



# Task 5.5: Data Management and data stewardship Training

[HCMR]

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## Acronyms and abbreviations

CC-BY 4.0	Creative Commons licence
DMP	Data Management Plan
DTO	Digital Twin of the Ocean
EOSC	European Open Science Cloud
EMODnet	European Marine Observation and Data Network
FAIR	Findable, Accessible, Interoperable, Reusable
INSTAC	In Situ Thematic Assembly Centre
NODC	National Oceanographic Data Centre
PI	Principal Investigator
RI	Research Infrastructure
TA	Transnational Access
VRE	Virtual Research Environment

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## Executive Summary

The deliverable (D5.4) reports on the implementation and initial outcomes of the Data Management and Data Stewardship Training under Task 5.5 of the Horizon Europe funded AQUARIUS project (2024–2028) providing transnational access to marine and freshwater Research Infrastructures. AQUARIUS supports research aligned with key European and international policy frameworks, including the EU Mission Restore our Ocean and Waters by 2030 and the European Digital Twin of the Ocean (DTO).

AQUARIUS Transnational Access (TA) activities generate multidisciplinary and heterogeneous datasets, requiring coordinated data management to ensure long-term usability and reuse. To address this, the project has established a dedicated Data Management Strategy and operational workflow, defined in the Data Management Plan (Deliverable D6.2) and aligned with FAIR principles and Open Science practices. Targeted training is essential for the effective implementation of this approach by TA project teams.

The Data Management and Data Stewardship Training equips TA scientific teams with the practical skills needed to manage, document, and publish AQUARIUS data in a FAIR manner through European data infrastructures. Training is mandatory and delivered through online webinars, complemented by ongoing support from expert data centres and data management specialists. Two webinars have been delivered to date, covering FAIR Data Principles and the AQUARIUS Data Management approach.

Additional training activities are planned for 2026, targeting both Call 1 and Call 2 TA projects. Deliverable D5.4 contributes directly to AQUARIUS objectives on capacity building, FAIR data management, and Open Science, supporting FAIR-aligned data publication and long-term integration of AQUARIUS data into European data ecosystems.

## 1. Introduction

AQUARIUS is a Horizon Europe–funded research project (2024–2028) that provides access to a comprehensive and diverse suite of integrated Research Infrastructures (RIs) to address challenges and explore opportunities for the long-term sustainability of the marine and freshwater ecosystems. It brings together a wide range of marine and freshwater RIs, resources and services, including vessels, observatories, aircrafts, drones, satellites, experimental facilities, and advanced data infrastructures to facilitate scientific research at national level, across borders, and through global collaborations. Through Transnational Access (TA) funding calls, AQUARIUS supports research and innovation activities that contribute to the objectives, regional scope and implementation of the **European Mission ‘Restore our Ocean and Waters by 2030’**, the Sustainable Blue Economy Partnership, the European Green Deal, and international climate initiatives, while also contributing to the **European DTO** and the **UN Decade for Ocean Sciences**.

Through the TA activities, AQUARIUS generates a broad range of **multidisciplinary and heterogeneous datasets** spanning physics, chemistry, biology, biodiversity, geology, biogenomics, carbon, and operational monitoring data. AQUARIUS has adopted an Open Data Strategy, striving for public access to all collected data and metadata in a FAIR way, contributing to wider use. Without appropriate coordination and management, such a wealth of data risks fragmentation, inconsistent documentation, and limited reuse.

To address this challenge, AQUARIUS has adopted a dedicated **Data Management Strategy** and an operational workflow defined in the Data Management Plan (DMP) ([Deliverable D6.2](#)). This approach ensures that all collected and generated data, metadata, data products, and scientific knowledge are managed and governed in line with the **FAIR principles** and **Open Science practices**. To ensure quality assurance, long-term

stewardship, wide access, use and reuse, AQUARIUS data are intended to be integrated into archives managed and operated by leading European data management infrastructures such as [SeaDataNet](#), [EurOBIS](#), [ELIXIR-ENA](#), [ICOS-Ocean](#) and [Copernicus INSTAC](#). These infrastructures, in turn, contribute to European services such as [EMODnet](#), [Copernicus Marine](#), [Blue-Cloud](#) (currently transitioning to EOSC node | Digital Twin of the Ocean) Virtual Research Environments (VREs), and emerging initiatives like Digital Twins of the Ocean.

The successful implementation of this approach explicitly depends on targeted training activities embedded as discrete steps within the AQUARIUS Data Management Flow Scheme. The data management and data stewardship training provides knowledge and practical skills required to manage and publish AQUARIUS data in a FAIR manner through European data management infrastructures. Building on top of it, AQUARIUS further extends the training scope towards the European Open Science Cloud (**EOSC**) strategy and web-based open science practices.

This deliverable, **D5.4 – Data Management and Data Stewardship Training**, describes the training activities implemented under **Task 5.5 – Data Management and Data Stewardship Training of Work Package 5 – RI Technical Training**. A training related to the use of Virtual Access services and analytical environments of Blue-Cloud VREs for further analysis, valorisation of FAIR AQUARIUS data, and integration to EOSC platforms, will be implemented under **Task 5.6 - Virtual Access and Analytics Training** of the same work package.

## 2. Objectives

The overall objective of the Data Management and Data Stewardship Training is to inform, educate, and equip participants with the knowledge and practical skills required to manage, document, and publish data generated within AQUARIUS in accordance with the project's Data Management approach and the FAIR principles.

Specifically, the training aims to:

- ensure a shared understanding of the **AQUARIUS federated data management workflow**, including roles, responsibilities, and timelines from data planning to FAIR publication,
- enable participants to **apply FAIR principles** in practice, with emphasis on machine-actionable metadata and interoperability,
- familiarize participants with the **European data management infrastructures promoted by AQUARIUS** and their associated standards, tools, and services,
- develop practical skills in metadata creation, provenance documentation, and data harmonization procedures,
- train researchers in the preparation and submission of standardized metadata and data packages via **AQUARIUS ingestion mechanisms**, in cooperation with AQUARIUS expert data centres,
- ensure correct and consistent use of AQUARIUS metadata indexing tools during data collection and processing activities,
- promote **open data and data sharing practices**, including the use of [CC-BY 4.0](#) licensing and justified management of temporary embargoes,
- raise awareness of data security, long-term stewardship, and sustainable data preservation through trusted repositories,
- support compliance with Horizon Europe and AQUARIUS DMP requirements, including DMPs updates,
- prepare participants for the adoption of open science practices and subsequent use of **EOSC aligned analytical environments**, such as the Blue-Cloud VREs.

Through these objectives, the training contributes to maximizing the visibility, reuse, and long-term impact of AQUARIUS data, data products, and scientific outputs within European and global data ecosystems.

## 3. Participants

### 3.1. Target Audience

The TA projects involve short-term, innovative data-collection activities that may not always be supported by sufficient expertise in FAIR data management, standardisation, and ingestion into established European data infrastructures. The data management training is therefore addressed to the **scientific teams of the AQUARIUS TA project**, with the aim of strengthening their capacity to develop, implement and maintain their projects' DMPs. Participation in the data management training is **mandatory for TA teams** to gain practical experience with the AQUARIUS data management standards, tools, and services prior to and during implementation of TA projects. Through targeted guidance and coaching, the training informs and educates the teams on European marine data management infrastructures and supports them throughout the project lifecycle in applying FAIR principles, metadata requirements, and data ingestion services.

### 3.2. Trainers

The trainers supporting the AQUARIUS TA project teams are **expert data centres** and **data management specialists**, partners in the AQUARIUS project. They have extensive experience in marine data management and FAIR data practices, with most operating as **National Oceanographic Data Centres (NODCs)** and being well connected to leading European data management infrastructures. They are geographically distributed across Europe and cover the data disciplines relevant to AQUARIUS with active involvement in implementing the AQUARIUS data management approach.

## 4. Training Format and Implementation

The AQUARIUS project provides a structured programme of [training activities](#) designed to inform and educate TA scientific teams on European data infrastructures, FAIR principles, and best practices in data stewardship and Open Science. These activities support the implementation of the AQUARIUS Data Management Strategy and its requirements defined in Deliverable D6.2. Training materials, including webinar recordings, presentations, and supporting documentation such as recorded presentations, are made openly available through the [AQUARIUS Training Hub](#) to maximize outreach and reuse, thereby enabling **consistent implementation of FAIR data management across TA projects**.

Data management and stewardship training is delivered through a **series of online webinars** that combine structured presentations with practical, hands-on exercises. The training equips TA researchers with knowledge related to metadata standards, (meta)data harmonization procedures, use of AQUARIUS data management tools, and data submission workflows to the European data management infrastructures. In this way, the training supports **FAIR compliant data publication** within the lifetime of the AQUARIUS project.

In addition to the webinars, coaching and continuous support by expert data centres will be provided to TA scientific teams throughout the data processing and transfer phases to the AQUARIUS repositories. Where necessary, additional training sessions beyond the

planned webinars will be organized to assist teams in transforming metadata and data into standard formats compliant with the relevant European data management infrastructures. This support also covers the transfer of elaborated metadata and data packages through the AQUARIUS data flows towards the appropriate NODCs for integration into the AQUARIUS repositories.

## 5. Training Activities

As part of the TA projects' field data collection activities and training planning, two webinars have been held so far.

### 5.1. Webinar on FAIR Principles

A recorded presentation on the **FAIR Data Principles**, delivered by Sissy Iona (HCMR), Task 5.5 leader, was shared in **May 2025**. Based on a review of relevant literature and web resources, the presentation provided an overview of the FAIR Data Principles, their background and importance, and clarified the relationship between FAIR and open data. It introduced the key concepts of Findability, Accessibility, Interoperability, and Reusability, including the role of metadata, standards, identifiers, and licensing. In addition, the FAIR extensions and complementary frameworks such as CARE and TRUST were presented.

The presentation concluded with an explanation of **how the AQUARIUS project implements FAIR data management** within TA projects through its open data policy, Data Management Plans, training activities, and integration with European data infrastructures. The content of the webinar is shown in **Table 1 of Annex 1**.

The webinar slides are available for download from the [Webinar pages](#) (Webinar 3) of the [AQUARIUS Training Hub](#), and the recording is available on [YouTube](#).

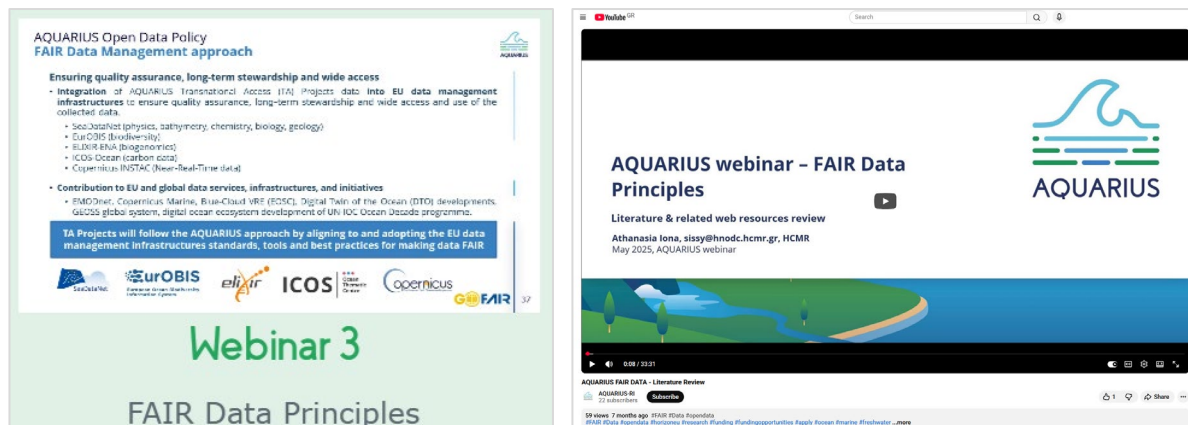


Figure 1: Screenshots of the webinar on FAIR Data Principles: (a) Training Hub, (b) YouTube

## 5.2. Data Management Webinar

The second webinar was held on **11 June 2025**, prior to the start of the field activities of the first TA Call 1 funded projects. The webinar was introduced by Sissy Iona (HCMR), Task 5.5 leader. Its scope was to explain **how TA projects will address the AQUARIUS Open Data Strategy** and ensure that the data collected will be shared openly and made accessible in a FAIR manner.

Participation in the webinar was **by invitation**. The Principal Investigators (PIs) and TA project teams of the granted proposals from the 1st TA Call were registered and participated in this webinar. In addition, representatives and experts from the data centres and European data infrastructures who will work closely with the scientific teams throughout the AQUARIUS project to support the implementation of FAIR data practices, also took part.

The training webinar focused on introducing the **AQUARIUS Data Management approach** and its alignment with European open and FAIR data services. An overview of the **EMODnet** public service for in situ marine was provided by Conor Delaney, highlighting its important role in supporting FAIR data and its contribution to the **European DTO**. This was followed by dedicated sessions on **SeaDataNet** and **EuroBIS** data infrastructures, addressing data management practices for marine and biodiversity data, which represent the main data themes of the newly collected AQUARIUS data. SeaDataNet introduced by Sissy Iona highlighting the key standards, services, metadata catalogues, controlled vocabularies, and tools that support data harmonization and quality control. Participants were guided through the main steps and resources to prepare and submit data in line with SeaDataNet and EMODnet requirements. As a representative of VLIZ, Ruben Perez introduced participants to the data management flow for submission to EMODnet Biology/EuroBIS, highlighting the importance of contributing data to EMODnet. The session covered standardisation best practices, including the use of Darwin Core Archives, and provided an introduction to controlled vocabularies, (meta)data standards, submission pathways to EMODnet Biology, and related submission requirements. Practical guidelines, templates, and tools were shared to support TA project teams in preparing and submitting datasets. The steps of the AQUARIUS data management approach were explained by Dick Schaap including how metadata from TA projects' observation activities are captured, as well as the data and metadata submission mechanisms.

The webinar concluded with a **Question-and-Answer (Q&A)** session and an overview of the **follow-up activities** planned for the coming months including the roles and responsibilities of TA teams and data centres before, during, and after TA activities. This included DMP finalisation, use of the metadata capture tool, data processing, and submission workflows to European data infrastructures, as well as coordination and support actions.

The agenda is shown in **Table 2 of Annex 1**, and the training resources links are provided in **Annex 2**.

The webinar slides are available for download from the [Webinar pages](#) (Webinar 4) of the [AQUARIUS Training Hub](#), and the recorded webinar is available on [YouTube](#).



Figure 2: Screenshots of the Data Management webinar presentations (YouTube)

## 6. Outcomes and Next Steps

The webinar on data management and data stewardship received very positive feedback from participants. A total of **49 invited participants registered** for the event, of whom **28 attended**. The training videos, together with the recording of the FAIR Data Principles presentation, are available and will remain accessible through the **AQUARIUS Training Hub** to ensure reuse and long-term accessibility. These resources support TA project teams in developing and implementing their DMPs in line with common standards and the AQUARIUS Data Management approach. The training material was further disseminated through online video-sharing platforms (such as **YouTube**) to increase outreach and visibility, achieving more than 135 views to date.

The next webinar is planned for **April-May 2026** and will target **TA Call 2 project teams** ahead of their field activities. Also, TA Call 1 project teams are welcome again to join as this will contribute to a better understanding of the AQUARIUS Data Management approach and its deployment in practice. This session will introduce the AQUARIUS Data Management approach, FAIR principles, and open data requirements, ensuring that Call 2 teams are prepared to plan, collect, and manage their data in compliance with the AQUARIUS Data Management Plan from the start. The webinar will also familiarize participants with the relevant European data management infrastructures, tools, and support mechanisms available throughout the lifecycle of their TA projects.

D5.4 deliverable directly contributes to AQUARIUS project Objective 5 (Capacity Building and training) and Objective 6 (Advancing data management and Open Science) as well as to the associated measurable and verifiable criteria for monitoring capacity building and data reuse:

- Adoption of **advanced Open Science Practices** enabled through data management and data stewardship training, including better Research Data Management ensuring a critical set of accessible data that supports scientific publications and evidence-based policymaking.
- Development and implementation of **10+ project specific DMPs**, specific to each funded TA project.
- Training of **50+ researchers** in open science practices and data management.
- **Availability of AQUARIUS datasets** within the 48-month project timeframe.
- Published data aligned with the **FAIR Principles**.

The content of this deliverable will be updated accordingly once the data management and data stewardship training are finalized.

## Annex 1: Webinar Agendas

Table 1: “FAIR Data Principles” webinar content

Scope of presentation
• What FAIR Principles are
• What FAIR Data is
• FAIR extensions
• AQUARIUS approach in addressing FAIR

Table 2: “Data Management and stewardship” webinar Agenda

Presentation	Presenter	Time	Organization
Welcome & Introduction to the AQUARIUS Data Management Approach	Sissy Iona	14.00 CEST	Hellenic Centre for Marine Research (HCMR)
EMODnet contribution to EDITO	Conor Delaney	14.15 CEST	EMODnet
SeaDataNet Pan-European infrastructure for ocean & marine data management	Sissy Iona	14.25 CEST	Hellenic Centre for Marine Research (HCMR)
EMODnet Biology/EurOBIS marine biodiversity data management	Ruben Perez	14.40 CEST	Flanders Marine Institute (VLIZ)
Data Summary Log APP & EMODnet Data Ingestion service	Dick Schaap	14.50 CEST	MARIS
Q/A Session	All	15.10 CEST	N/A
Follow up Actions	Sissy Iona	15.25 CEST	Hellenic Centre for Marine Research (HCMR)

## Annex 2: Training Resources and other Web Links

- AQUARIUS Data Management Plan, <https://aquarius-ri.eu/wp-content/uploads/2024/09/D6.2-Data-Management-Plan-V1-MARIS.pdf>
- AQUARIUS Training resources, <https://aquarius-ri.eu/training-resources>
- AQUARIUS Training Hub, <https://aquarius-ri.eu/training-resources/traininghub>
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- EuroBIS, <https://www.eurobis.org>
- ICOS-Ocean, <https://www.icos-cp.eu/observations/ocean/otc>
- SeaDataNet, <https://www.seadatanet.org>
- Copernicus INSTAC, <https://marine.copernicus.eu/about/producers/insitu-tac>
- Copernicus Marine, <https://marine.copernicus.eu>
- Blue Cloud, <https://blue-cloud.org>