27-29 May 2024

International conference on Marine Data and Information Systems

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The AquaINFRA Interaction Platform: Access to FAIR Multi-disciplinary Freshwater and Marine Data and Services to Restore our Ocean and Waters by 2030

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The objectives of AquaINFRA

- The overall objective of the project is to develop a virtual environment equipped with FAIR multi-disciplinary data and services to support marine and freshwater scientists and stakeholders restoring healthy oceans, seas, coastal and inland waters

- The AquaINFRA virtual environment will enable the target stakeholders to store, share, access, analyse and process research data and other research digital objects from their own discipline, across research infrastructures, disciplines and national borders leveraging on EOSC and the other existing operational dataspaces (e.g., EMODnet, Copernicus Marine Service, Digital Twins, etc.)

- To seamlessly integrate the new AquaINFRA components with the EOSC-Core services and to make the AquaINFRA relevant resources discoverable and accessible via the EOSC Exchange
- To provide an EOSC service that allows users to seamlessly and easily find and access data from the diverse set of catalogues
- To equip marine and freshwater scientists with a user environment for data harmonisation, processing, quality assessment, interaction and sharing, emphasising the pan-European seamless connectivity across the marine and freshwater realms
- To develop use cases for improved water quality and healthy aquatic environments to demonstrate the value of sharing open and FAIR research data and provide feedback to the EOSC Partnership
- To build an open and reproducible science capacity in the marine, coastal, and inland water research communities, from bachelor’s students to experienced researchers
- To synergize with the oceans, seas, coastal and inland waters initiatives and the EOSC Partnership to avoid overlaps and reuse existing resources

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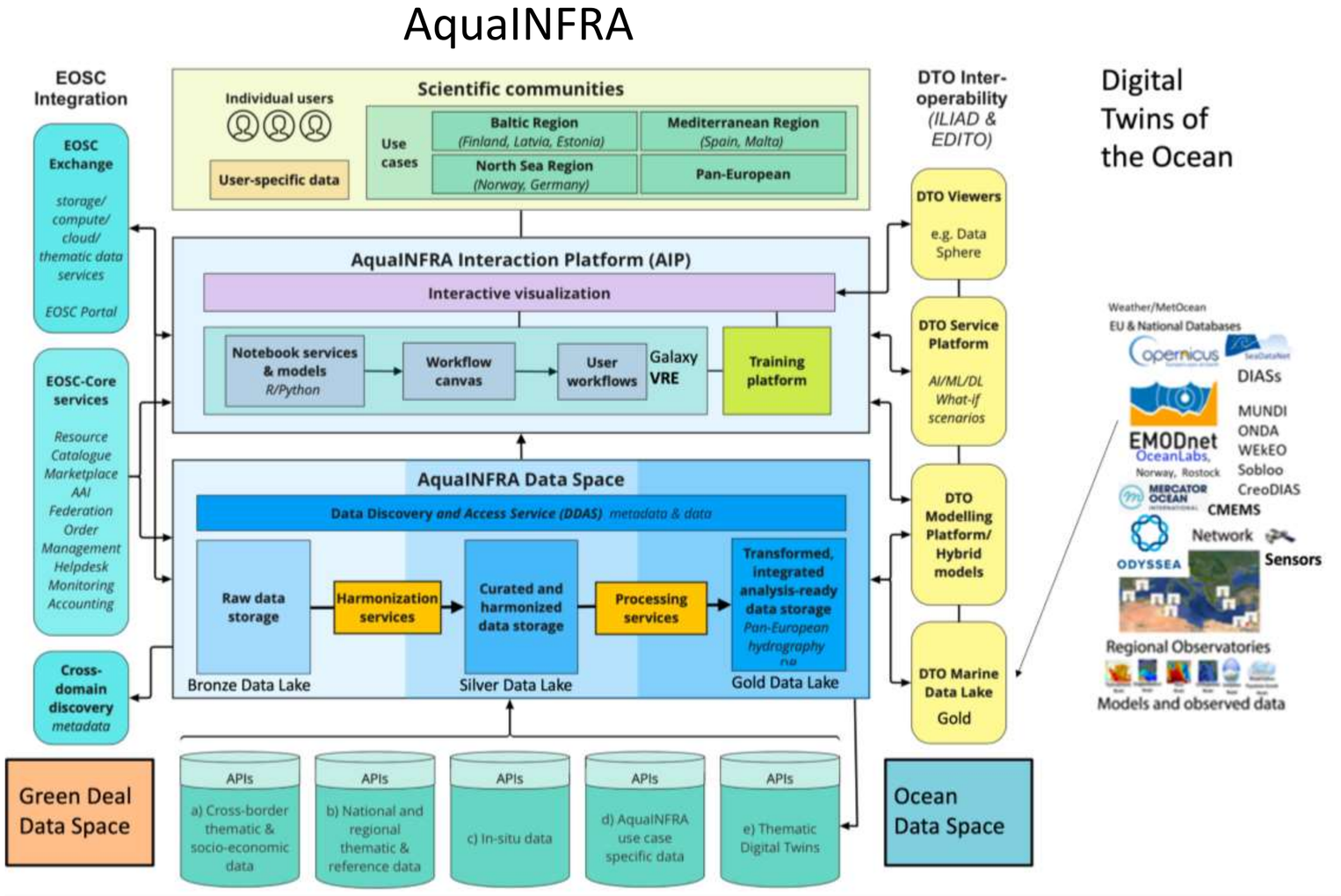
- The technical framework is designed to enhance cross-domain research, enabling seamless discovery and access to marine and freshwater data via interdisciplinary discovery services

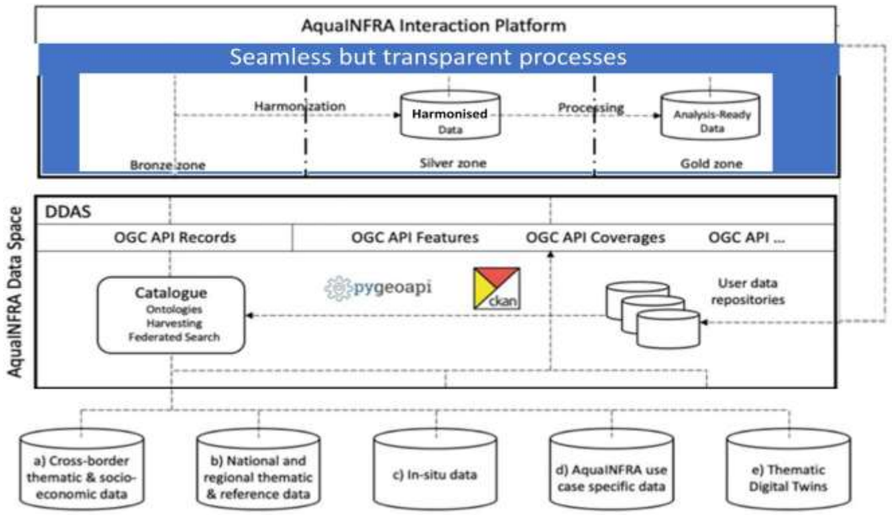
- DDAS will act as a bridge connecting diverse data catalogues, APIs, and Digital Twins

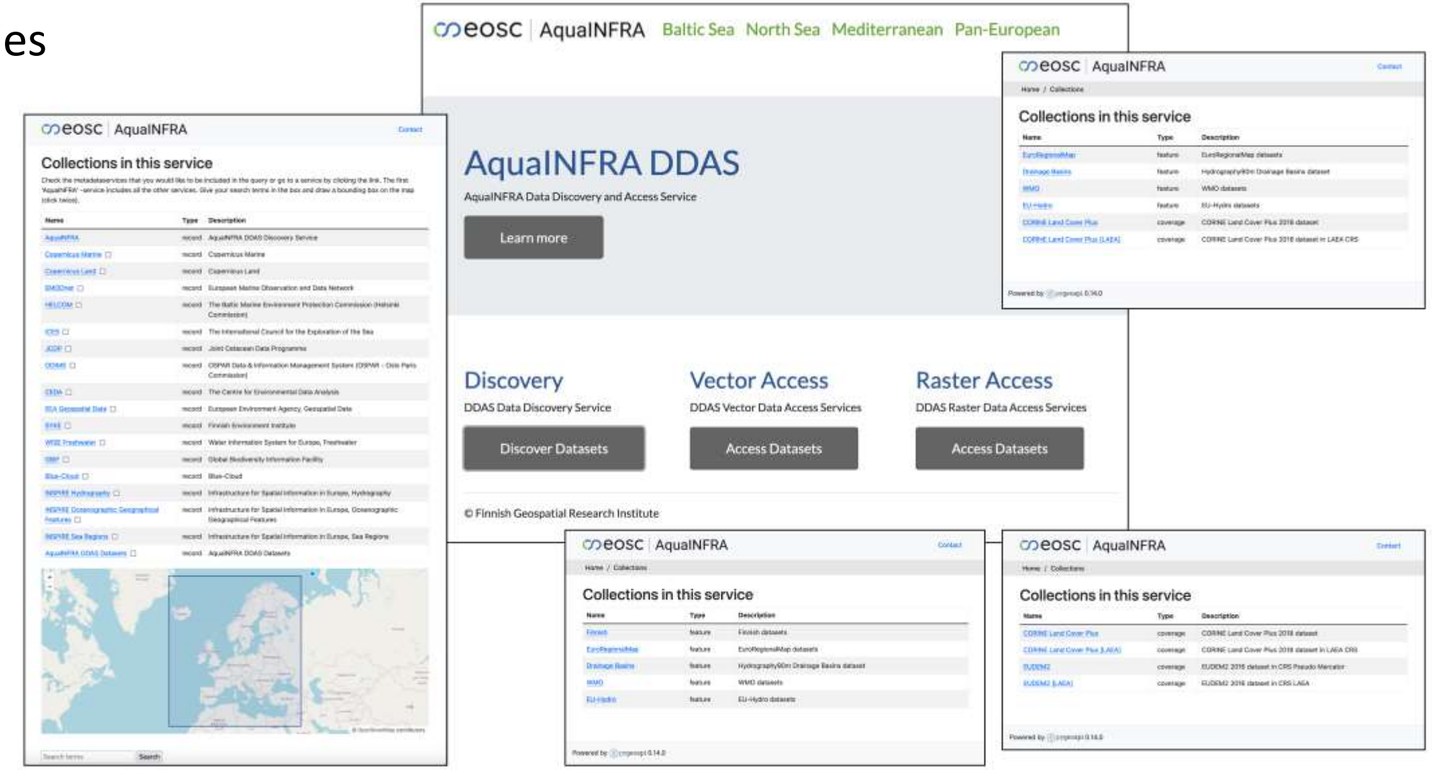
- The AquaINFRA architecture will utilise international standards such as those from ISO TC211, the Open Geospatial Consortium (OGC), and the EU INSPIRE Directive



AquaINFRA Data Discovery & Access Service

- The AquaINFRA Data Discovery & Access Service will search for marine data, freshwater data, and socio-economic data seamlessly across borders and data repositories





https://vm4072.kaj.pouta.csc.fi/ddas

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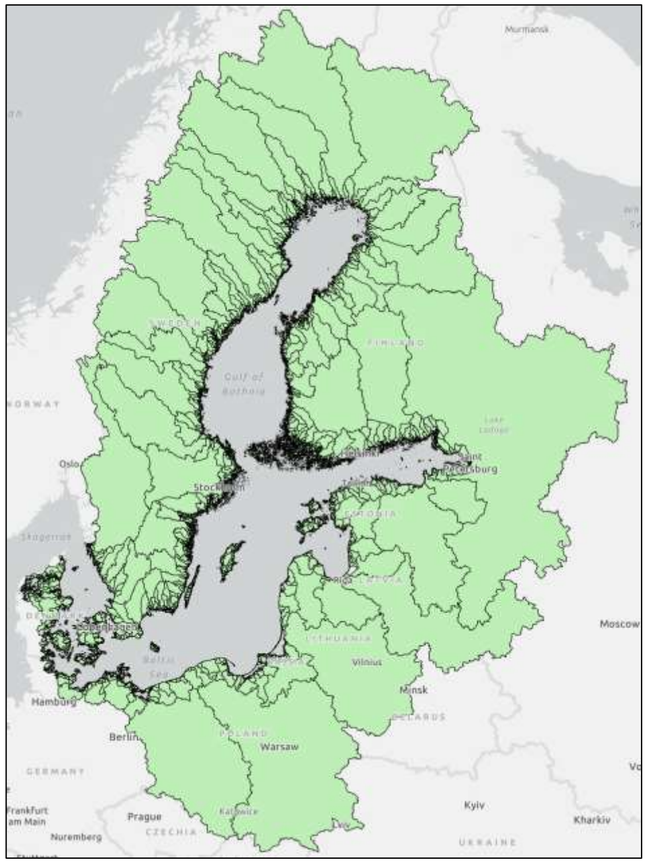
Data Harmonisation and Integration

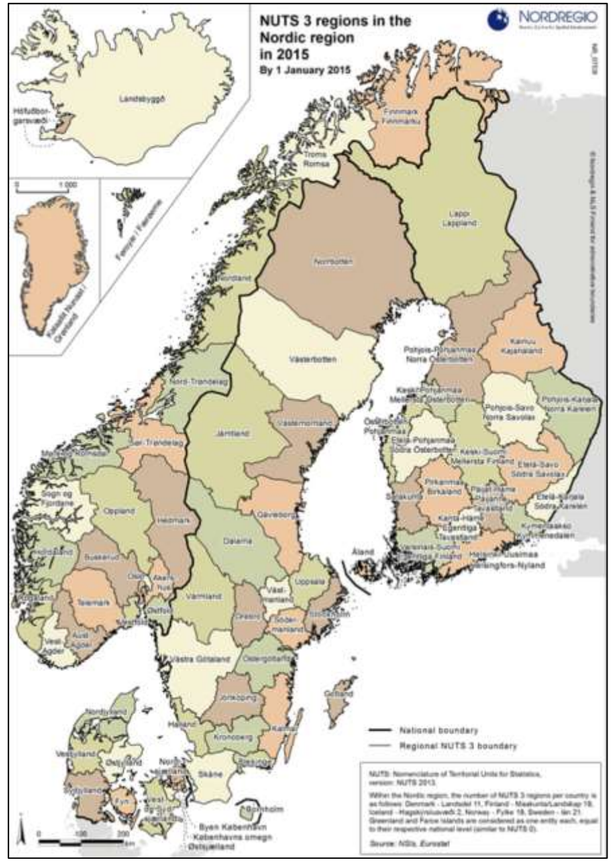
- A cornerstones of AquaINFRA is data harmonisation, essential for integrating diverse datasets from disparate sources, ensuring consistency and compatibility across different systems.

- The process will involve standardising data formats, metadata, and vocabularies to align with FAIR principles.

- The harmonised data, once processed, will feed into the AquaINFRA Data Space.



https://maps.helcom.fi/website/mapservice/



https://nordregio.org/maps/nuts-3-regions-in-the-nordic-region-in-2015/

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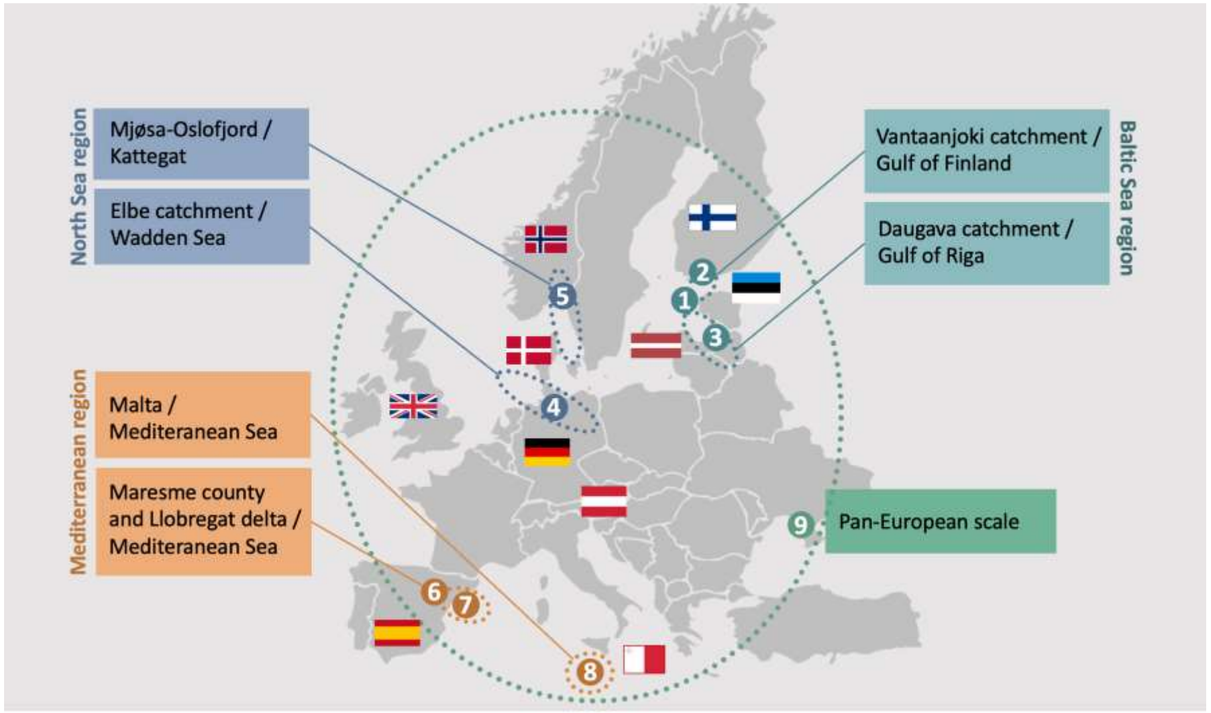
Case studies and use cases

1. Effectiveness of measures, their social and economic effects
2. Demonstrate the creation of seamless water quality data from land to sea utilising high-frequency water quality monitoring with FerryBox observations and combining sensor data with satellite observations.
3. Changes in nutrient loading and the Gulf of Riga optical properties: effectiveness, costs and socio-economic effects of environmental measures.
4. Monitoring the aquatic carbon cycle and quantifying the human impact (eutrophication).
5. Land- Sea interactions and quantifying the human impact (eutrophication)
6. Marine ecological state by the land catchment interactions
7. Future scenarios for inland water quantity and coastal impacts
8. Marine ecological state by the land groundwater interactions
9. Freshwater biodiversity



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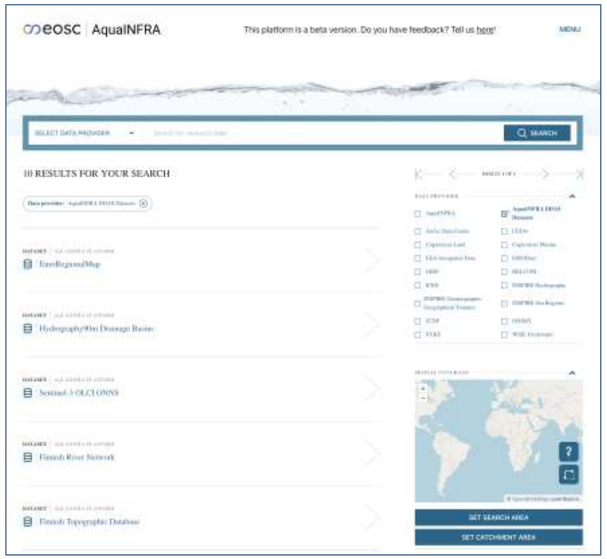
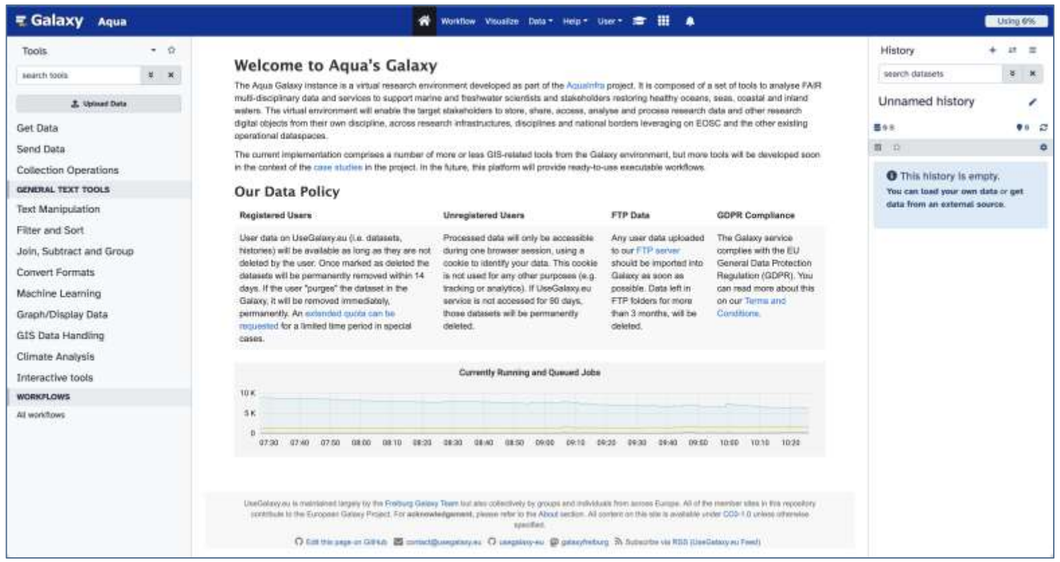
Interaction Platform (AIP) and Virtual Research Environment (VRE)

- The AquaINFRA Interaction platform provides access to DDAS as well as the Virtual Research Environment
- The VRE will provide computational tools and services necessary for sophisticated data analysis and modelling and support a range of programming languages, such as R and Python
- Notebook services offering customisable workflows to facilitate the analysis of raw or harmonised data will be included, allowing researchers to create tailored processes for their specific research needs.



https://aquainfra.dev.52north.org/



https://aqua.usegalaxy.eu/

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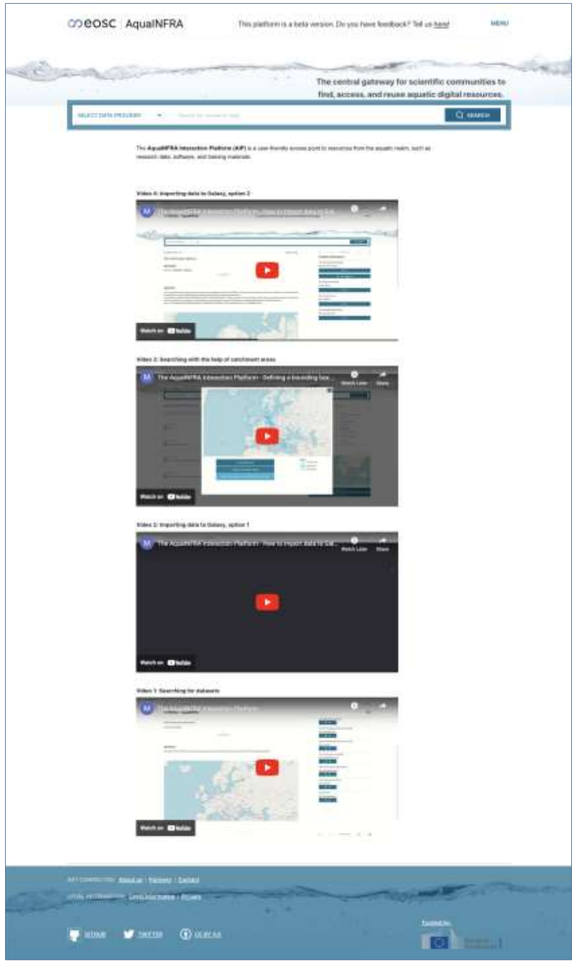
Training and Capacity Building

- AquaINFRA will develop a suite of educational materials and resources, which will be disseminated through the project's training platform.

- Demo versions supporting the internal capacity building are available via the AquaINFRA Interaction Platform (AIP)

- Further materials are being co-developed during the project taking into account the various user needs to utilise these resources effectively, promoting a sustainable culture of open science within the marine and freshwater research communities.



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Concluding remarks and next steps

- The combination of these technical methodologies underscores AquaINFRA's commitment to providing a robust, user-friendly, and innovative environment that enables and propels forward the research in marine and freshwater sciences.
- Through leveraging high-performance computing, adhering to and advancing standards, and promoting open science and FAIR data principles, AquaINFRA aims to be a transformative force in aquatic research infrastructures
- The next steps comprises the further development of DDAS and the Galaxy-based Virtual Research Environment and adapting our services to the ongoing developments of the European Open Science Cloud (EOSC)

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DKRZ DEUTSCHES KLIMARECHENZENTRUM

CSIC Consejo Superior de Investigaciones Científicas

bluelobster the digital experience company

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HELCOM

IGB Leibniz Institute of Freshwater Ecology and Inland Fisheries

TECHNISCHE UNIVERSITÄT DRESDEN

MML MAANMITTAUSLAITOS

NIVA Norsk institutt for vannforskning

Hochschule Bochum
Bochum University
of Applied Sciences

KIT Karlsruher Institut für Technologie

L-Università ta' Malta

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Thank you for your attention!

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