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D1.3 – Intermediate Project and Data Management Plan

Work Package	**WP 1 – Management**
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	RE: Restricted to a group specified by the consortium (including the Commission)
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0.6	23.05.2024	FAIR-EASE Technical Board	Final internal review
1.0	04.06.2024	Corentin LEFEVRE	EU submission

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Terminology

Terminology/Acronym	Description
Terminology/Acronym	**Description**
API	Application Programming Interface
BODC	British Oceanographic Data Centre
CF	Climate and Forecast
CFS	Certificate of Financial Statement
CNRS	Centre National de la Recherche Scientifique
CSW	Catalog Service for the Web
CWL	Common Workflow Language
DCAT	Data Catalog Vocabulary
DESCA	Development of a Simplified Consortium Agreement
DIVAND	Data-Interpolating Variational Analysis in n dimensions
DMP	Data Management Plan
EAL	Earth Analytic Lab
EC	European Commission
ECA	European Court of Auditors
EGI	European Grid Infrastructure
EMBRC	European Marine Biological Resource Center
EOSC	European Open Science Cloud
EPPO	European Public Prosecutor's Office
ESA	European Space Agency
EU	European Union
FAIR	Findable; Accessible; Interoperable; Reusable
FAIR4RS	FAIR for Research Software
FAIR-EASE	FAIR EArth Sciences & Environment services
FDMM	Fair Data Maturity Model
GA	Grant Agreement
GANTT	Generalized Activity Normalization Time Table
GEODAB	Geo Discovery and Access Broker
GPL	General Public Licence
HAL	Hyper Article en Ligne
IDDAS	Interdisciplinary Data Discovery and Access Service
JRC	Joint Research Centre
MIT	Massachusetts Institute of Technology
NASA	National Aeronautics and Space Administration
NetCDF	Network Common Data Form
NVS	Nerc Vocabulary Server
OAI-PMH	Open Archives Initiative - Protocol for Metadata Harvesting
ODV	Ocean Data View
OGC	Open Geospatial Consortium
OLAF	European Anti-Fraud Office
Open PM²	Open Project Management Methodology

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Terminology/Acronym	Description
PID	Persistent IDentifier
PMO	Project Management Office
PMP	Project Management Plan
RDA	Research Data Alliance
RPO	Research Performing Organisations
T	Task
TB	TeraByte
TRL	Technology Readiness Level
VAT	Value-added Tax
VDAP	Virtual Data Analysis Platform
VRE	Virtual Research Environment
WFS	Web Feature Service
WMS	Web Map Service
WMTS	Web Map Tile Service
WP	Work Package
WPS	Web Processing Service

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1 Executive summary

This deliverable provides the intermediate Data and Project Management Plan of the FAIR-EASE project, describing the comprehensive life cycle of the data to be considered, collected, processed and generated throughout the project.
The Data Management Plan is under the project coordination responsibility and is part of WP1 - Task T1.3. It contains the description of how the data are collected, re-used, processed and generated during the FAIR-EASE project implementation and how they will be handled after the end of the project. Based on FAIR principles, this deliverable defines the methodology and standards to handle any data/research outputs; how these data/research outputs are shared and/or made open within the definition and scope of the EOSC vision.
The Project Management Plan is under the project management and coordination responsibility and is part of WP1. It contains the description of the main processes of the project as well as its management structure, completing both the project Grant and Consortium Agreements. The PMP is conceived as a general guide for the partners of the consortium to access the detailed procedures of the project everyday life implementation. The FAIR-EASE PMP is based on the European project management methodology Open PM² adapted to the needs and specificities of Horizon Europe Collaborative Projects.

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2 Data Management Plan - Introduction

The FAIR-EASE project aims to provide FAIR integrated services tailored to the emerging need to discover, access, process and analyse easily and on-demand transdisciplinary and heterogeneous environmental data for Environment and Earth scientists, data analysts as well as private companies and citizens through EOSC. The consortium is coordinated by CNRS and is composed of 27 partners. Most of the partners are national Research Performing Organisations (RPO) managing Earth Science and Environment data, associated access and processing services, as well as computing resources. In addition, they are part of thematic European research infrastructures (SeaDataNet, EMBRC, Euro-Argo), national multidisciplinary research infrastructure (Data Terra), or EOSC cloud infrastructure, such as CNRS/France Grilles, the French national Hub of EGI. They are deeply involved in national and European research projects and initiatives developing and promoting open science and FAIR principles across disciplines. The FAIR-EASE project adopts a community-driven approach, involving the Earth Science and Environment research communities as actors in the development of discovery, access and analysis services, and as end-users in testing the proposed services via real-life science use-cases. Thus, all technical partners, managing environmental data, will provide access to their data repositories and services and integrate them via the technical work-packages (WP).

The scientific communities involved in the FAIR-EASE project have long been engaged in the implementation of Open Science practices, in particular with regard to open access to scientific publications and the deposit of research outputs in trust data repositories.

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3 Data/Research Outputs summary

The data handled by the FAIR-EASE project are mainly related to Earth System, Environment and Biodiversity observations. In addition, throughout the project other research outputs are addressed, such as scientific publications, project results, source code, novel or curated datasets, etc.

Data is re-used or generated by the research communities involved in the FAIR-EASE to implement specific pilots within real life sciences use cases. These data are heterogenous in their type (tabular, geo-referenced, image, numerical model, experimentation outputs, sequencing, etc.) and format (netCDF, shape, ODV, etc.) and they come from observation of the Earth System via sensors (e.g. Argo floats, satellite images, etc.), sampling (for genomic or biochemical analyses), or experiments. The FAIR-EASE project itself does not aim to gather geospatial and earth observation data, but acting as a federation of existing data infrastructures aiming to enable data analyses by its end users, it brings together data from various existing sources. Thus, the data are mainly collected from environmental research European and EU member states infrastructures (Seadatanet, EuroArgo, DataTerra, etc.) and European and International data centers (NASA, Copernicus, ESA, JRC, ...) that have protocols in place to ensure the FAIR principles.

The main goal of FAIR-EASE is to provide users with the possibility to access and process data through the integration and customization of pre-operational services. The focus is on providing scientific input data, and handling the resulting derived data, which may then be published in thematic trust repositories. Thus, the following groups of scientific data can be identified:

- Scientific input data from existing known data infrastructures, i.e. as identified in the WP5 pilots. A detailed list of the dataset used by the FAIR-EASE use cases can be found in the annex *A. Resource and Tools Mapping Table* of the Deliverable 5.1 [Chiusano, 2023]. This can be divided into:
    - Input data that is being kept at the originating data infrastructures and is transferred to the FAIR-EASE servers only on demand, when a (machine) user requests the data to sync it, or perform processing on it. The originating infrastructures remain responsible for this data and their DMP applies.
    - Input data that was copied from the originating infrastructures and stored (and possibly modified) by the FAIR-EASE project, to match the pilots requirements.
- Other input scientific data, uploaded by the users.
- Resulting datasets/derived datasets, created by users as a result of their usage of FAIR-EASE analytical services.

All the data and research outputs generated by the FAIR-EASE project are aligned with Open Science practices:

- Scientific publications, pre-print and final peer-reviewed are published in open peer review journals (e.g. Open Research Europe, episciences) and are filed in open dedicated repositories where Metadata are in line with the FAIR principles (e.g hal, arXiv, etc.).
- The project deliverables and milestone reports are available in the Zenodo repository, indexed by OpenAIRE and published on the project website.

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- Earth science and environmental related data, models and results from the FAIR-EASE project, will be deposited in one or more thematic trust repositories (e.g. EMODNET, Seanoe, Data Terra repository, Pangaea, etc.), respecting already established international agreements (CoreTrustSeal, etc.).
- A git-hub repository has been set up for the overall project. The source code produced by the FAIR-EASE project is open source, and will be pushed in Software Heritage to be archived.

The data/research outputs addressed by the FAIR-EASE project are summarized in table 1. The detailed list for the reporting period is available in annex A.

Type of Research Output	Description	Format	Accessibility/Dissemination level	Repository
Project results	Deliverables, milestones reports of the project	pdf/a - other different file formats depending on the type of reports	All deliverables are public. Final-non approved version is published on Zenodo with relevant disclaimer, and replaced by the final version once approved by the EC.	Zenodo, project website, OpenAIRE, Cordis
Project internal supports	Presentations, meeting notes, meeting records, schema, …	different file formats depending on the type of document : pdf/a, audio/video (Mp4), images (jpg, png), …	All documents are available for the project consortium. Some documents created for an internal use are considered to be publicly shared on Zenodo and the FAIR-EASE project.	FAIR-EASE Confluence space of the project for private documents - website, Zenodo and openAIRE for public ones
Scientific publications	Scientific publications are published in open peer review journals, pre-print and final peer-reviewed manuscripts accepted for publication are filed in open dedicated repositories where Metadata	pdf/a	open access	Open Research Europe: https://open-research-europe.ec.europa.eu/ - OpenAire,

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	are in line with the FAIR principles			
Source code	Source code produced by the technical WPs and the Use cases/pilots. It can be jupyter notebooks, softwares, galaxy workflows, images/containers,	java, julia, python, R, …	Open source (MIT, GPL, Apache2, …)	FAIR-EASE git (https://github.com/fair-ease) - Galaxy instance of the Galaxy Europe project (https://galaxyproject.org/eu/) - Software Heritage - archive (https://www.softwareheritage.org/)
Data	Data produced by the project	various formats including NetCDF files, csv, raster and vector data, …	Open license Creative Commons + PID	Earth Science / thematic TRUST repositories : Pangaea, Emodnet, Seanoe, EaSy Data, …
Non-internal webinars, workshops	Recordings of the webinars/workshops of the project	mp4	Users have to give consent for publication of recordings	FAIR-EASE Confluence space of the project (https://fair-ease.atlassian.net) Youtube (https://www.youtube.com/channel/UC38GCbvhoGomre3lROFD4ww)
Modified/extended services	existing services extended in the context of the FAIR-EASE project (e.g. IDDAS, Divand, …)		Open source (MIT, GPL, Apache2, …)	FAIR-EASE git (https://github.com/fair-ease) or partners source code repositories

Table 1 - List of research outputs generated by the FAIR-EASE project

4 FAIR Data and other research outputs

FAIR-EASE Project aims to build interdisciplinary FAIR services for integrated use of environmental data. The project will provide two services: (1) an Interdisciplinary Data Discovery and Access Service (IDDAS) to find and access environmental, multidisciplinary & aggregated data, and (2) the Earth Analytical Lab (EAL) to visualise, analyse and process

environmental data on-demand. The IDDAS will be developed in WP2 to enable federated discovery and access to a large variety of interdisciplinary data infrastructures and will ensure that scientific data will be referenced for the scientific communities in an efficient way, by using data and metadata standards, augmented with semantic descriptions. The IDDAS is described in D2.2[1]. The EAL will be developed in WP3 and will guarantee that distributed integrated services will be available in a common space, in order to process and visualise data in an interoperable way. The EAL will be built on existing open source platforms (Jupyterlab, Galaxy, Examind, webODV) and will integrate virtual labs provided by the FAIR-EASE pilots (DivaND, SOURCE, BGC toolbox, VocPlume, etc.). The Uniform Data Access Layer (UDAL) enables users to access data seamlessly, whether it's stored locally or remotely, without concern for its location or format. Additionally, users have the option to upload their own data files. The EAL is described in the Deliverable 3.1[2]. Milestone MS07[3] report that specifications of WP2 and WP3 FAIR-EASE services are fitted to use-cases requirements. Both services will ensure that data and research outputs handled by the communities involved in the project will be done in a Findable, Accessible, Interoperable and Reusable way.

In addition, a dedicated task (T6.3 in the WP6) aims to ensure FAIR principles are fully endorsed in the FAIR-EASE project. This task focuses on the application and the evaluation of the FAIR principles for the project's target communities. A first assessment has been performed with the project partners to determine the FAIRness of the data and services used in the FAIR-EASE project at the beginning of the project. Two representative datasets of each pilot and some research software have been chosen to conduct this first evaluation. To avoid the risk mentioned by the FAIR Metrics and Data Quality Task Force: *"the same Digital Object (DO) assessment by different tools often exhibits widely different results because of independent interpretations of the Metrics, metadata publishing paradigms, and even the intent of FAIR itself*" [FMDQ TF, 2022], the evaluation of the dataset has been done by using two different approaches and the results have been compared: (1) the F-UJI[4] tool to have a first evaluation based on the metrics produced by the FAIRsFair project [Devaraju el al. 2022] and (2) the Fair Data Maturity Model (FDMM) to conduct a second analysis of the dataset [RDA FDMM WG, 2020]. The evaluation of services has been done by using the FAIR Principles for Research Software [RDA FAIR4RS WG, 2022]. The overall methodology used to conduct this survey and analysis of this study has been provided in MS06[5]. The feedback and results of these evaluation have been provided to the FAIR-IMPACT[6] project.

FAIR principles in the FAIR-EASE project

To guarantee the **Findability** and the **Reusability** of the data and research outputs from the project, the data referenced in the FAIR-EASE project will be pushed in thematic (e.g., Data Terra, Archimer) or national catalogs (e.g. Research Data Gouv), as well as European ones (e.g. EOSC Portal), therefore making them conveniently findable for everybody. Metadata

[1] D2.2 – Environmental Data Infrastructures: Services Analysis Report

[2] D3.1 : Specifications of FAIR-EASE Earth Analytics Lab and implementation plan (M12)

[3] MS07 : Validation of WP2, WP3 technical specifications for transdisciplinary services

[4] F-UJI : https://www.f-uji.net/

[5] MS06 : FAIR-EASE initial evaluation of the FAIRness of digital resources and services (M10)

[6] FAIR-IMPACT : https://fair-impact.eu/

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associated with the data and research outputs will be compliant with existing community standards (e.g. ISO 19115, Dublin Core, CF metadata) and with Metadata Schema used in the EOSC environment (e.g. DCAT, DataCite Metadata Schema). To make the data and research outputs of the project accessible, they will be stored in thematic trusted repositories commonly used as reference resources by the engaged communities (e.g. EaSy Data, Seanoe, Emodnet, Pangaea). These repositories assign PID to each dataset they stored, and provide API and services, so that metadata can be harvested and indexed by catalogs. All data and research outputs produced by the FAIR-EASE project will be shared in open access according to the latest available version of the Creative Commons Attribution International Public Licence, and will be accessible through free and standardized access protocol. The data and research outputs created throughout the project will be made interoperable through widely used formats (netCDF), standards or vocabularies (SeaDataNet, NERC Vocabulary Services, CF convention, ISO, Dublin Core) and standard access protocols (WMS, WFS, WPS, CSW, OAI-PMH, …). These controlled vocabularies will be available in dedicated registries (NVS, AERIS vocabulary server, etc.).

To ensure the **Findability** and **Accessibility** of the data, the FAIR-EASE IDDAS will build and maintain a common FAIR-EASE metadata catalogue, which will feature a common metadata model with a limited number of metadata tags, to be completed by mappings with each of the metadata services of the data infrastructures. The common metadata model will focus on describing data collections by means of fields for What, When, Where, Who, and additional fields for querying more detailed metadata at each source and for facilitating access by means of downloading the data collections from the source infrastructures. The resulting FAIR-EASE metadata catalogue will be established adopting the GEODAB[7] brokerage service principles which has a metadata core in ISO19115 standard, and will be expanded to support DCAT as well. The FAIR-EASE discovery service will then be made available by means of web services for machine-to-machine interactions (CSW; OAI-PMH; and SPARQL RDF endpoint), as well as by GUI for human users.

The FAIR-EASE EAL will build and maintain a catalog of services where the services integrated and available in the EAL could be found in an harmonized way. The specification and standard used are described in the D3.1.

Accessing the data generated by the pilots through the EAL will be done with the use of standards and protocols such as OGC web services or API, Dedicated subsetting services (e.g. ERDDAP or other), OpenDAP, STAC/Opensearch. Access protocols for data re-used are described in the D5.1. Accessibility of services/notebooks has been done by the use of Galaxy platform ToolShed[8]

Regarding **Interoperability** FAIR-EASE will not only make use of syntactical mapping of the metadata models of the data infrastructures to the common FAIR-EASE metadata model, but this will be semantically supported by the use of vocabularies and mappings. Use of common vocabularies in all metadata and data formats is an important prerequisite towards consistency and interoperability. Common vocabularies consist of lists of standardized terms

[7] https://www.geodab.net/

[8] https://galaxyproject.org/toolshed/

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that cover a broad spectrum of disciplines of relevance to the FAIR-EASE communities. Using standardized sets of terms solves the problem of ambiguities associated with data markup and also enables records to be interpreted by computers (machine actionable concept). This opens up metadata and data sets to a whole world of possibilities for computer aided manipulation, distribution and long-term reuse. Therefore, as part of the FAIR-EASE WP2 activities, the FE semantic brokerage offers translation services across different terminologies used by diverse data sources. It enhances semantic discovery of datasets and promotes interoperability by aligning semantics. Achieving this semantic alignment necessitates a thorough comprehension of the targeted datasets, including their metadata structure and semantic elements. This is facilitated by the Semantic Analyser (SA). The SA extracts textual information from metadata records and data files, comparing it to semantic artifacts stored in the FE Knowledge Base composed of terms from ontologies and controlled vocabularies. Another component of interoperability activities is the development of a standardized metadata profile based on the DCAT Linked Data standard. This profile will facilitate machine-to-machine discovery of datasets. These services are described in D2.3[9].

For data to be **Reusable,** the FAIR principles reassert the need for rich metadata and documentation that meet relevant community standards and provide information about provenance, reporting how data was created and information about consecutive data reduction or transformation processes to make data more usable, understandable or 'science-ready'. The ability of humans and machines to assess and select data on the basis of criteria relating to provenance information is essential to data reuse, especially at scale. Reusability also requires that the data be released with a 'clear and accessible data usage license': in other words, the conditions under which the data can be used should be transparent to both humans and machines.

The data input for the FAIR-EASE pilots and work in the EAL is derived mostly from the selected data infrastructures (published in D2.1). Each has developed and is operating their dedicated discovery and access services, applying community standards and principles. The FAIR-EASE Interdisciplinary Data Discovery and Access Service will use the metadata from these data infrastructures as it is offered. Indeed, improving their richness is not in the scope of the FAIR-EASE project.

This is different for the FAIR-EASE EAL data-output catalog aiming at publishing data products as generated by the researchers within the pilots. Their metadata will be enriched with the provenance documentation (e.g. following PROV-O standard) to provide users detailed information about the way that the data products were generated (software, version, settings, dataset input information), this will be very useful for wider reuse. And the provenance information will give scientific users detailed information how the data products might be reproduced with the EAL components which is again very useful as it allows EAL users to repeat the same analysis, but for instance changing input and/or settings.

In order to promote data reuse within the FAIR-EASE EAL, Examind community platform[10] will be used for the dissemination of data. Examind is a geographic data server where the

[9] D2.3 - FAIR-EASE semantic brokerage service

[10] https://github.com/Geomatys/examind-community

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provision of data is done via OGC Standard services such as WMS, WMTS, etc.. Data download services allow users to extract all or part of the data and provide it in common and reusable formats for the communities (e.g. Geotiff, GeoJson, etc.)

The Galaxy platform[11] used as a VRE in the EAL provides a way to ensure the reusability of the workflows and data generated by the FAIR-EASE scientists involved in the pilots. Indeed, workflow can be pushed directly in the WorkflowHub platform[12] to be findable and re-usable by other scientists and exported in RO-CRATE[13]. Galaxy workflows can also be shared using CWL (Common Workflow Language) using Planemo[14], the Galaxy development toolkit.

Finally, after the first evaluation of data and services by task 6.3, an on-going consultation will be conducted with partners to ensure that all FAIR principles are fully endorsed in the project for the data, services, and semantic artifacts. Collaborations with the FAIR-IMPACT project, the EOSC FAIR Metric and Data Quality Task Force, and RDA dedicated working groups (RDA4RS , RDA4VRE, RDA FDMM WG) will be conducted to achieve a wider application of results. Production of community guidelines to improve the FAIRness of the research outputs of the project, will be provided in the Deliverable 6.5[15], including cross-domain and transdisciplinary aspects.

5 Allocation of resources

The FAIR-EASE project will use data from several resources, i.e. from established international and European research infrastructures and data centers. Although these data infrastructures are mostly engaged in data FAIRification processes, the level of FAIRness of their data and their FAIR technical choices can differ. Thus, specific efforts and developments will be needed to connect the FAIR-EASE services (IDDAS and EAL) to the different data sources.

In order to perform efficient on-demand analysis of scientific data through EAL service, additional processing / conversion may also be necessary. In addition, some input data may need to be replicated from the data infrastructures to the FAIR-EASE infrastructure to serve the WP5 Pilots activities, and storage costs will therefore need to be considered. It will be done taking into consideration technical and financial sustainability matters. Finally, costs related to the operation of FAIR-EASE services will apply.

According to the description of action of the FAIR-EASE project, targeted activities will be deployed after the mid-term in relation to the cost analysis for making research outputs FAIR and exploitable after the end of the project. A dedicated task, T1.4, will focus on sustainability and exploitation pathways based on the general technical architecture described in previous deliverables (D3.1, D4.1 and D4.2) and in line with the services or related technical

[11] https://github.com/galaxyproject

[12] WorkflowHub, a registry for describing, sharing and publishing scientific computational workflows.

[13] https://www.researchobject.org/ro-crate/

[14] https://github.com/galaxyproject/planemo

[15] D6.5 Guidelines for the improvement of the FAIRness digital resources and services (M24)

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components upgraded and customized by the Use-cases and pilots (WP5) taking into account the different options already exploited or available.

The partners involved in WP5, WP3 and WP2 will be responsible for data management during the project lifetime. As T1.3 leader, CNRS will be in charge of reporting the data management practices in the current and future versions of FAIR-EASE data management plan.

Long-term preservation of FAIR-EASE results will be ensured through their publication in TRUST repositories. Those repositories are national or international services offering publication, open access and long-term preservation of research outputs without charges.

6 Data Security

FAIR-EASE aims to provide services that allow data to be accessed and analyzed on-demand, thus favoring efficient data access and limiting data transfer and replications. Therefore, in general, data will not be copied to another location, even if subsets can be temporarily stored in cash and deleted from memory when the analysis is completed. The repositories (i.e. data infrastructures) where the data are stored are therefore responsible for their safe storage and security.

Where data upload is required for scientific purposes, e.g. to combine datasets and conduct an analysis through the EAL, the security protocols of the service used to store and process the data will apply. Components and related services are fixed and are described in deliverables of WP2, WP3 and WP4**.**

In any case, FAIR-EASE will mainly rely on existing services from the project partners, which have their own data preservation plans and secured storage on durable and redundant archiving systems. The use of additional services (such as an instance of Galaxy for Earth System or D4 Sciences) has been set-up or envisaged with particular attention to the conditions of use of this service and its implication in terms of data security.

In general, standard measures will be applied to ensure data security within the project: replication of content between systems, automatic saving, use of information transfer protocol such as Transport Layer Security protocol.

All the data and research outputs generated by the FAIR-EASE project will be published in trusted repositories to ensure long-term preservation: source code in the FAIR-EASE git and push in a Software Heritage archive at the end of the project, scientific data in EaSy Data, EMODnet, Seanoe or Pangaea data repositories, deliverables and milestones reports in Zenodo. Such repositories are built upon research infrastructures that guarantee the sustainability of the service and safe storage of the research outputs, according to their data preservation plans.

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7 Ethics

The FAIR-EASE project is not explicitly dealing with any activity related with personal data collection. Only as part of the registration of users for communication and outreach activities and for creating accounts at the shared working platform (Confluence: https://fair-ease.atlassian.net/) personal information of users will be gathered. The uses and measures for securing personal data are clearly explained to users that register for the FAIR-EASE services already available (https://fairease.eu/privacy-policy-full#_Toc5364824) in accordance with the GDPR. The Privacy Policy includes a reference to the Cookies Policies that is also noticed at the homepage. Finally, the Terms of Use clarify all the policies regulating the usage and exploitation of the services provided. It will be annotated and extended along the time with the specification of the policies associated with the FAIR-EASE additional services.

Moreover, specific surveys might be undertaken by the FAIR-EASE project to better meet the final expectations from the stakeholders. These surveys would collect personal data and, in this case, they will be treated in the most appropriate and secure way and users will be previously informed about any specific process deployed. Finally, concerning specific rules on the management of Intellectual Property Rights (IPR) in FAIR-EASE, partners will refer to the Consortium Agreement.

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8 Project Management Plan - Introduction

FAIR-EASE is a project aiming to significantly advance the application of Earth System environmental data. By enhancing the various components that have been implemented in collaboration with user-communities, the European Open Science Cloud, and research infrastructures in their design and sustainable availability, FAIR-EASE will operate distributed and integrated services for observation and modelling of the Earth system, environment, and biodiversity. FAIR-EASE will produce these services in a customised and integrated manner.
The consortium is composed of 25 partners based in 9 countries – France, Portugal, Greece, Belgium, Italy, Germany, United Kingdom, Netherlands and Ireland. The project is funded by the European Union through its research and innovation framework programme Horizon Europe, operated by the European Research Executive Agency (REA).

Collaborative European projects of research and innovation are complex to manage and thus require the development and implementation of an appropriate methodology to achieve their objectives timely and in a resource-efficient manner.

The purpose of this document in two part is, firstly, to present the main management procedures for the FAIR-EASE project. It is intended for all the people involved in the project and has the ambition to be an updated practical guide to refer to in the daily life of the project.

The various chapters discussed in this document address the main themes of the project's life, as well as its structural elements. The readers will therefore find information related to: governance, management of objectives, tasks and associated costs, as well as information management, follow-up procedures, and, where appropriate, procedures of modification.
The procedures and method adopted by the FAIR-EASE consortium are partly based on the OpenPM[2][16] method developed by and for the European Commission.

[16] https://www.pm2alliance.eu/

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9 Contractual documents

The formal relationships and obligations between all the partners and the funding agencies of the project are described extensively in several contractual documents linking the project participants to the funding agencies on the one hand, and the partners among themselves.

This chapter summarises the content of those contracts and their roles in the project.

9.1.1 Grant Agreement

The project's Grant Agreement describes the rights and obligations of the partners on one side, and the European Commission.

9.1.2 Preparation of the FAIR-EASE Horizon Europe Grant Agreement

The figure below describes the steps taken by the FAIR-EASE consortium and the European Union to prepare and sign the FAIR-EASE Grant Agreement.
FAIR-EASE Grant Agreement has been signed by the European Commission and all the project's partner on 21/12/2020.

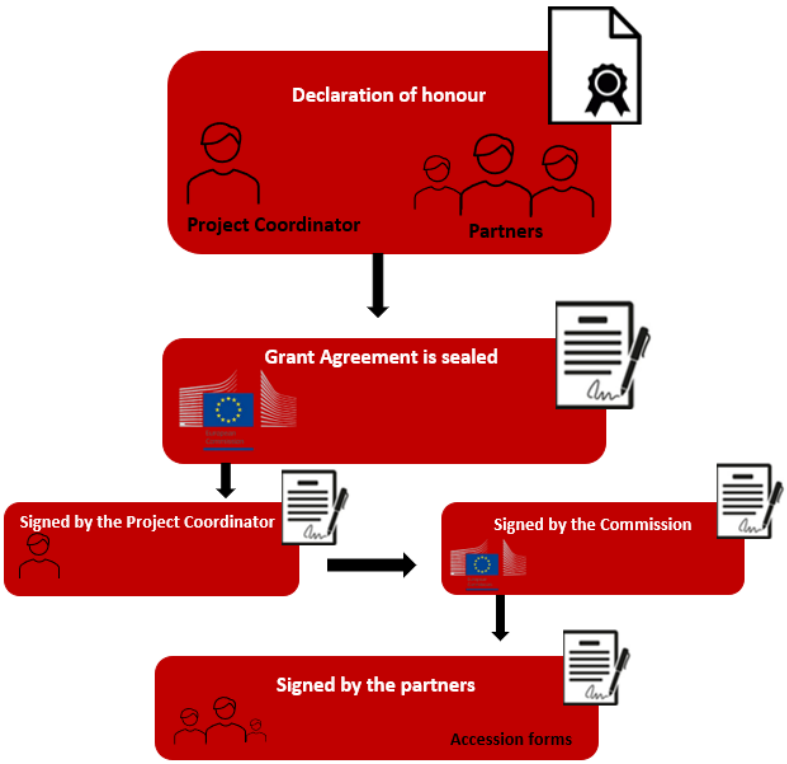

Figure 1 – Grant Agreement preparation process

9.1.3 Contents of the Grant Agreement

The Grant Agreement is based on the European Commission standard Model Grant Agreement (MGA) for Horizon Europe collaborative projects.
It is composed of:

- A datasheet summarising key elements of the project
- 6 chapters and 44 articles stating the rights, obligations, eligibility, procedures, reportings and audits, etc… of every partner towards the European Commission
- The annex 1 which is the description of the action based on part A and B of the project proposal – and updated in case of amendments
- The annex 2 which is the budget table of the envisaged costs of the project
- Annex 3 which gathers the accession form of the partners to the Grant Agreement
- Annex 4 which is the template of financial reporting statement for a reporting period
- Annex 5 that details specific rules on several topics such as confidentiality, ethics, gender equality, communication of the project's results…

All partners have access to the latest version of the project Grant Agreement on the consortium collaborative space.

9.1.4 Consortium Agreement

The Consortium Agreement is a confidential agreement signed by the project's partners, that covers at least the whole duration of the project. This agreement notably describes and sets out the procedures, rights, and obligations of the partners among themselves.
The FAIR-EASE Consortium Agreement was prepared based on the European DESCA Model[17], this draft being the starting point of discussions between the partners.

The document contains information about the management structure of FAIR-EASE, including definitions and a description of the governance, the role and procedures for each consortium body (e.g. meetings, boards members). It also presents the mechanisms of the decision-making process such as voting rules and responsibilities. The FAIR-EASE Consortium Agreement specifies rights and obligations regarding the results of the project (ownership) as well as access rights to background. Finally, the document contains information regarding the access of the leaving of a party and describes the related procedure to be followed by the consortium.

10 Project's governance

In FAIR-EASE, the project's governance is shared among two dedicated boards: The Management Board and the Technical Board. The rules and roles related to those boards are agreed among the partners during the project's preparation phase and described in the project's Consortium Agreement.

[17] http://www.desca-agreement.eu/

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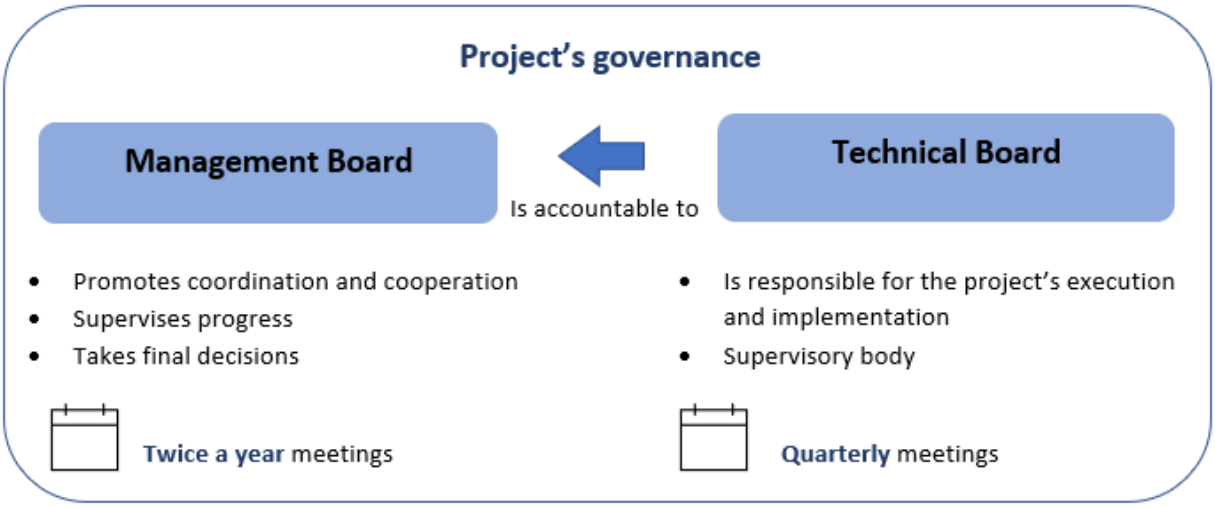

Figure 2 – FAIR-EASE governance

10.1.1 The Management Board

The Management Board is the decision-making body of the consortium. It promotes coordination and cooperation throughout the project and supervises its progress based on the follow-up of structural elements (see section 4 on Project's structural elements) such as the deliverables and milestones.

The Management Board is composed of one representative per partner, that can also designate alternate representatives. Its members meet at least twice a year, and can also organise extraordinary meetings at any time, based on the request of the Technical Board, or at least one third of the Management Board members.

Decisions of the Management Board are taken by consensus. However, if a consensus cannot be reached, decisions are taken by a vote with a majority of 2/3. Electronic votes can be organized to ease the decision-making process in-between two Management Boards meetings.

Among others, the Management Board is in charge to assess, plan and validate any change to the consortium plan and, if needed, to initiate the official procedures requested by the Funding Agencies to do so.

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At the date of submission of this deliverable, the FAIR-EASE Management Board is composed of:

First and Last Name	Partner's affiliation	Role
Alessandro RIZZO	CNRS	Chair Primary representative
Reiner SCHLITZER	AWI	Primary representative
Cymon COX	CCMAR	Primary representative
Gabriella SCIPIONE	CINECA	Primary representative
Enrico BOLDRINI	CNR-IIA	Primary representative
Nicolas PADE	EMBRC-ERIC	Primary representative
Marine BOLLARD	EURO-ARGO ERIC	Primary representative
Vincent HEURTEAUX	Geomatys	Primary representative
Stelios NINIDAKIS	HCMR	Primary representative
Erwan BODERE	IFREMER	Primary representative
Simona SIMONCELLI	INGV	Primary representative
Peter THIJSSE	MARIS	Primary representative
Eoin O'GRADY	MI	Primary representative
Corentin LEFEVRE	Neovia	Primary representative
Mark HEBDEN	NOC-BODC	Primary representative
Alessandra GIORGETTI	OGS	Primary representative
Jérôme GOURRION	Pokapok	Primary representative
Serge SCORY	RBINS	Primary representative
Fabio CONVERSANO	SZN	Primary representative
Cristina MANCARELLA	Trust-IT	Primary representative
Alexander BARTH	U. Liège	Primary representative
David SARRAMIA	UCA	Primary representative
Maria-Luisa CHIUSANO	Unina	Primary representative
Lennert TYBERGHEIN	VLIZ	Primary representative

Figure 3 – Management Board composition

10.1.2 The Technical Board

The Technical Board acts as a supervisory body and is responsible for the execution and implementation of the project. It is accountable to the Management Board and must report to it. Its members meet at least quarterly, and can also request for extraordinary meetings, based on the solicitation of one of its members. These meetings are prepared and chaired by the project coordinator unless a majority has taken another decision. The day-to-day technical coordination is under the responsibility of CNRS and Ifremer. Their primary representatives in the technical board are respectively the technical coordinator (CNRS) and the deputy technical coordinator (Ifremer). They are responsible of the alignment of the activities' technical implementation to the project's objectives and supervised the quality of the technical deliverables which are formally reviewed and approved by the Technical Board.

The Technical Board is composed of the project's coordinator, technical coordinators, work packages' leaders and additional parties appointed by the Management Board. Exceptionally, and based on the request of some members, external experts can be invited to attend the Technical Board.

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At the date of submission of this deliverable, the FAIR-EASE Technical Board is composed of:

First and Last Name	Partner's affiliation	Role
Erwan BODERE	IFREMER	Primary representative – Technical coordinator deputy – WP3 Leader
Vincent BRETON	UCA	Primary representative – WP4 deputy
Maria-Luisa CHIUSANO	Unina	Primary representative – WP5 leader
Jérôme DETOC	IFREMER	Deputy representative – WP3 deputy
Clémentine FERRE	Neovia	Deputy representative - PMO
Marie JOSSE	IFREMER	Deputy representative – FAIR-EASE Galaxy co-leader
Tjerk KRIJGER	MARIS	Deputy representative – WP2 Leader deputy
Corentin LEFEVRE	Neovia	Primary representative – PMO – WP6 co-leader
Cristina MANCARELLA	Trust-IT	Deputy representative – WP6 T6.1 leader
Christelle PIERKOT	CNRS	Primary representative – Technical coordinator
Marc PORTIER	VLIZ	Primary representative – WP4 leader
Alessandro RIZZO	IRD	Primary representative – Project coordinator
David SARRAMIA	UCA	Deputy representative
Peter THIJSSE	MARIS	Primary representative – WP2 Leader

Figure 4 – Technical Board composition

10.1.3Description of roles

In collaborative projects, several roles are defined among the participating partners, each role being assigned with specific responsibilities – should they be contractual (see part 2. "Contractual documents") or informal. This chapter summarizes the main roles defined for the FAIR-EASE project.

10.1.4 Project Coordinator

The coordinator is the intermediary between the parties and the European Funding Authority and oversees related tasks mentioned in the Grant[18] and Consortium Agreements. For instance, the coordinator ensures parties' compliance to their obligations and submits reports to the Funding Authority.

In FAIR-EASE the project coordinator is the CNRS and the consortium relies on the professional support team of the coordinator for an effective implementation of the project respecting all guidelines and obligations as described in the Grant Agreement. The

[18] Chapter 5 of the Grant Agreement

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coordination team is completed by IRD – an Affiliated Entity to the CNRS in the project. This addition strengthens the coordination as it reflects the overall management of the project being taken by Data Terra[19] – the French national research infrastructure on Earth System – which is a joint structure under the shared responsibility of both CNRS and IRD. Data Terra also receives research and technical support from other national research performing organisations and academia. The relationship between the CNRS and IRD is regulated by a general Memorandum of Understanding as well as by the contract governing the joint structure (Data-Terra). All the cited documents have been provided by the coordinator to the European Commission during the Grant Agreement negotiation phase.

10.1.5 Project Partners

Partners are involved in the implementation of the project. In accordance with the Consortium and Grant Agreements, the partners are responsible for carrying out their contractual duties and tasks with respect to the work packages they are involved in. Partners are also required to communicate any information, fact, problem, or delay that may affect the proper implementation of the project, as well as providing all information asked by the consortium or the project coordinator, technical coordinator, technical board, management board and PMO.

10.1.6 WP and tasks leaders

The work is divided among the partners who are responsible for the implementation of their own share of the project's workplan. This workplan is divided in work packages and their associated tasks. Each work package is supervised by a specific partner (called Work Package leader), who oversees the proper implementation of the tasks and deliverables. The workplan is presented in the annex 1 part A of the FAIR-EASE Grant Agreement. In the Workplan Tables of the Grant Agreement, each work package is described including its objectives, and the tasks to be performed by the partners.
The following table presents the WP leaders, co-leaders and their deputies for FAIR-EASE at the date of submission of this deliverable:

WP number	*WP Title*	*WP leader*	*First and Last Name*
WP1	Management	CNRS	Alessandro RIZZO (Deputy: Christelle PIERKOT)
WP2	Discovery, Access and FAIR Data services	MARIS	Peter THIJSSE (Deputy: Tjerk KRIJGER)
WP3	Earth Analytics Lab – Interactive development & visualization services	IFREMER	Erwan BODERE (Deputy: Jérôme DETOC)
WP4	Interoperability, Integration, and Supporting Services	VLIZ	Marc PORTIER (Deputy: Vincent BRETON)

[19] https://www.data-terra.org/en/

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WP5	Research communities engagement: Use Cases and domains	UNINA	Maria-Luisa CHIUSANO
WP6	Dissemination, User Engagement and Outreach	Neovia	Emilie GERMETZ Corentin LEFEVRE (Co-leading)

Figure 5 – FAIR-EASE work packages

At the date of submission of this deliverable, this table presents the tasks and their related leaders for FAIR-EASE:

Task number	*Task Title*	*Task leader*
T1.1	Administrative and financial	CNRS
T1.2	Technical management	IFREMER
T1.3	Quality assurance and risk management, PMP and DMP	CNRS
T1.4	Sustainability	CNRS
T2.1	Establishing cross-domain FAIR-EASE Data Discovery and Access services	MARIS
T2.2	Developing and integrating semantic brokerage service components	NOC-BODC
T3.1	VDAP	IFREMER
T3.2	VRE	IFREMER
T3.3	Visualization services	AWI
T4.1	Data Lake Architecture Blueprint	VLIZ
T4.2	Software components for data interoperability and integration	IFREMER
T4.3	Technical implementation of FAIR-EASE data lake	CNRS
T4.4	Interfacing FAIR-EASE services to distributed computing and storage infrastructures	CNRS
T4.5	Testing and optimisation of data access and data lake for special UC datasets	OGS
T5.1	Use case 1. Earth and environment dynamics	CNRS
T5.2	Use Case 2. Environmental Bio-Geochemical Assets	Euro-Argo
T5.3	Use Case 3. Biodiversity Observation	CCMAR
T5.4	Resources Assessment and cross-domain interaction working group	UNINA
T6.1	Communication, Dissemination, Exploitation and Outreach	Trust-IT
T6.2	External Communities and users' engagement	Neovia
T6.3	Promote and evaluate FAIR principles across research communities	CNRS
T6.4	Liaison with and contribution to the EOSC and relevant European initiatives	Trust-IT

Figure 6 – FAIR-EASE tasks

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10.1.7 Project Management Office

The Project Management Office (PMO) provides support for management activities throughout the whole project implementation. For instance, it establishes mailing lists, organises meetings, creates shared workspaces, prepares the signature of contractual documents, etc.

In FAIR-EASE the PMO is shared between the coordinator CNRS and Neovia Innovation.

The PMO's role is to encourage the actors of the project to pay attention to a balanced participation of women and men in the composition of the working groups (committees, Management Board, Technical Board, etc.), but also in the allocation of decision-making roles (WP leaders, task leaders). The PMO aims to raise awareness about the importance of achieving a gender-balanced ratio of speakers in the events organized by the partners (webinars, conferences, consortium meetings, etc.) within the project. This action of awareness raising is also implemented through the organization of a “Diversity & Inclusion” workshop at the beginning of the project during the kick-off meeting.

10.1.8 Data protection

Data protection is an important process for the proper implementation of the project, its responsibility being shared between the granting authority and the partners.
The granting authority is responsible for controlling the protection of data in line with the rules stated in the Portal Privacy Statement. In case the granting authority is the European Commission, an EU agency or body, data processing will be subject to the Regulation 45/2001[20].

On the other side, partners are also committed to ensure that personal data is lawfully and fairly processed, in a transparent manner, and collected for specified, explicit and legitimate purposes. It must also be adequate, relevant, and limited to what is necessary in relation to the purposes for which they are processed, accurate and kept up to date, as well as processed in a certain way to ensure an appropriate security.

Access to personal data can be granted by partners if and only if it is required to implement, monitor, and manage the Agreement. Therefore, personal data must comply with confidentiality requirements (see section 5.2.1 on Privacy). Partners are obliged to notify the persons to granting authority when granting access and provide them with the Portal Privacy Statement.

Process for data protection in FAIR-EASE are more described in chapter 7 Ethics of the present deliverable.

[20] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32001R0045

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11 Project's structural elements

The FAIR-EASE project is based on several structural elements defined and agreed among the partners and described in the project's Grant Agreement. Each structural element is an important asset of the project's workplan towards its objectives, shall it be the project's outputs (deliverables), the description of the planned resources (budget) or the project's organization (planning and responsibilities).

In particular, the progress of the project is monitored and assessed through the evolution of these elements.

11.1.1 Deliverables and milestones

Deliverables and milestones are described in the Workplan Tables in the annex 1 part A of FAIR-EASE Grant Agreement. This section presents the different work packages (with the responsible lead partners), as well as the list of deliverables attached to the implementation of the work package in question.

The type of deliverable, the dissemination level and the due date (in months) are clearly stated in the Workplan Tables, as well as the lead partner responsible for each deliverable. Regarding the milestones, the latter also include a due date (in months) and a mean of verification, to make sure that the milestone is correctly reached.

This information can also be found on FAIR-EASE Confluence platform that has been created by the PMO.

11.1.2 Deliverables' submission process

Quality procedures are part of the reviewing process and validation of deliverables.
Before the deliverables are submitted to the funding authority, the consortium agreed on the following quality process:

- Deliverables are reviewed within the consortium before submission. Reviewers are appointed based on a common agreement between partners, and a list of selected people is available on Confluence
- Deliverables are reviewed by the project technical board before submission to the Funding Authority

To ensure both delivery in time and in quality, the quality process is incorporated into the deliverable preparation timeframe, e.g deliverables shall be drafted one month before their submission in order to allocate sufficient time for the review processes.

11.1.3 GANTT & project timeline

The GANTT chart is a graphical tool which shows the activities and tasks performed against time for a specific project. It helps to have a better overview of the project's progress and provides a better understanding of the interlinkage between various activities. The GANTT chart of FAIR-EASE was defined by all partners and is presented in the annex 1 part B of the Grant Agreement.

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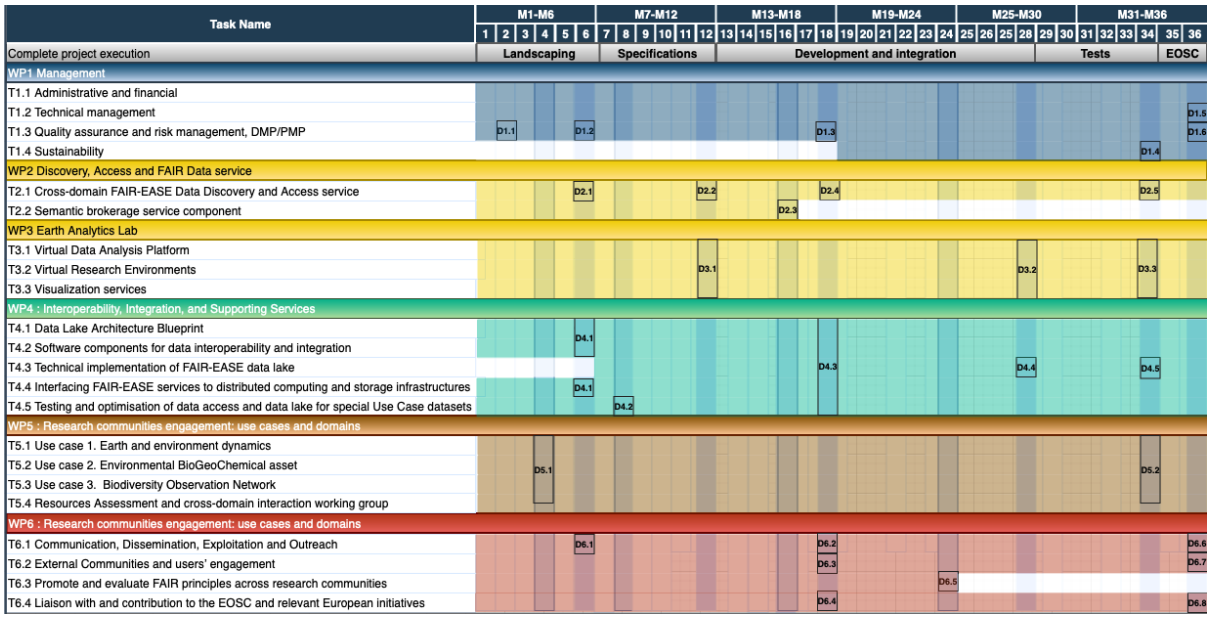

Figure 7 – FAIR-EASE Gantt chart

11.1.4 Development Cycles

As described above, the FAIR-EASE project is structured with 5 main implementation phases:

- Phase 1: Landscaping (M1-M6)
- Phase 2: Specifications (M7-M12)
- Phase 3: Development and integration (M13-M28)
- Phase 4: Tests (M29-M34)
- Phase 5: Deployment (EOSC) (M35-M36)

While the WPs and tasks structure of the project sufficiently addressed the project needs for phase 1 and 2, the Technical Board and the project partners identified a need to strengthen the transversal interactions among the project technical parts to conduct phases 3 and 4. This led to introduce the Development Cycles (DevCycle) agile method during the development, integration and tests phases.

Topics coordinators are partners responsible of the organisation and management of a DevCycle topic which is a transversal task defined in relation with the project objectives and current implemenation status.

A DevCycle lasts 3-4 months and is structured around topics which are discussed, agreed and prioritised. Each topic is under the responsibility of a topic coordinator, with active participation from relevant partners. Each DevCycle is organized in four steps:

- A two-week preparatory step, during which the consortium collaboratively generates and exchanges ideas regarding potential topics for the upcoming DevCycle
- A kick-off meeting, where potential topics are presented along with their respective objectives and work plans and then topics are selected. This step serves to disseminate information and enlist the engagement of each partner in areas where their contributions are needed
- The implementation step of the DevCycle, during which each topic focuses on executing its plans and achieving results. An intermediate meeting is held halfway

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through to share preliminary findings and ensure cross-disciplinary information exchange
- A closing meeting to present the achieved outcomes

Throughout the entirety of the DevCycles, the consortium is actively involved during the preparation, kick-off, and closing phases.
Each topic of the DevCycle is lead by topics coordinators.
Within the project's implementation framework, topics feed the formal WPs and Tasks structure, enabling cross-WP synergies and fostering closer and more fluid participation from partners in accordance with their needs. Consistency with the project's Description of Action is maintained through:

- Inclusion of WP and tasks leaders in Development Cycle topics, often serving as coordinators themselves. WPs and tasks leaders ensure the coherence of the DevCycle topics with the project DoA and tasks structure and objectives
- Oversight by the Technical Board, the Coordinator, and the Project Management Office (PMO)
- Maintenance of WP-specific meetings

As of the date of this deliverable, two DevCycles have been completed, with the third currently underway.
The provisional calendar for the project DevCycles is the following:

Table 2 - FAIR-EASE DevCycle calendar

DevCycle 1	DevCycle 2	DevCycle 3	DevCycle 4	DevCycle 5	DevCycle 6
April – June 2023	September – December 2023	February – April 2024	May – September 2024	October – December 2024	February – April 2025

Dates may be adjusted by the consortium to take into account the project development. Discussion on an additional DevCycle 7 will be discussed regarding the results achieved after DevCycle 6 and the project actions towards the deployment of its results.

The PMO supports the organisation of each DevCycle.

11.1.5 Budget

The budget of the project is agreed by all partners and includes estimated eligible costs and contributions for the action for each participant and budget category. It is presented in the appendix of the Grant Agreement, and divided into two categories of costs: estimated expenses and its related EU contributions.

At the date of the submission of this deliverable, the following table presents a simplified version of FAIR-EASE budget including main budget elements.

	Estimated eligible costs (per budget category)	*EU contribution*

Partner	*Direct personnel costs*	*Direct costs of subcontracting*	*Other direct costs*	*Indirect costs*	*Total costs*	*Maximum grant amount*
CNRS	667 680.00€	0.00€	7 001.00€	168 670.25€	843 351.25€	843 351.25
IRD	259 500.00€	0.00€	0.00€	64 875.00€	324 375.00€	324 375.00
IFREMER	195 000.00€	0.00€	4 000.00€	49 750.00€	248 750.00€	248 750.00
CCMAR	115 250.00€	0.00€	4 000.00€	29 812.50€	149 062.50€	149 062.50
EMBRC-ERIC	21 000.00€	0.00€	16 000.00€	9 250.00€	46 250.00€	46 250.00
HCMR	58 300.00€	0.00€	24 000.00€	20 575.00€	102 875.00€	102 875.00
VLIZ	253 540.00€	0.00€	4 000.00€	64 385.00€	321 925.00€	321 925.00
CINECA	76 000.00€	0.00€	4 000.00€	20 000.00€	100 000.00€	100 000.00
EURO-ARGO ERIC	45 000.00€	0.00€	4 000.00€	12 250.00€	61 250.00€	61 250.00
AWI	263 500.00€	0.00€	4 000.00€	66 875.00€	334 375.00€	334 375.00€
CNR-IIA	112 000.00€	0.00€	14 000.00€	31 500.00€	157 500.00€	157 500.00€
INGV	69 927.00€	0.00€	4 000.00€	18 481.75€	92 408.75€	92 408.75€
MARIS	210 700.00€	0.00€	4 000.00€	53 675.00€	268 375.00€	268 375.00€
MI	107 518.00€	0.00€	4 000.00€	27 879.50€	139 397.50€	139 397.50€
OGS	48 750.00€	0.00€	4 000.00€	13 187.50€	65 937.50€	65 937.50€
RBINS	61 940.00€	0.00€	4 000.00€	16 485.00€	82 425.00€	82 425.00€
ULIEGE	162 325.00€	0.00€	4 000.00€	41 581.25€	207 906.25€	207 906.25€
NEOVIA	175 500.00€	0.00€	54 000.00€	57 375.00€	286 875.00€	286 875.00€
TRUST-IT	71 500.00€	0.00€	4 000.00€	18 875.00€	94 375.00€	94 375.00€
COMMPLA	38 500.00€	0.00€	0.00€	9 625.00€	48 125.00€	48 125.00€
SZN	75 000.00€	0.00€	4 000.00€	19 750.00€	98 750.00€	98 750.00€
UNINA	130 000.00€	60 000.00€	4 000.00€	33 500.00€	227 500.00€	227 500.00€
GEOMATYS	169 950.00€	0.00€	4 000.00€	43 487.50€	217 437.50€	217 437.50€
POKAPOK	110 200.00€	0.00€	3 800.00€	28 500.00€	142 500.00€	142 500.00€
UCA	61 119.00€	0.00€	0.00€	15 279.75€	76 398.75€	76 398.75€
NOC-BODC						
TOTAL	**3 559 699.00€**	**60 000.00€**	**182 801.00€**	**935 625.00€**	**4 738 125.00€**	**4 738 125.00€**

Figure 8 – FAIR-EASE simplified estimated budget

Budget flexibility rules are stated in the Article 5.5 of the Grant Agreement and provide an overview of the conditions and procedures if adjustments are required in the budget throughout the project's lifetime.

Budget flexibility rules allow transfers between partners, budget categories to modify the estimated budget presented in the annex 2 of FAIR-EASE Grant Agreement. These operations do not require amendments if the action is implemented as mentioned in the annex 1 of the document.

Costs related to subcontracts that are not provided for in the annex 1 require an amendment to the agreement, that should follow the procedure described in the section 7. "Procedure for change". This procedure is also described in the article 39.2 of the FAIR-EASE Grant Agreement.

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11.1.6 Risk matrix

Risks represent part of the project success or failure and are important to anticipate and mitigate. Therefore, risks and appropriate mitigation measures are identified and described in the Workplan Tables of the FAIR-EASE Grant Agreement (Annex 1). Risks are classified based on the likelihood to happen and the impact it could have on the project. Mitigation solutions implementation are controlled by the Technical Board and/or the Management Board.

At the date of submission of this deliverable, the consortium has identified the following risks for FAIR-EASE :

Risk Description	*Risk Likelyhood*	*Risk Mitigation*
Risks identified at the proposal stage		
Disputes between partners	Low	The CA and D1.1 will contain necessary conflict resolution procedures.
Failure of WP leaders to perform adequately or their unavailability	Low	Regular meetings organized to address this in good time. A deputy WP Leader will be appointed prior to the start of the project.
Variation from the calendar, budget or the planned result	Low	Regular meetings organized to address this in good time. A deputy WP Leader will be appointed prior to the start of the project
Failure to commit to the project work plan, resulting in execution delays	Low	The WP Leaders and the Project Coordinator will impose specific corrective actions throughout the project lifecycle to provide the necessary flexibility ensured by a carefully designed work plan.
Lack of interest from the research communities in contributing in, validating and using the integrated and customized solutions	Low	Communities are involved in the very design of this project. The Use-cases belong to large thematic communities, and can build upon a strong user base and, being the services already pre-operational, the appropriate channels to ensure the uptake of the up-scaled services are already in place.
Failure or major difficulties in deploying the services	Low	Partners responsible for the services' integration and deployment are very experienced and have a positive track in delivering services and are involved in a number of related projects nationally and transnationally.
Failure to coordinate effectively with EOSC and EOSC-related initiatives	Low	Many of the consortium key partners have a direct involvement in the EOSC-related initiatives as well as in thematic clusters. Through them, any lack of coordination can be promptly addressed.

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Risks added at mid-term		
Lack of transversality between WPs, risk of silo effect	Medium	Creation and installation of the Development Cycle approach
Deployment of the project first versions of services on a dedicated infrastructure	High	Engage in a partnership with an infrastructure provider
Changes in the EOSC general framework during the project duration	Medium	Many of the consortium key partners have a direct involvement in the EOSC-related initiatives as well as in thematic clusters. Through them, any lack of coordination can be promptly addressed. The consortium also relies on the coordination work conducted at the EOSC level

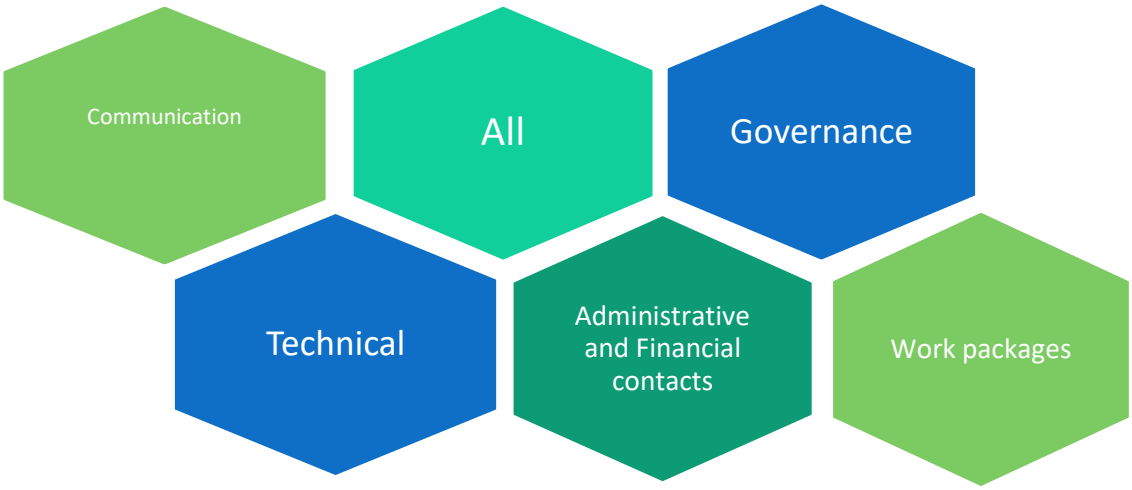
Figure 9 – Risk Matrix

12 Daily basis management

12.1.1 Group management/Contact lists

With the aim to facilitate and structure the daily basis management of the project, sub-groups have been created based on the project's work packages or main themes such as the administrative and financial sub-group.

The sub-groups' structure for FAIR-EASE is the following:



These sub-groups are associated with specific contact lists, as well as collaboration tools (see the section 5.3 on "Tools and collaboration tools").

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12.1.2 Project's templates

Document templates are provided to the partners and available on the FAIR-EASE Confluence platform. At the beginning of the project, three templates are usable:

Deliverables

PowerPoint presentations (communication)

Meetings minutes

Additional templates will be added in the course of FAIR-EASE, following the project's needs, such as templates related to reportings.

12.1.3 Privacy

Documents and information shared during the project are subject to privacy rights. Confidentiality levels are determined for shared documents, either considered as confidential or public. The article 13.1 of the FAIR-EASE Grant Agreement states that any information (e.g. data, documents, or other material) that have been declared as "sensitive information", must remain private and should not be communicated outside of the project for its whole duration. This rule implies compliance of all parties to obligations related to confidentiality and non-disclosure of information.

Sensitive information may be disclosed by partners to third parties or their personnel, if and only if they need to know about this information to implement the project's workplan, and are compelled by an obligation of confidentiality.

Confidentiality obligations no longer apply in the following cases:

- If the disclosing party accepts to release the other party
- If the recipient already knew about the information, or was provided to him without obligation of confidentiality by a third party, which was not compelled by any obligation of confidentiality
- If the recipient can prove that the information was conceived without resorting to confidential information
- If the information is made generally and publicly available, without infringement to confidentiality obligations
- If the information release is required by the EU, international or national law

12.1.4 Tools and collaboration tools

The principal collaborative tool available for the FAIR-ASE partners is a dedicated Confluence platform, serving as the one-stop shop for all information (minutes, template, document library, etc.). A mattermost chatting tool and a Github have also been implemented. These latter are aimed at facilitating collaboration among partners from different European countries.

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In a project involving numerous partners, a smooth and transparent communication is crucial for the project's success. Therefore the PMO provides access to collaborative communication tools, such as video conferencing (using Zoom), mailing lists, and translation tools (using the European Commission translation service).

12.1.5 Meetings

Meetings are a core element of daily basis management of a project, since they help keeping partners updated about the project's progress and allow discussion about specific points. It also contributes to strengthen collaboration between the different stakeholders.
Non exhaustively, two regular meetings are organised both for the Technical and Management Boards. Consortium meetings will also be organized in the course of the project.

12.1.6 Risk management

Risk management is crucial to ensure the success of the project since they can seriously impact the achievement of its objectives. They need to be anticipated, monitored, and mitigated on a continuous basis. Risks must be properly identified and assessed in order to develop an adequate strategy to potential or actual risks arising, in accordance with the risk tolerance of the project. Risk monitoring intervenes in the assessment of the developed strategy to control its efficiency in response to the associated risk. The risk matrix (see section 4.5) provides support in the identification and classification of the risks for a more efficient response strategy.
In FAIR-EASE the risk management is ensured on a continuous basis by the WPs leaders and reported/discussed in the Technical Board. Mitigation measures are deployed at the consortium level, while the Management Board is involved if an arising problem impacts the project scheduled workplan, finance or objectives.

13 Gender equality and inclusion

Gender gaps and inequalities remain in the European Research Area (ERA), and more specifically for FAIR-EASE in all domains related to the digital transformation of science. Root causes contributing to the digital gender divide are numerous, among them hurdles to access and use of ICT devices and digital technologies, education and lack of technological literacy, as well as inherent biases and socio-cultural norms that lead to gender-based digital exclusion. The latter at times may also take the form of a "glass ceiling", preventing women from expressing and developing their leadership abilities and entrepreneurial endeavors.

At his level, FAIR-EASE aims to participate in the common effort to tackle Gender Equality challenge – and moreover to a more inclusive science – in Horizon Europe[21] and in the ERA with two main objectives.

The first objective is linked to the project management and implementation, in order to ensure that FAIR-EASE builds an inclusive environment and equally promote the participation

[21] There are three main levels of action regarding Gender Equality in Horizon Europe: i. Requiring a Gender Equality Plan (GEP) for public actors; ii. Integrating the gender dimension into research and innovation content and iii. Increasing gender balance.

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of everyone regardless of its gender, origin, religion... This implies, for instance, that leadership positions are equally fulfilled or that participation to project presentation or groups follow a fair balance of women, men and non-binaries. In this regard, language is also very important. The project will prioritize the use of inclusive pronouns (using more they instead of he/she for example).

FAIR-EASE shall also take care that the project represents an equal opportunity for its participants to advance their careers. The consortium will make sure that it respects its obligations regarding flexible working conditions, access to child-care, maternity leave and parental leave.

In order to ensure the respect of this engagement, the following KPI have been defined:

KPIs
Boards and committees are composed of an equal percentage of men and women.
At least half of work packages leaders are women.
There is a balance participation of women/men in public events the project either organize or participate to

The second objective is linked to the development of innovative services and to ensure that no gender-bias harm the implementation and exploitation of such services. While by definition, the basis of the project content (Earth systems data and related services) is not gender-based, our focus will be put on making our services gender neutral. Furthermore, the dissemination WP will target some sciences events with example showing international opportunities for women in science. The goal is to show that women can be researchers in the field covered by Fair-EASE and encourage women to be a part of such projects.

The project should also communicate on its website about the engagement of the whole Fair-EASE consortium in terms of gender equality.

A dedicated action plan will be put in place that will, among others, take build on existing skills, knowledge, and good practices of both the partners and existing projects and initiatives at the EU level.

14 Environmental impact and sustainability

14.1.1 Environmental impact and sustainability

Sustainability is a transversal dimension of all human activities among which research and innovation activities in general, to which belong international collaborative projects. While mitigating the environmental impact of the project implementation rely on the partners' practices, at his level, FAIR-EASE is committed to participate to the realization of the EU objectives related to sustainable development in all their dimension and to contribute to a new generation of projects and research services that not only limit the environmental footprint of research activities but contribute in a positive way to the sustainability challenges.

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To act on this commitment, FAIR-EASE has two objectives.

The first objective is linked to the project management and implementation and to get as close as possible to an "environmental neutral" research project. Actions taken in the frame of this first objective is described more extensively in section 14.2.

The second objective is linked to the design and implementation of new and innovative services and their impact. The environmental impact of the FAIR-EASE infrastructure and services will be incorporated in the technical implementation of the project since the beginning of the project in order to conceive the project outcomes as the most environmental friendly as possible. Such a dimension will also be incorporated when drafting the project sustainability plans.

14.1.2 Environmental impact in project management and implementation

To mitigate its environmental impact, the FAIR-EASE consortium decided to analyse and put dedicated actions towards activities that would be under its responsibility. The project can rely on several initiatives which took place at different levels (institution, organisation…) to analyse the research sector environmental impact, produce the related sustainability plans and implement them. Yet, we don't have any knowledge of holistic guidelines or roadmaps specifically dedicated to EU-funded and international collaborative projects and therefore the proactive engagement of the FAIR-EASE consortium shall be seen as an exploratory action and a continuous work in progress.
However, the climate emergency is driving the consortium partners to take into account the environmental dimension throughout the project. After preliminary discussions prior to this document, the partners have identified two main measures to reduce as much as possible their carbon impact:

- **The respect of specific guidelines drafted by the coordinator team and the project management office** and shared with all the project's partners. These guidelines include four categories: "Project publications and dissemination products", "Organising green events", "Materials" and "Food and drinks". They largely came from the Programme Manual of the Interreg Euro-MED program.
- **Produce an estimation of the carbon footprint of the project**. At the end of the project, the partners could record the amount of greenhouse gas produced during the project through a pre-established methodology. This is particularly based on the purchase costs of each partner in the project budget and will be produced through the GES 1point5 tool, which enabled French research laboratories to calculate their carbon footprint for several years.

This calculation is not intended to be exhaustive, but rather to identify the project's main sources of emissions.
Since no methodology or guidelines were known by the consortium, the PMO created ad-hoc methodology based on existing tools (French initiative Labos 1.5[22]) and the inherent characteristics of Horizon Europe collaborative project.
A first intermediate report covering the two main measures has been issued which will be updated alongside the project technical and financial reports.

[22] https://labos1point5.org/

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15 Reportings and financial monitoring

15.1.1 Monitoring and control

Monitoring and control are a continuous process that takes place throughout the whole project. This is aimed at checking that the activities carried out are in accordance with the workplan, as well as to monitor the project's performance. This task consists in gathering information about the state of the project, and its overall health. The scope, schedule, costs, and risks will be assessed in order to anticipate any associated problem.

Schedule monitoring helps to foresee if changes in the Work Plan (see section 7 on Procedures for change) would not impact the implementation of the project within the deadlines.

Costs' monitoring is aimed at ensuring that the actual costs comply with the estimated budget set out in the Grant Agreement and anticipate over or underspending. Risk monitoring is developed in the sections 4.5 on Risk Matrix and 5.5. on Risk management.

Monitoring and control also refer to manage the proper implementation of the project's objectives and deliverables' submission. Based on a continuous assessment, corrective actions can be suggested and established in case some issues arise in the project's proceeding.

15.1.2 Reporting procedures and periods

Reporting periods are specified in Data Sheet (Point 4.2), and the procedure is described in article 21 of the FAIR-EASE Grant Agreement. At the date of submission of this deliverable, three reporting periods are planned, the first one being from month 1 to month 12 – e.g from 01/09/2022 to 31/08/2023, the second from month 13 to month 24 – e.g from 01/09/2023 to 31/08/2024, and the third one from month 25 to month 36 – e.g from 01/09/2024 to 31/08/2025.
Reportings can be divided into two categories, meaning continuous and periodic reportings.

15.1.3 Continuous reporting

Continuous reportings include deliverables, milestones outputs and outcomes, risks, and indicators, that allow a constant evaluation of the project's progression. Partners are required to report continuously on the European Funding and Tender Portal[23] throughout the project, based on the timing and conditions agreed with the Granting Authority.

[23] https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/home

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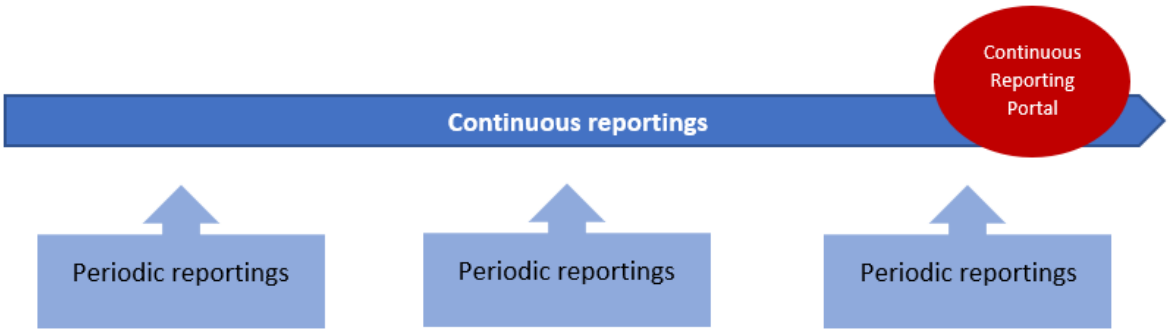

Figure 10 – Continuous and periodic reportings

15.1.4 Periodic reporting

This section presents the procedure for periodic reporting under projects financed by Horizon Europe.

Periodic reports must be provided by the project coordinator within 60 days after the end of each reporting periods. Periodic reports must be composed of a periodic technical report and a periodic financial report.

The technical part includes a detailed presentation of the work carried out by the partners, an overview of the action implementation based on an EU template, as well as a justification for the differences between expected work to be carried out and what was actually realised. It must also be composed of a "Plan for the Exploitation and Dissemination of the Results", a summary for publication by the Commission or an EU agency.

The financial part must include an individual financial statement from each beneficiaries and its affiliated entities covering the associated reporting period, an explanation of the use of resources, as well as information on subcontracting and in-kind contributions provided by third parties. Finally, it must contain a "Periodic Summary Financial Statement" that includes the request for interim payments (except for the last reporting period).

The project coordinator is responsible for providing the "Final Report" to be delivered within 60 days after the last reporting period. This report also contains a technical and a financial part. The following graph presents the elements contained in these two parts.

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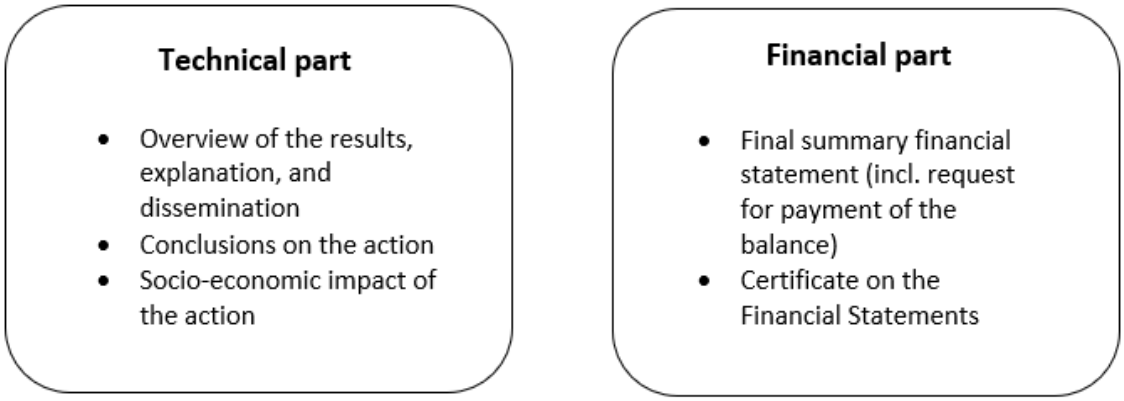

Figure 11 – Main elements for the EU periodic reporting

15.1.5 Costs eligibility

15.1.5.1 Eligible costs

Eligible costs can be calculated within three sub-categories: actual, unit and flat-rate costs, which meet specific criteria.

15.1.5.2 Actual costs

- They must be actually incurred by the beneficiary
- They must be incurred in the period of project's duration after the starting date, excepted costs related to the submission of the periodic report for the last reporting period and the final report, which may be incurred forwards
- They must be stated in the estimated budget
- They must be related to the action described in the Grant Agreement and necessary for its implementation
- They must be identifiable and verifiable, and recorded in the beneficiary's accounts following the accounting standards of the beneficiary's country of establishment, and in accordance with the beneficiary's usual cost accounting practices
- They must conform with applicable laws on taxes, labour, and social security
- They must be justified, reasonable and in accordance with the principle of sound financial management, especially economy and efficiency

15.1.5.3 Unit costs

Unit costs must be actually used or produced by the beneficiary within the project's implementation period and be essential for implementing the action. Finally, their number must be identifiable, verifiable, and supported by records and documentation.

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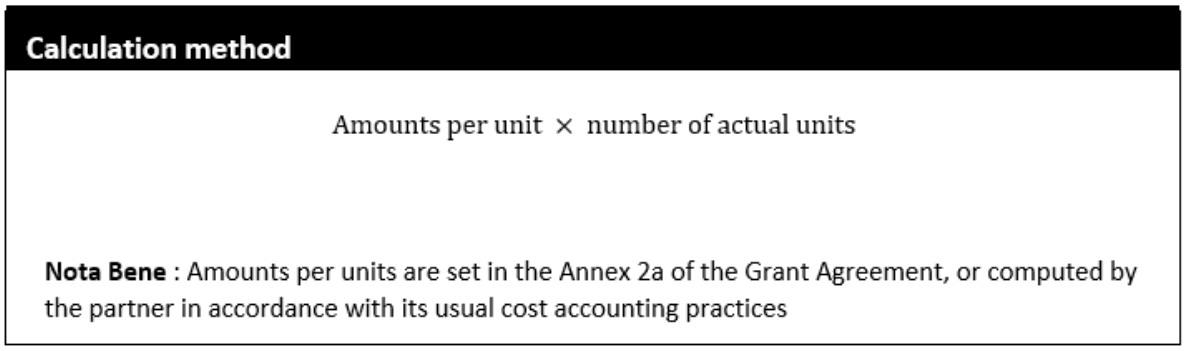

Figure 12 – Unit costs calculation method

15.1.5.4 Flat-rate costs

Flat-rate costs must be declared under one of the budget categories set out in Annex 2 of the Grant Agreement. The costs and contributions to which it is applied must be eligible, meaning that they must be in accordance with eligibility conditions mentioned above, and relate to the period of project's duration.

15.1.5.5 Categories of eligible costs and calculation methods

Each cost must comply with the general conditions mentioned above, as well as particular conditions respective to each category.

15.1.5.6 Personnel costs

Personnel costs are the expenses linked to each partners' employee working to implement the project. Actual costs can be claimed by each partner following one of the available calculation methods set out in the Grant Agreement and described below. The general case is for the partners to declare the number of hours worked by each person on the project multiplied by the costs. This method requires that each partner has put in place a time record system, for instance through the establisment of timesheets.

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Calculation method

$$\text{Daily rate} \times \text{nb of day} - \text{equivalent worked on the action}$$

Daily rate:

$$\frac{\text{actual personnel costs during the months within the reporting period}}{\text{maximum declarable day} - \text{equivalents}}$$

Maximum declarable day-equivalents for each reporting period:

$$\left(\frac{215}{12} \times \text{nb of months}\right) \times \text{working time factor}$$

Nota Bene: The total number of day-equivalents declared in EU grants, for a person for a year, cannot be higher than 215, minus time spent on parental leave (if any).
The number of months corresponds to the number of months during which the person is employed within the reporting period. Working time factors equal 1 for full-time, 0.5 for 50% part time etc.

Figure 13 – Personnel costs general calculation method

Costs for employees or equivalents:
They must comply with general eligibility criteria mentioned above. These costs notably include salaries (incl. parental leave), social security contributions, taxes and other costs included in the remuneration.

Project-based remuneration:
This method refers to legal entities that provide additional payments or contracts with higher payments to employees working on projects as part of their normal remuneration practice. In this case, European payment levels should not exceed those of national projects. Otherwise, not the full amount is eligible for EU funding and the difference between the two payment levels cannot be charged on Horizon Europe action.

Apart from those general cases, particular situation may arise that are specifically described in the Grant Agreement. Partners that encounter such situation may refer to the GA. The situations are:

- Costs for natural persons working under a direct contract with the beneficiary, other than an employment contract
- Costs of personnel seconded by a third party against payment
- Costs of owners of beneficiaries that are SMEs
- Costs of beneficiaries being natural persons

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15.1.5.7 Direct subcontracting costs

Subcontracting costs include related duties, taxes and charges (e.g. non-deductible or non-refundable VAT). They must be computed based on the costs actually incurred and comply with the Article 6.2.B of the Grant Agreement.

15.1.5.8 Other direct costs

Travel costs and related subsistence allowances:
These costs include related duties, taxes and charges (e.g. non-deductible or non-refundable VAT), and must comply with the partner's usual practices on travel.

Depreciation of equipment, infrastructure, or other assets:
They must be purchased in accordance with Article 6.2.C.2 of the Grant Agreement, and must be written off in accordance with international accountings standards and the partner's usual accounting practices.

Costs of renting or leasing equipment, infrastructure of other assets:
These costs include related duties, taxes and charges (e.g. non-deductible or non-refundable VAT). They are eligible if they do not exceed the depreciation costs of similar equipment, infrastructure, or assets and exclude any financing fees.

Costs of equipment, infrastructure or other assets contributed in-kind against payment:
They should not exceed the depreciation costs of similar equipment, infrastructure or assets, and exclude any financing fees to be eligible. They must also comply with the Article 6.1.

Costs of other goods, works and services:
They include related duties, taxes and charges (e.g. non-deductible or non-refundable VAT). They are considered eligible if and only if they are purchased specifically for the action in accordance with the Article 6.2.C.3 of the Grant Agreement, or are contributed in-kind against payment in accordance with Article 6.1. They notably include consumables and supplies, dissemination, protection of results, CFS, Certificates on the Methodology, translations and publications.

Costs of internally invoiced goods and services:
These costs are considered as eligible if they are directly used for the action, declared as unit costs in line with usual costs accounting, and computed based on the actual costs for the good or service recorded in the partner's accounts. Unit costs must exclude any costs of items indirectly linked to invoiced good/service production.

15.1.5.9 Indirect costs

By opposition to direct costs, indirect costs cannot be directly attributed to the action implementation due to their indirect link.
They are eligible if and only if they are declared based on the flat-rate of 25% of the eligible direct costs, and exclude:

- Costs of subcontracting

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- Costs of in-kind contributions provided by third parties not used in the partner's premises

15.1.6 Ineligible costs

Which costs are considered ineligible?

By definition, ineligible costs are all costs that do not comply with the conditions for eligible costs mentioned above, especially:

- Costs related to return on capital
- Debt and debt service charges
- Provisions for future losses or debts
- Interest owed
- Currency exchange losses
- Bank costs charged by the beneficiary's bank for transfers from the granting authority
- Excessive or reckless expenditure
- Deductible or refundable VAT
- Costs incurred during suspension of the implementation of the action
- Costs declared under another EU grants

As all these eligibility conditions and rules could be quite complex, a dedicated workshop on EU Reporting Requirements has been organised by PMOs at January, 5th 2023 and a dedicated dynamic page gathering useful informations and resources on Horizon Europe's rules has been implemented on Confluence.

16 Procedures for change

16.1.1 Specific cases of procedure for change

Some elements detailed in the Consortium and Grant Agreements can be changed throughout the project, due to unforeseen situations. The Management Board should be notified of the change intention and provided with a justification and a solution proposal.

Based on this demand, the Management Board will determine whether the change requires an amendment of contractual documents, for instance if it is planned to subcontract a task or an activity while subcontracting was not scheduled and therefore agreed by the European Commission in the Grant Agreement.

Deliverables and milestones are usually associated to a change in dates of submission, which will require an amendment if it is likely to affect the achievement of objectives, and the implementation of the project. This condition also applies to changes in the Work Plan, which would require an amendment in case a substantial change affects the delivery of results and quality of the project.

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Regarding a change in the budget, the estimated budget presented in the Grant Agreement's appendix can be modified without amendment if it takes the form of transfers between beneficiaries, budget categories, if and only if it does not imply a substantial change in the action's implementation as described in Annex 1 of the FAIR-EASE Grant Agreement.

16.1.2 Beneficiary termination

If one or more partners leave the project, the participation must be ended by the coordinator who should notify the decision to the granting authority and the partner concerned.
The notification must include the reasons of the participation termination, the opinion of the partner concerned, and the date on which the termination takes effect.

The coordinator is responsible for submitting **within 60 days** after the termination:

- A report on the distribution of payments to the beneficiary concerned
- A termination report from the beneficiary concerned, including an overview of the work progress, the financial statement, the explanation on the use of resources and the CFS (if applicable).
- A second request for amendment concerning other required amendments (e.g. reallocation of the tasks, estimated budget of the beneficiary concerned, addition of a new beneficiary if required)

16.1.3 Accession of new beneficiaries

As they can ask for the termination of a partner's participation to the project, partners can ask for the addition of new beneficiaries. In this case, the coordinator will make a request for amendment, including an Accession form that the new beneficiary will sign through the Portal Amendment tool. The new partners will be requested to comply with rights and obligations set out in the FAIR-EASE Grant and Consortium Agreements from the date of accession.

16.1.4 Amendment procedures of contractual documents

In the course of the project, some elements might be modified, requiring an amendment of contractual documents. Conditions and procedures are stated in the article 39 of the FAIR-EASE Grant Agreement.
"The Agreement may be amended, unless the amendment entails changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants".

In order to be valid, the request must be electronically signed by the party asking for the amendment on the Portal Amendment tool. In general cases, the request should include the reason of the amendment and associated supporting documents.
In case of a request for a change of coordinator, the demand must be done by another party, if the coordinator did not agree with that decision. In this specific case, the request should also include the coordinator's opinion.

Regarding the adoption of the amendment, the request must be signed within 45 days of notification by the party who receives it. If the party in question does not agree with the request, it must formally notify its disagreement within 45 days as well.

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The amendment enters into force from the day of signature by the receiving party and takes effect on the date agreed by all the parties. In case there is no specific agreement, the date is when the amendment enters into force.

Finally, if the request has not received any answer after 45 days, it is considered as rejected.

17 Audits and reviews

Audits and reviews can be conducted by the granting authority, the European Commission or by European agencies and bodies.
The granting authority is entitled to carry out reviews and audits to check the correct implementation of the action, compliance with obligations set out in the Agreement, as well as to assess costs, deliverables, and reports.

Concerning reviews, the granting authority can conduct them during the implementation of the action based on the time limit set out in the Data Sheet. Coordinators and beneficiaries concerned must be notified of the review, cooperate, and provide all required information with transparency.

The granting authority can be assisted by an outside expert, which must be notified to the coordinator and beneficiaries concerned who can object to this decision. Based on the evaluation, a project review report will be produced by the grant authority and sent to the coordinator or beneficiaries concerned to make observations. Audits are subject to the same conditions than reviews except that the granting authority will have to produce a draft audit report. The European Commission has the same rights as the granting authority regarding audits and reviews.

Finally, audits and reviews can be conducted either by the European Anti-Fraud Office (OLAF), the European Public Prosecutor's Office (EPPO) or the European Court of Auditors (ECA).
The beneficiaries concerned must therefore cooperate with the body conducting the review or the audit, providing all required information, documents (e.g. accounts, salary statements or personal data).

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Annex A - Detailed list of Research Outputs generated or produced by the project (M6-M18)

The data/research outputs addressed by the FAIR-EASE project for the reporting period M6-M18 are detailed below.

Project results (deliverables, milestones, reports)

- FAIREASE-Deliverables List
- Grouped publications for FAIR-EASE at Zenodo

Scientific publications, participation in webinar, conference or workshop

- Grandin, R., Boichu, M., Mathurin, T. Pascal, N., "Automatic estimation of daily volcanic SO2 gas flux from TROPOMI satellite observations: application to Etna and Piton de la Fournaise". In review in *Journal of Geophysical Research : Solid Earth. ESS Open Archive.* November 22, DOI: 10.22541/essoar.170067242.21872660/v1, 2023
- Boichu, M., Grandin, R., Blarel, L. et al. Growth and global persistence of stratospheric sulfate aerosols from the 2022 Hunga Tonga-Hunga Ha'apai volcanic eruption. *Journal of Geophysical Research*: *Atmospheres*, *128,* e2023JD039010, https://doi.org/10.1029/2023JD039010, 2023.
- Boichu, M., Grandin, R. et al., 2023 international workshop on recent advancements in remote sensing and modeling of aerosols, clouds and surfaces, Lille, oral, May 2023.
- Boichu, M., Grandin, R., Blarel, L. et al. Growth and global persistence of stratospheric sulfate aerosols from the 2022 Hunga Tonga eruption, « Hunga Tonga Impacts » Science international SPARC/SSiRC workshop, oral, May 2023.
- Boichu, M., R. Grandin, A. Behera, T. Shreve, T. Mathurin, N. Pascal, J. Riedi et al., Near real time monitoring of volcanic activity from space, Première rencontre scientifique volcanologiques, colloque CNFGG / SNOV, Clermont-Ferrand (France), Oct 2023.
- Boichu, M., R. Grandin, et al. Etude multi-échelles des aérosols volcaniques : depuis leur source jusqu'à leur impact sur le climat, AEROCLIM workshop on the climatic impact of aerosols,, Toulouse, Oct 2023.
- Boichu M., R. Grandin, T. Shreve, T. Mathurin et al., Near-real time monitoring of volcanic activity from space : an interdisciplinary effort from Solid Earth and Atmospheric Sciences communities (Interface TS-A), PNTS (Programme National de télédétection spatial) scientific day « Télédétection aux interfaces », invited oral, May 2023.
- Schlitzer, R. and S. Mieruch-Schnülle, The GEOTRACES Intermediate Data Products – Rich resources for research, education and outreach, Oceanography, in print, 2024.
- Schlitzer, R. and S. Mieruch-Schnülle. Online Analysis and Visualization of BGC-Argo Data with webODV, GO-BGC/BGC-Argo webinar hosted by the US Ocean Carbon and Biogeochemistry program, June 20 2023, https://www.youtube.com/watch?v=neTx8u_kze8, 2023.
- Huber, R., Pierkot, C., Vernet, M., and Strollo, A.: Implementing FAIR metrics and assessments for the Earth and Environmental Sciences, EGU General Assembly 2023, Vienna, Austria, 24–28 Apr 2023, EGU23-8006, https://doi.org/10.5194/egusphere-egu23-8006, 2023
- Linck Rosenhaim, I., S. Mieruch-Schnülle, R. Schlitzer. Data preparation for the development of a user-friendly, free, online, and interactive platform for the visualization and analysis of interdisciplinary data, https://doi.org/10.5194/egusphere-egu23-14352, 2023.
- Mieruch, S., I. Linck Rosenhaim, R. Schlitzer. The MOSAiC webODV: Interactive online data exploration, visualization and analysis, https://doi.org/10.5194/egusphere-egu23-13807, 2023.

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- Vernet, M., Bodere, E., Detoc, J., Pierkot, C., Rizzo, A., and Carval, T.: PANGEO multidisciplinary test case for Earth and Environment Big data analysis in FAIR-EASE Infra-EOSC project, EGU General Assembly 2023, Vienna, Austria, 24–28 Apr 2023, EGU23-14547, https://doi.org/10.5194/egusphere-egu23-14547, 2023.
- Jossé, M., Detoc, J., Bodéré, E.: Galaxy for the Earth system and biodiversity. https://galaxyproject.org/events/gcc2023/
- C.Pierkot, A. Rizzo, W. Nyberg Åkerström, Y. Le Franc, S. Sansone, D. Broeder, A. Kokkinaki and C. Jonquet : EOSC Symposium, Semantic interoperability for data and metadata session, Madrid, September 2023, https://symposium23.eoscfuture.eu/symposium/semantic-interoperability-for-data-and-metadata/
- Rizzo, A., Lefevre, C., Mancarella, C., Greco, A., Pierkot, C., & Vernet, M. (2022). FAIR-EASE Poster 2022. Zenodo. https://doi.org/10.5281/zenodo.8183381
- Christelle Pierkot, Research objects FAIRness assessment for Earth and Environmental science applications, FAIR-IMPACT all hands meeting, October 2023. https://doi.org/10.5281/zenodo.10260030
- Katrina Exter, Research objects FAIRness assessment for Earth and Environmental science applications, OSFAIR meeting, Sept 26, 2023. No DOI.
- Katrina Exter, Navigating data lakes for Earth and marine science: FAIR Data management and Service Interoperability in practice, OSFAIR workshop, Sept 27, 2023. https://zenodo.org/records/8403128

Source code produced/modified/extended or integrated in FAIR-EASE services

- FAIR-EASE general Git : https://github.com/fair-ease
  - UDAL
    - https://github.com/fair-ease/py-udal-interface
    - https://github.com/fair-ease/py-udal-fe-impl
    - https://github.com/fair-ease/dataset-demand-register
  - Pilot 5.1.1 (Coastal Dynamics)
    - DIVand
      DIVAnd adapted notebook https://github.com/fair-ease/Divand-Galaxy-ext
    - Source
  - Pilot 5.1.2 (Earth Critical Zone)
    - Holoviz adapted notebook on NDVI
  - Pilot 5.1.3 (Volcano)
    - Copernicus Data Space Ecosystem adapteds notebook
  - Pilot 5.2 (Ocean Bio-Geochemical Observation)
    - Canyon-B
    - Scoop-Argo
  - Pilot 5.3 (Biodiversity Observation)
  - IDDAS
- External source code repositories
  - IDDAS
    - GeoDab :
      - https://github.com/ESSI-Lab/DAB
      - https://seadatanet.geodab.eu/gs-service/search?view=fair-ease
    - Semantic Analyser : https://semantics.bodc.ac.uk/ The source code will be shared in the FAIR-EASE git
  - EAL
    - E-infrastructure
      - FAIR-EASE Galaxy Europe instance : https://earth-system.usegalaxy.eu/

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- Galaxy tools
  - Argo data access for global ocean in situ observing system (Galaxy Version 0.1.15+galaxy0)
  - Obis occurrence retrieve data (Galaxy Version 0.0.2)
  - Copernicus Data Space Ecosystem sample notebooks to access and discover data (Galaxy Version 0.0.1)
  - Holoviz ecosystem High-level tools to simplify visualization in Python (Galaxy Version 0.0.1)
  - Stac catalog for searching, aggregating and downloading data (Galaxy Version 2.11.0)
  - Source Sea Observations Utility for Reprocessing, Calibration and Evaluation
  - Interactive DIVAnd notebooks Data-Interpolating Variational Analysis in n dimensions (Galaxy Version 0.0.5)
  - ODV interactive plotting tool for geo-referenced data (Galaxy Version 5.6.5.1)
  - QGIS interactive geographic information system (GIS) (Galaxy Version 3.34)
  - Interactive HDFView tool Desktop application to display netcdf, hdf4 or hdf5 files
  - Scoop 3 Argo Interactive visual quality control of Argo netCDF files
- Data exploration and visualization
  - webODV deployment as part of EAL
  - Examind Community
- Volcano pilot platform
  - Volcano Space Observatory

Data produced or transformed by the project

- Pilot 5.3.1 : RO-crate specifications and example manifests
  - MetaGOflow-Data-Products-RO-Crate - example ro-crate for the MetaGOflow data products and generating script
  - MetaGOflow-Sequence-Data-RO-Crate - example ro-crate for the MetaGOflow sequence data
  - observatory-rformosa-crate - EMO BON observatory metadata ro-crate for station Ria Formosa, Algarve, Portugal (plus an additional 17 repositories for other EMO BON stations)
- Semantic Analyser (Part of WP2)
  - https://github.com/fair-ease/IDDAS/tree/main/Dataset

Project internal support (presentations, meeting notes, meeting records, schema,...)

- Private :
  - FAIR-EASE Confluence space
  - FAIR-EASE Google Drive
- Public :
  - FAIR-EASE second annual meeting (Madrid, September 2023)
  - UDAL General introduction : 20240209_FW_D3T2 IDDAS and UDAL

Project non-internal webinars, workshops, communication materials

- Project Website : https://www.fairease.eu/
- YouTube channel : https://www.youtube.com/@fair-ease7206

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- 1st webinar: https://fairease.eu/events/first-steps-towards-integrated-use-environmental-data
- 2nd webinar : https://fairease.eu/events/mythical-data-lake
- Galaxy Training :
    - https://training.galaxyproject.org/training-material/topics/climate/tutorials/ocean-data-view/tutorial.html
    - https://training.galaxyproject.org/training-material/topics/climate/tutorials/ocean-variables/tutorial.html
    - https://training.galaxyproject.org/training-material/topics/ecology/tutorials/QGIS_Web_Feature_Services/tutorial.html
    - https://training.galaxyproject.org/training-material/topics/climate/tutorials/sentinel5_data/tutorial.html
    - https://training.galaxyproject.org/training-material/topics/ecology/tutorials/obisindicators/tutorial.html
    - https://training.galaxyproject.org/training-material/topics/ecology/tutorials/ndvi_openeo/tutorial.html
- Galaxy Community Hub (blog and communication) :
    - https://galaxyproject.org/news/2023-10-06-qgis/
    - https://galaxyproject.org/news/2023-10-17-earth-system/
    - https://galaxyproject.org/news/2023-10-18-odv/
    - https://galaxyproject.org/news/2024-02-04-jupyterlabs/

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Annex B – References

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