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D1.2 1st Updated version of the Data Management

EFFECTIVE

PROTECTION AND RESTORATION MANAGEMENT · MEDITERRANEAN MPAS

Enhancing social well being and economic prosperity by reinforcing the eFFECTIVEness of protection and restoration management in Mediterranean MPAs

ABBREVIATIONS

Acronym	Meaning
CSV	Comma-Separated values
CTN	Centro Tecnológico Naval y del Mar
DMP	Data Management Plan
DOI	Digital Object Identifier
DPO	Data Protection Officer
EOSC	European Open Science Cloud
FAIR Data	Findable, Accessible, Interoperable, Reusable Data
GDPR	General Data Protection Regulation
MPA	Marine Protected Area
ORDP	Open Research Data Pilot
WP	Work Packages

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1. SCOPE

This document provides the 1st updated version of the Data Management Plan (DMP) for the EFFECTIVE project according to the Open Research Data Pilot (ORDP) under Horizon 2020. The purpose of this DMP is to support the data management life cycle of all data that will be collected, processed, or generated by the project.

As a project participating in the ORDP in Horizon 2020, this document structure's and contents' are based on the Guidelines on FAIR Data Management in Horizon 2020 (Version 3.0, 26 July 2016) and Guidelines on Implementation of Open Access to Scientific Publications and Research Data in projects supported by the European Research Council under Horizon 2020 (Version 1.1, 21 April 2017).

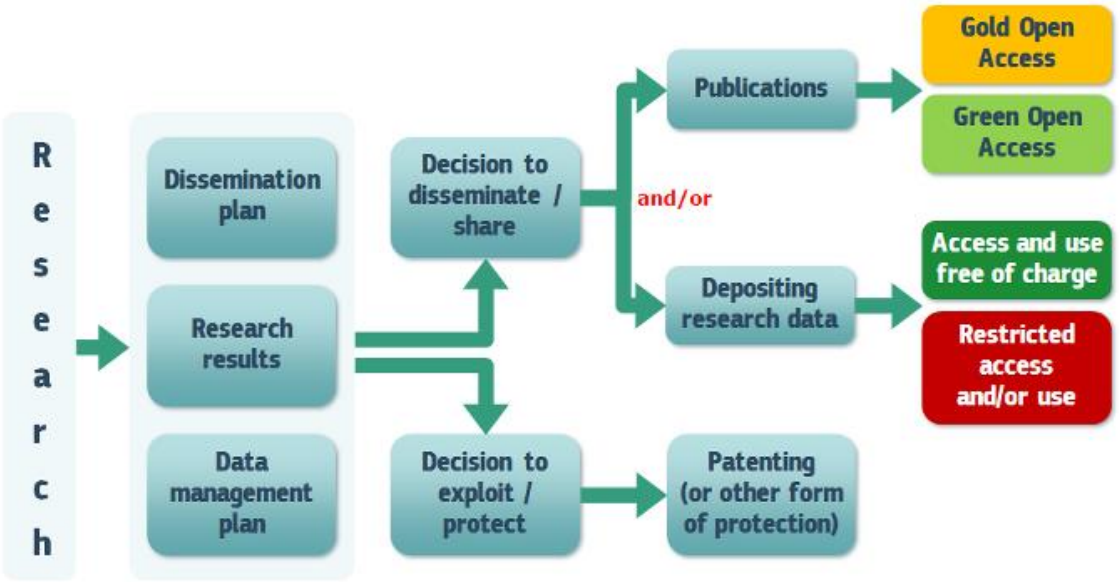

Figure 1: Open access to scientific publication and research data decision diagram in the context of dissemination and exploitation.

The following sections outline the types of collected and generated data, how these data will be exploited and made accessible for verification and re-use, and how data will be curated and preserved upon closure of the project. This DMP is a living document and will be updated over the course of the project whenever significant changes arise, such as (but not limited to):

- New data.
- Changes in consortium policies (e.g., new innovation potential, decision to file for a patent).
- Changes in consortium composition and external factors (e.g., new consortium members joining or old members leaving).
- Changes in ORDP under Horizon Europe.

All changes made to this document will be communicated to the project partners. Common standards, folder structure, and identifiers will be agreed upon with the project consortium. This DMP has been shared and agreed between the project partners.

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2. DATA SUMMARY

DATA RELATED TO THE PROJECT AND DATA ORIGIN

The EFFECTIVE main objective is to develop a comprehensive scientific knowledge base and practical guidance, combining science, technological nature-based solutions, digitalization, and social implications for the application of the Ecosystem-Based management to the protection and restoration management of the EU's Mediterranean Blue Natural Capital.

In the EFFECTIVE project, CTN has carefully evaluated the possibility of reusing existing data, and we have concluded that data reusability is a critical strategy in achieving our objectives. The primary reason for reusing existing data is to leverage the established scientific knowledge base in the field of ecosystem management in the Mediterranean. This previously collected and validated information provides us with a solid foundation for developing our comprehensive scientific knowledge base and practical guidance.

Reusing existing data - where possible - allows us to optimize our resources and expedite the process of knowledge base development. Furthermore, by harnessing historical data, we can ensure that we remain consistent with best scientific practices and align our initiative with international data quality standards. This guarantees the reliability and relevance of the information we will provide in the context of ecosystem-based management for the blue natural capital of the Mediterranean in the European Union.

In Work Package 5 (WP 5) of the EFFECTIVE initiative, the central emphasis is placed on monitoring additional parameters that are pivotal and fundamental to the progression of the project. Diverse data from data acquisition activities will be systematically catalogued within a unified template, aiming to discern which parameters are of paramount importance. The objective is to identify key parameters that can be consistently measured under uniform conditions, thereby contributing to the development of models in WP 6. This new data will be published as much as possible following EU aggregator (SeaDataNet, EuroBIS, EMODnet standards) in order to achieve optimised FAIRness and re-use.

In WP 6 of EFFECTIVE the focus lies on developing a 2D/3D demo digital twin of the pilot MPA's and on modelling to support the management of MPA's. Having access to sufficient and reliable input data is of key importance for both these objectives. Therefore, the WP6 partners will start with a scan of existing data resources about the pilot areas as input for mapping the current situation related to observation data to the requirements for management, restoration activities and modelling. From this, the gaps will be determined for additional data acquisition and which modelling activities will need to be developed. To compile this data overview, a template is created and WP6 will scan the main EU data aggregators such as EMODnet, Copernicus and SeaDataNet, (as well as regional data resources together with the pilot partners), to investigate which data is already existing in the areas. The model output is an additional data source of the project. These data products will be described with complete metadata and published as FAIR open data.

The data generated or re-used is directly related to the project's objectives and they will provide a solid scientific foundation, with observation data, and practical evidence to support our recommendations and strategies. These data contribute to the formulation of nature-based, digitalization, and social involvement solutions, which are key components of our comprehensive approach.

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TYPES AND FORMATS OF DATA

Following previous chapter it is expected that several types of data in different formats from data acquisition, documents, images, software codes, and external sources will be generated and stored.

- Model output, Data and metadata will be requested, stored, and transferred in either comma-separated values (ASCII, .csv) as well as NetCDF format.
- To facilitate the data exchange, MS Excel compatible files including comma-separated and .xls(x) format will be also accepted.
- Cartographic formats .shp, .JSON, .kml, and other formats facilitating such as GEOTIFF.
- For analytical purposes, other formats include .py (python).
- Where applicable, data formats may be migrated when new technologies become available and are proven robust enough to ensure digital continuity and continued availability of data.

The next table shows the types, formats, and volume of data that EFFECTIVE project will manage. CTN will be responsible for data management, standardization, harmonization and quality assurance.

Data origin	WP Leader	Task	Types	Formats	Volume
WP1	CTN	N/A	N/A	N/A	N/A
WP2	CSIC	N/A	N/A	N/A	N/A
WP3	SV	Bioeconomical diagnosis	Carbon sequestration [g/LBU]; O_2 produced [mg/L].	.csv, .xls(x)	> 20-50 MB
WP4	OE	Pilots, cartographic data	Cartographic data; biomass [g/LBU]; density [number of individuals/m^2]; species richness [% of spp].	.shp, .JSON, .kml, .TIFF, .csv, .xls(x)	> 20GB.
WP5	GPA	Monitoring parameters	Aquatic parameters: salinity [psu]; temperature[º]; dissolve oxygen [mg/L]; chlorophyll [mg/L] and [µmol/m^2]; nutrients [mg/L] and [µmol/L]; depth [m]; pH; water quality [µmol/L]; Solar radiation [µmol/$m^2 \cdot S^2$], [W/m^2] and [lux]; turbidity [NTUs]; current [cm/s]; conductivity [mS/cm]; heavy metals and pesticides [ppm]; TOC [mg/L]; granulometry [µm-mm]; O_2 saturation [%].	.csv, .xls(x)	To be determined (Probably in the order of TB's)
WP6	MARIS	Spatial-temporal modelling, Digital twin 2D/3D	Observation data: Input data from EU data aggregators as well as regional providers may be stored at Data Sharing	ODV, NetCDF, ASCII	To be determined (probably in the order of GB's)

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			Platform EFFECTIVE (see parameters WP5). Observation data: Input data from COSEA App (citizen science)		
WP7	FEDERPARCHI	N/A	N/A	N/A	N/A
WP8	CTN	N/A	N/A	N/A	N/A
WP9	F6S	N/A	N/A	N/A	N/A

Table 1. Type and formats of the data collected.

New data will be collected from various sources, including sensors, citizen science initiatives, etc. Additionally, data contributions are anticipated from the responsible entities overseeing Marine Protected Areas (MPAs) and Research Centers. Furthermore, collaboration with technical divers is expected to provide valuable datasets. Data from established repositories like Copernicus/EMODnet and relevant port authorities, including cartographic data, will also be incorporated into the data management plan. It is important to note that for all used data from external resources, the EFFECTIVE team will follow the provided data policy.

Regarding the COSEA App, the data from user submissions in the project's Citizen Science App is available for the coordinator, work package leader (WP6) and for consortium members via the toolkit's data administration interface. This password- and encryption protected section of the toolkit allows the consortium to directly work with the data. The administration interface also integrates communication tools to send media-rich messages with push notification to all participants. Access to the data administration interface can be structured on a per-country or even per-region basis. This allows already in the current version of the toolkit to provide a country or region-specific access for consortium partners for independent use of the Citizen Science/Monitoring App for own data recording or first public dissemination and community building in the pilot areas. The workflow of self-managed app use on location to data management/exports and project-to-user communication will be presented right after the deliverable in upcoming works.

DATA UTILITY

The data we generate and reuse in our project may have a wider data utility beyond the project itself. Potential beneficiaries of these data outside our project may include:

- The scientific community: Researchers, scientists and institutions working in the field of ecosystem management and environmental conservation can find value in the data. It can contribute to wider scientific knowledge and research in the Mediterranean region.
- Environmental organizations: Environmental organizations and non-governmental organizations (NGOs) focused on conservation and sustainability can use our data to inform their advocacy efforts and conservation projects in the EU Mediterranean region.
- Government and policymakers: Policymakers at various levels, including local, regional and national governments, can use our data to make informed decisions on the management and protection of the Mediterranean's blue natural capital.
- Business and industry: Businesses operating in or dependent on the Mediterranean ecosystem, such as fisheries, tourism and shipping, can find our data valuable for sustainable business practices and compliance with environmental regulations.

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- Educational institutions: Universities and educational institutions can use the data for teaching and research purposes, fostering a new generation of environmentally aware professionals.
- The general public: The data will be disseminated to the general public through educational programs, awareness campaigns and citizen science initiatives, allowing individuals to better understand and engage with environmental issues and restoration actions in the Mediterranean.

The data utility goes beyond the immediate objectives of our project and serves as a valuable resource for a wide range of stakeholders with an interest in the conservation and sustainable management of the EU's Mediterranean Blue Natural Capital.

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3. FAIR DATA

EFFECTIVE underwrites the importance of open access to scientific publications; thus, results will preferably be made available through Open Access. To determine how, it is important to differentiate between output types, and between input and output data.

First of all, the project will produce documents such as research publications and deliverables within this project. These (unless otherwise specifically mentioned in the consortium agreement) will be made publicly available through Zenodo, an open-access repository that assigns a Digital Object Identifier (DOI) to each uploaded document.

Secondly, there is data: observation data and model output datasets. For the input data EFFECTIVE will follow the data policy of the data providers, make reference to the original sources as much as possible, and only reshare when needed.

For the new data acquisition as done as part of the project we will follow the FAIR principles https://www.go-fair.org/fair-principles/. This data will be shared under CC-BY licensed data to the outside community, and in order to publish FAIR data the data will be made available for uptake in EU data aggregators with as complete metadata as possible. Depending on the type of marine data it will be published towards EMODnet and its underlying data infrastructures (SeaDataNet, EuroBIS, etc). The optimum solution would be to publish the datasets via the national data centers already connected to the EU aggregators. In order to streamline the process EFFECTIVE partners should already formulate their metadata and datasets following the EU data exchange standards, which will automatically mean that the data will be as FAIR as possible. If the route to a national data center turns out to be too complex or time-consuming, the alternative is to publish the EFFECTIVE project datasets via EMODNet Data Ingestion: https://www.emodnet-ingestion.eu/data-submission . More details about the approach and how it supports FAIR data in the rest of this section.

Sensitive data will be anonymized before being made public, and data that cannot be made public will be archived in a suitable closed repository in agreement with the data owner. All data will be gathered and stored in accordance with the General Data Protection Regulation (GDPR) requirements. To enhance preservation and make available results and research data, the open-access repository Zenodo and the European Open Science Cloud (EOSC) will be used. Consequently, all data and metadata involved in the project will comply with FAIR data principles.

Thirdly, software: All project software deliverables will be licensed under open-source principles, unless otherwise specifically mentioned in the consortium agreement or decided by the general assembly. The project will follow as much as possible the FAIR principles for software publishing https://www.nature.com/articles/s41597-022-01710-x.

Finally, and in line with the communication and dissemination plan, additional platforms, such as the EFFECTIVE website will publish and disseminate posters, presentations, publications, and other data.

MAKING DATA FINDABLE

All observation data will have an associated metadata document (stored as a .txt file) which describes key aspects of the data. All (meta)data will be assigned a globally unique and persistent identifier, and in the metadata there will be a reference to the datafile it described. In order to achieve findability,

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the (meta)data will be registered in a searchable resource such as EMODnet data ingestion, or ideally in one of the EU aggregators (SDN, EuroBIS, other).

All final versions of the deliverables will be hosted on Zenodo and will be adjusted to the following nomenclature:

EFFECTIVE-[number of Deliverable]-[xxx_xxx]

Where xxx_xxx is a meaningful short description of the document or file, where words are separated by "_", e.g.: EFFECTIVE-D1.2-Data_Management_Plan.

All files made publicly available reference EFFECTIVE in their name, with the recommended convention "EFFECTIVE_xxxxxxx".

Photographs and audio/visual recordings are expected to be named as follows:

EFFECTIVE-[event]_[date of event]_[description of the event]

E.g., EFFECTIVE_workshop_kick-off_meeting].

MAKING DATA OPENLY ACCESSIBLE

To maximize the impact of EFFECTIVE research data, the results will be shared within and beyond the consortium. Selected data and results will be shared with the scientific community and additional stakeholders through publications in scientific journals and presentations at conferences, as well as open access repositories.

All observation data will be openly available and accessible, with the exception of personally identifiable information and data underlines deliverables that are covered by confidentiality. The personal data processed in EFFECTIVE will not be made publicly accessible but kept closed and inaccessible to third parties. By publishing the data as much as possible also via the EU data aggregators, the data will also be accessible once the project is no longer active.

All personal data, as defined in Article 4 of the Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 (GDPR) will be treated following the principles stated in Article 5 of the aforementioned Regulation.

Data, such as documents, templates and deliverables will be available to all consortium partners via SharePoint Site. The access to SharePoint repository will be restricted to the Consortium. Should other individuals wish to access the data for research purposes during the project, it will be openly shared on request. Every meeting will be recorded and will be stored in a private YouTube's channel called EFFECTIVE.

Data will be published using standard file formats (.txt, .pdf, .csv, .xlsx, etc...). All data will be accessed using standard tools. Software relevant to accessing the data would be made available, but it is not seen as being a requirement. If required, we will provide the necessary open source to access and analyse the data.

For the duration of the project, personal data will be stored on the local secured server of the partner responsible for taking care of it.

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MAKING DATA INTEROPERABLE

Partners will go through OpenAIRE guidelines for online interoperability, including OpenAIRE Guidelines for Literature Repositories, OpenAIRE Guidelines for Data Archives, OpenAIRE Guidelines for CRIS Managers based on CERIF-XML. These guidelines can be found at: https://guidelines.openaire.eu/en/latest/. Partners will also ensure that BLAZE data observes FAIR data principles under H2020 open-access policy.

To ensure interoperability for new observation data as well as model output, the key will be to share via the EU data aggregators and follow their metadata and data standards as much as possible. In that way all datasets will use the community format standards for data and metadata capture/creation, and they will be described with community vocabularies. This will automatically achieve optimised Interoperability of the published data and will prepare the data for sharing via the EMODnet data ingestion route.

As the project progresses and data is identified and collected, further information on making data interoperable will be outlined in subsequent versions of the DMP. Specifically, information on data and metadata vocabularies, standards or methodologies to be followed to facilitate interoperability, and whether the project uses standard vocabularies for all data types present to enable cross-disciplinary interoperability.

DATA RE-USE

CC Licenses will be used for all data to be preserved.

Again, for new observation data as well as model output, the key will be to share via the EU data aggregators and follow their metadata and data standards as much as possible. In that way all datasets will use the community format standards for data and metadata capture/creation, and they will be described community for quality, data usage, which are all elements for Reusability of the observation data.

All Personal Identifiable Information will be restricted to internal usage and not going to be shared with third parties. For shared information, standard format, open-source software, and proper documentation will guarantee re-usability by third parties.

For publications deposited on a public data repository (Zenodo) access is unlimited.

An internal peer review is performed for the main project deliverables to guarantee the deliverable is developed with a high level of quality. Each WP leader must submit all the produced documents to another partner assigned as internal reviewer to check for the quality of the documents produced.

The project publications will remain re-usable for at least 2 years.

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4. ALLOCATION OF RESOURCES

Costs related to open access to research data in Horizon Europe are eligible for reimbursement under the conditions defined in the H2020 Grant Agreement, in particular Article 6, but also other articles relevant for the cost category chosen. Project beneficiaries will be responsible for applying for reimbursement for costs related to making data accessible to others beyond the consortium.

The costs for making data FAIR includes:

- Fees associated with the publication of scientific articles containing project's research data in "Gold" Open access journals. The cost sharing, in the case of multiple authors, shall be decided among the authors on a case-by-case basis.
- Project Website operation: https://effective-euproject.eu/
- Data archiving at Data Management developed by CTN and on ERDAPP data repository which is linked to EMODnet.
- Copyright licensing with Creative Commons: free of charge.

The project members of the General Assembly are also responsible for the Data Management of EFFECTIVE dataset and research data in accordance with each organization's internal Data Protection Officer (DPO).

Each partner is responsible for the data they produce. Any fee incurred for Open Access through scientific publication of the data will be the responsibility of the data owner (authors) partner(s).

EFFECTIVE DATA SHARING PLATFORM

Regarding the Data Management deployed, firstly we develop a framework where every pilot could upload every dataset.

We are currently developing an advanced data-sharing platform designed with dual functionality to streamline both data upload and download processes. The platform provides two distinct views: the Upload view and the Datasets view. This structure allows users to interact with the data efficiently, catering to specific needs in each view.

In the Datasets view, user can access and refine their searches to locate relevant datasets efficiently. Filtering options ensure that users can tailor data selections to meet specific project requirements, enhancing both accessibility and usability. Once the desired datasets are filtered, users can proceed with downloads, benefiting, from a smooth and organized retrieval process directly from the CTN server.

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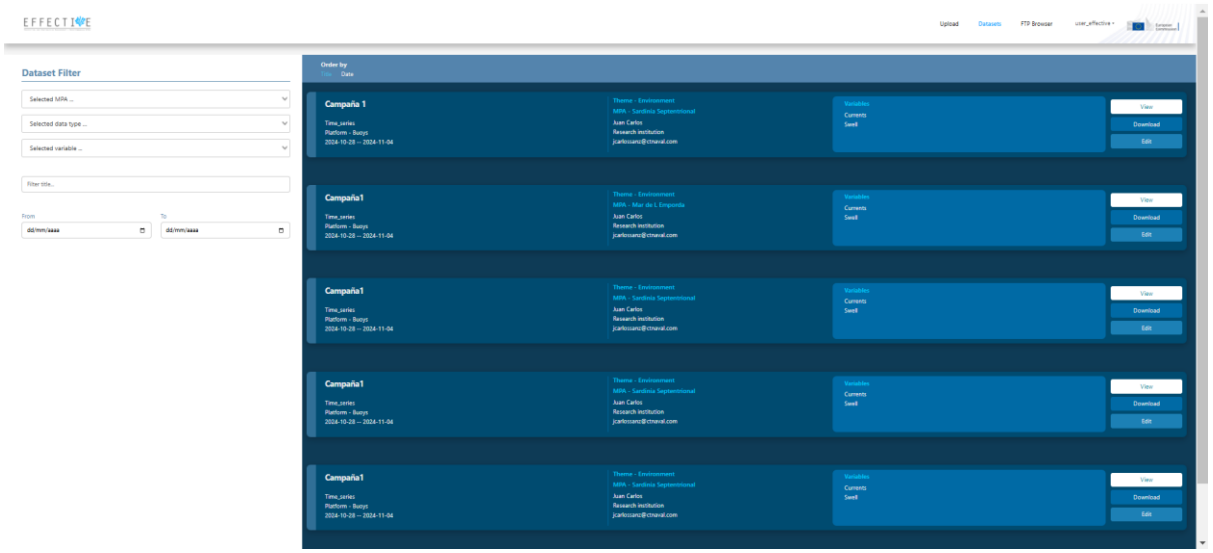

Figure 2. Datasets view of the data sharing platform.

The Upload view is a structured environment that guides users, including pilots and researchers, thorough a step-by-step data submission process. This view is designed to facilitate direct uploads to ERDAPP, and established platform for scientific data that adheres to the highest standards for data sharing and accessibility. As ERDAPP requires all datasets to be FAIR, we are planning to incorporate FAIR compliance checks within our upload process to ensure data meets these standards from the outset.

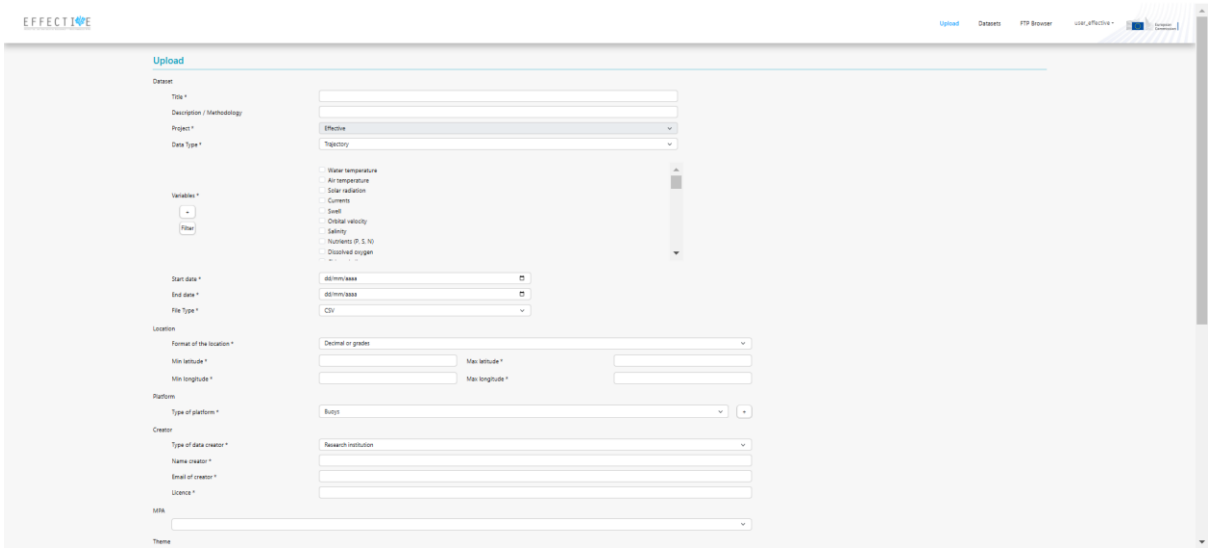

Figure 3. Upload view of the data sharing platform.

ERDAPP plays a central role in our data-sharing strategy, serving as a repository that enhances data visibility and accessibility on a European scale. ERDAPP enables the dissemination of data to various European platforms, ensuring that uploaded datasets are available for a wide array of scientific, regulatory, and policy-making purposes. By supporting FAIR principles, ERDAPP fosters a culture of data transparency and long-term usability, making datasets more accessible and valuable for future research.

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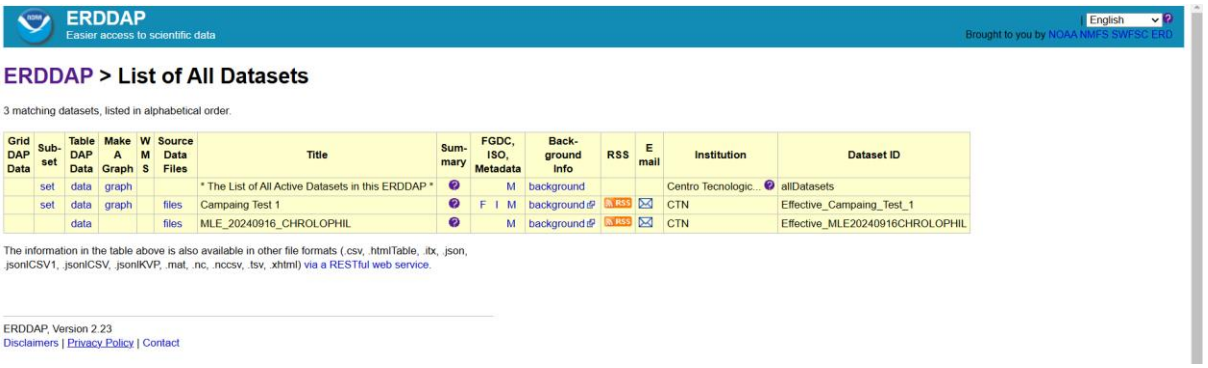

Figure 4. ERDAPP view linked to the data sharing platform.

To assist in the FAIR data preparation process, CTN will provide pilots with a detailed, easy-to-follow guide that outlines best practices for ensuring data meets ERDAPP's FAIR criteria. This guide is designed to simplify the upload process, ensuring that all datasets are adequately formatted, documented, and standardized according to FAIR principles. This structured approach helps maintain data quality while facilitating seamless integration into ERDAPP and broader European data-sharing frameworks.

In addition to enabling compliant data uploads, our platform's integration with ERDAPP supports European data-sharing initiatives by making datasets accessible across different organizational and geographic boundaries. Once datasets are uploaded, our server facilitates efficient data downloads for registered users, allowing organizations across Europe to retrieve data quickly and easily. This open data sharing approach enhances collaborative research efforts and contributes to informed decision-making across various sectors.

A guide and a video on how to correctly upload and download data on the platform will be developed and posted on the YouTube channel to ensure that every partner can watch it every time they need and uses the platform properly.

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5. DATA SECURITY

The following guidelines will be followed to ensure the security of the data:

- Store data in at least two separate locations to avoid loss of data.
- Encrypt data if it is deemed necessary by the participating researchers.
- Limit the use of USB flash drives.
- Label files in a systematically structured way to ensure the coherence of the final dataset.

As an initial step, only the Consortium Partners will have access to the cloud storage where datasets and metadata are filed. Following, scientific publications and articles, the dataset deliverables and the final demonstrator research results will be shared through Zenodo to promote the data making FAIR.

6. ETHICAL ASPECTS

As stated in Annex 5 of the Grant Agreement, the actions carried out in this project comply with:

- Ethical principles (including the highest standards of research integrity).
- Applicable EU, international and national law, including the EU Charter of Fundamental Rights and the European Convention for the Protection of Human Rights and Fundamental Freedoms and its Supplementary Protocols.

Particular attention is paid to the principle of proportionality, the right to privacy, the right to the protection of personal data, the right to the physical and mental integrity of persons, the right to non-discrimination, the need to ensure the protection of the environment and high levels of human health protection.

In addition, the project partners agree to comply with the fundamental principle of research integrity as set out in the European Code of Conduct for Research Integrity.

This implies compliance with:

- Reliability in ensuring the quality of research reflected in the design, the methodology, the analysis and the use of resources.
- Honesty in developing, undertaking, reviewing, reporting and communicating research in a transparent, fair and unbiased way.
- Respect for colleagues, research participants, society, ecosystems, cultural heritage and the environment.

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