reassess those choices if necessary. The opportunity to provide details of their specific occupation or role will also be given, though this will optional.

Demonstration events will be hybrid events, with a physical meeting supplemented with access on-line for stakeholders who are not able to attend in person. By knowing whether a person attended on-line or in person and their perception of the event, information given their and interaction with the demonstrators will provide the project with valuable feedback about how to improve the later demonstrations so that both in-person and on-line attendees have the same experience.

This section of the template requests the following information;

1) Name

(optional)

2) Gender

(optional)

3) Did you attend as private citizen or representing an institution?

◯ Private ◯ Representative

4) To which target group do you consider yourself belonging to?

- ◯ Landowner/manager
- ◯ Risk prevention
- ◯ Industry
- ◯ Scientific community
- ◯ Civil society organisations
- ◯ First responders
- ◯ Wider public
- ◯ Other

(if you chose Other please describe, optional)

5) Occupation/Role

(optional)

6) Did you attend on-line or in-person?

◯ On-Line ◯ In-Person

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7) How often does wildfire risk assessment feature in your employment role?
◯ Daily ◯ Weekly ◯ Monthly ◯ Seasonally ◯ Annually ◯ Very Rarely

3.3.3 Assessment of the Demonstration

Apart from the obvious and necessary validation of the products in order to assess the project's KPIs and potential for improvement, feedback about the demonstration events themselves is critical. In addition to this, these demonstration events occur whilst the project is still running, meaning that conveying the concept of the project during these events should also be considered. The following questions in the reporting template enable this analysis.

To what extent do you agree with the following statements?

1) The FirEUrisk project and its reasoning, objectives and goals were well presented at the start of the demonstration.
◯ Strongly Agree ◯ Agree ◯ Neither Agree nor Disagree ◯ Disagree ◯ Strongly Disagree

2) The products were described in sufficient detail for my needs
◯ Strongly Agree ◯ Agree ◯ Neither Agree nor Disagree ◯ Disagree ◯ Strongly Disagree

3) Enough time was given to understand the use of the product(s)
◯ Strongly Agree ◯ Agree ◯ Neither Agree nor Disagree ◯ Disagree ◯ Strongly Disagree

4) Enough time was given for questions about the product(s)
◯ Strongly Agree ◯ Agree ◯ Neither Agree nor Disagree ◯ Disagree ◯ Strongly Disagree

5) I felt that could ask questions if I wanted to
◯ Strongly Agree ◯ Agree ◯ Neither Agree nor Disagree ◯ Disagree ◯ Strongly Disagree

6) All questions that were asked were answered satisfactorily
◯ Strongly Agree ◯ Agree ◯ Neither Agree nor Disagree ◯ Disagree ◯ Strongly Disagree

7) The sound and video quality were sufficient
◯ Strongly Agree ◯ Agree ◯ Neither Agree nor Disagree ◯ Disagree ◯ Strongly Disagree

8) The on-line experience was sufficient to validate the product
◯ Strongly Agree ◯ Agree ◯ Neither Agree nor Disagree ◯ Disagree ◯ Strongly Disagree

9) If you disagreed or strongly disagreed with any of the above statements, please use the box below to let us know why (optional)

Comments

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3.3.4 Assessment of the Product

This section is designed to ascertain the usefulness, usability and relevance of the product(s) for the stakeholder within the specific pilot site. It will ask questions about scales, both temporal and spatial and how useful the product(s) for the respondents amongst other relevant questions related the potential use of the product.
(note: for each pilot site the products may differ, those products selected will automatically be added to the drop-down menu).

1) Please select the name of the product from the drop-down list Please Select a Product Click on the Arrow

2) Following the demonstration I am familiar enough with the product and the subject matter to provide feedback on the product's performance
◯ Strongly Agree ◯ Agree ◯ Neither Agree nor Disagree ◯ Disagree ◯ Strongly Disagree

3.3.5 Usability

3) The product was described in a way that I found easy to understand
◯ Strongly Agree ◯ Agree ◯ Neither Agree nor Disagree ◯ Disagree ◯ Strongly Disagree

4) If the product was displayed in an interactive/multi-layered viewer, which choice below best describes it?
◯ Clear and easy to Use ◯ OK, with some time to learn ◯ A little clumsy ◯ Difficult to use

5) If the product was a document/manual how would you describe it?
◯ Concise and clear ◯ Too complicated ◯ Too simplistic

6) If you answered negatively for any the above statements and would like to explain why please use the box below (optional)

Comments

3.3.6 Usefulness and Relevance for the Pilot Site

7) I could imagine using this product in my capacity as a professional
◯ Strongly Agree ◯ Agree ◯ Neither Agree nor Disagree ◯ Disagree ◯ Strongly Disagree

8) Based on your local knowledge of the pilot site the product used accurate and up-to-date data
◯ Strongly Agree ◯ Agree ◯ Neither Agree nor Disagree ◯ Disagree ◯ Strongly Disagree

9) The product is improvement on what is already available in the pilot site
◯ Strongly Agree ◯ Agree ◯ Neither Agree nor Disagree ◯ Disagree ◯ Strongly Disagree

10) The spatial scales of the product were appropriate for the needs of the pilot site

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◯ Strongly Agree ◯ Agree ◯ Neither Agree nor Disagree ◯ Disagree ◯ Strongly Disagree

11) The update frequency of the product was appropriate for the pilot site
◯ Strongly Agree ◯ Agree ◯ Neither Agree nor Disagree ◯ Disagree ◯ Strongly Disagree

12) Overall, the product was innovative and a step forward for assessing and planning for wildfire risk
◯ Strongly Agree ◯ Agree ◯ Neither Agree nor Disagree ◯ Disagree ◯ Strongly Disagree

13) If you disagree or strongly disagree about any of the above statements, please use the box below to let us know why (optional)

Comments

14) If you have any further comments about how a product could be improved such as additional data or perhaps how your institution could help improve the product please let us know in the box below

Comments

15) If you would like to be contacted about your comments please provide your email address. Your email address will only be used to approach about those comments, will not be shared with any other third parties and will be deleted from the project's records upon conclusion of the project in April 2025.

Email address (optional)

16) Would you like to be invited to further events held by the FirEUrisk Project?
◯ Yes ◯ No

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4 Project Objectives and Key Performance Indicators

	KPI Description	KPI Metrics for Output and Impact	
		Minimum	Optimum
O1	European wildfire risk platform to operationalise this framework and to support joint professional training and common operational exercises involving multiple stakeholders, addressing the full range of wildfire management tasks.	European wildfire risk platform operational and tested at the 5 Pilot Sites (PS)	European wildfire risk platform operational, tested at the 5 PS, and applied in other locations in a fire season
O2	Geodatabases and spatially-explicit products for evaluation of values at stake in FirEUrisk data portal, supported by online handbook and App for highly valued resources and assets (HVRAs) in FirEUrisk platform-Wiki	Socio-economic assessment integrated in data portal and platform/ Socio-economic IPBES assessments tested at ET scale and 3 pilot sites/ ICA System tested at ET scale and at 3 PS	Socio-economic assessment integrated in data portal and platform/ Socio-economic IPBES assessments tested at ET scale and 5 pilot sites/ICA System tested at ET scale and at 5 PS
O3	Geodatabases, spatially-explicit products in FirEUrisk data portal, and safety protocols in FirEUrisk platform-Wiki	WUI assessments integrated in data portal and Wiki and tested at 3 PS	WUI assessments integrated in data portal and Wiki and tested at 5 PS and ET scale
O4	Wiki platform and citizen-science based App to engage leaders of local communities in fire risk assessment and reduction strategies	Platform and App tested in 3 PS	Platform and App tested in 5 PS
O5	Geodatabase of Land Management Strategies (LMS) to reduce the risk (prescribed burnings, silvo-pastoralism, brush-clearing, bio-economy)	Map of LMS applicability through 2 PS	Map of LMS applicability through 5 PS and transfer at ET level
O6	Report with potential actions to reduce both citizen-driven and operations-based ignitions	Tested actions integrated in 2 PS	Tested actions integrated in 5 PS
O7	Guidelines including socio-economics and environmental concerns to apply different LMS and to reduce communities' vulnerability in the WUI	Guidelines adapted to 3 PS	Guidelines adapted to 5 PS
O8	Reports on causes and impacts of extreme fires in different EU and external countries	5 reports	10 reports
O9	Handbook with guidelines to face extreme fires, and fires in WUI areas	Handbook adapted and translated for responders in 2 PS	Handbook adapted and translated for responders in 5 PS
O10	Fire regime simulations based on climate, demography, and land-use models	Coarse-scale simulations complete for Europe and at higher resolution for the 5 PS	Coarse-scale simulations complete for Europe and at higher resolution for the 5 PS
O11	Scenarios of fire risk conditions in new areas of expected fire expansion	2 Scenarios: Northern and Central Europe (2 PS)	5 scenarios: in all pilot sites (5 PS)

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O12	Spatial geodatabases compatible with existing EU fire related services	Databases linked to EFFIS and Disaster Risk Management Knowledge Centre (DRMKC)	Integration with other legacy systems and national fire risk systems
O13	Design and implement the platform connected to Risk Data Hub (RDH)	Conceptual design and demonstration prototype	Implementation at RDH
O14	Science-based Fire knowledge platform involving scientists, decision-makers, agencies, citizens definition	Platform proposed at EU level	Platform implemented at EU level
O15	Assessment report on cascading effects and development and dissemination of models to integrate fire risk and other natural hazards	Cascading effects and other risks are accounted within the integrated strategy for fire risk management	General framework model to integrate fire risks with other hazards,
O16	Critical thinking documents on implications of different EU policies in integrated fire management	Position paper with summary for policymakers + focus groups with policymakers	Implementation of recommendations made in position paper in policy guidelines
O17	Database with new players in existing fire expert communities and networks: architects, forest owners, timber or paper industry, insurance companies, tourist resources...	Multi-partner networks created in the 5 PS	Multi-partner networks created in the 5 pilot sites plus a Multi-partner network empowered at EU level
O18	Formal and informal education material (booklets, media, social networks, storytelling, gaming, advanced data visualisation).	3 resources	5 resources
O19	Groups of scientists from key countries as partners or as active collaborators sharing and discussing international standards	International standards for large fires published and disseminated at European and national level	Proposal of international standards to be properly adopted worldwide

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