SEUS
Smart European Shipbuilding

Funded by the European Union

NTNU CADMATIC CONTACT Software ULSTEIN GONDAN SHIPBUILDERS SARC NHL STENDEN UNIVERSITY OF TURKU

D7.4 - FIRST UPDATE TO THE DMP (M18)

This project has received funding from the Horizon Europe Framework Programme (HORIZON) EU programme under grant agreement No 101096224.

Project no.	101096224
Project acronym:	SEUS
Project title:	Smart European Shipbuilding
Call:	HORIZON-CL5-2022-D5-01-06
Start date of project:	01.01.2023
Duration:	48 months
Deliverable title:	First update to the DMP
Deliverable No.:	D7.4
Document Version:	V02 (M18)
Due date of deliverable:	30 June 2024
Actual date of submission:	
Deliverable Lead Partner:	Partner No. 1, NORGES TEKNISK-NATURVITENSKAPELIGE UNIVERSITET NTNU
Work Package:	7
No of Pages:	10
Keywords:	Data, DMP, Data Management Plan

Name	Organization
Henrique M. Gaspar	Partner No. 1, NORGES TEKNISK-NATURVITENSKAPELIGE UNIVERSITET NTNU

Dissemination level

CO	Confidential

History

Version	Date	Reason	Revised by
01	12.06.2024	First version (JH)	Jisang Ha and Henrique M. Gaspar (NTNU)
02	26.06.2024	Final Version (HG)	Magnhild Wolff and Henrique M. Gaspar (NTNU)

This project has received funding from the Horizon Europe Framework Programme (HORIZON) EU programme under grant agreement No 101096224.

Executive Summary

This is an updated report on the Data Management Plan D7.3 (M6), in accordance with the HORIZON EU data management guidelines, the SEUS data management plan defines the management policy for the data that is generated in the project, specifically what types of data are to be generated in the project, whether and how they are made open and accessible for verification and re-use. It also specifies how it is curated, processed, and stored. It is worth mentioning that three of the SEUS partners are software developers, and they comply already with EU guidelines in Data Protection guidelines. The project supports openness according to the EU FAIR approach and the principle "as open as possible, as closed as necessary". For the data management and sharing, GitHub and Zenodo are being used as Open-Data Repositories with FAIR principles. The project has no ethical issues.

This document is part of WP7 of the SEUS project (task 7.4) and is responsible for the elaboration of the project's data management requirements and policies.

This version of the document is the updated version due at the end of the eighteenth month of the project (M18). This document will evolve during the project lifecycle and will be updated at M36 and M48, as project implementation progresses and significant changes occur to include new information, new datasets, and results.

Table of Contents

Executive Summary 3

Table of Contents 3

1. Purpose and Overview 4

1.1. Purpose 4

1.2. Project Overview 4

2. Smart Platform - SEUS 5

3. Data Description and Management 7

3.1. Data Management and Sharing Plans 7

This project has received funding from the Horizon Europe Framework Programme (HORIZON) EU programme under grant agreement No 101096224.

1. Purpose and Overview

1.1. Purpose

The organizational structure of SEUS has been chosen according to the DESCA model grant agreement governance structure such that the objectives can be achieved within the project's lifetime, thereby guaranteeing the highest quality possible.

This document, D7.4 – Updated Data Management Plan (DMP) is an update of the First DMP (D7.3), and a result of the SEUS project. As specified in the guidelines, the DMP is a document outlining how research data is managed during a research project, and after the project has been completed. It should describe what data is collected, processed, or generated, making explicit what methodology and standards are used, whether and how this data is shared and/or made open, and how it is curated and archived. No ethical issues are expected with the data from this project.

1.2. Project Overview

The main ambition of the Smart European Shipbuilding project (SEUS) is to develop a smart platform dedicated to shipbuilding and its downstream and upstream lifecycle phases. This is achieved by architecting an integrated platform for a combined and open solution incorporating CAE, CAD, CAM, and PDM software and testing it at shipyards. The new platform solution is being built with state-of-the-art European shipbuilding expertise provided by academic and industrial consortium participants. It intends to develop novel practices for human-centric knowledge management in shipbuilding, the use of NLP, and data-driven AI design elements in the current consensus or intelligent technologies and Industry 5.0.

The SEUS project is developing, implementing, testing, and qualifying software solutions with an Industry 5.0 mindset for the European shipbuilding market. Smart technology, in terms of digitalization and cyber-physical systems, including humans, are concepts that have never been built from a shipbuilding perspective. Current solutions used by shipyards include significant parts of manual data handling and are prone to a high level of human error or a fragmented adaptation of PLM from other industries, such as aerospace, automotive, or other discrete manufacturing. The shipbuilding industry uses many computational tools to plan, design, simulate, and build vessels and other marine products, such as offshore platforms or other floating constructions. Consequently, the digital information chains of shipbuilding are more weakly integrated than in discrete manufacturing industries and thus lack support for a digital thread: digital continuity, digital lifecycle management, and digital ship operation support. This is an obstacle to gaining efficiency and to implementing new business models based on digital innovations and the development of IT technology. We have set up seven objectives towards a stepwise progress over 4 years:

1. Create workflow activity map and use cases applying smart technology and Industry 5.0 concept, specific to European shipbuilding
2. Enhance the human-centric competitiveness of shipbuilding and reflect diverse values of stakeholders, including shipyard workers, shipowners, operators, users/passengers, and shipbuilders in general
3. Build a shipbuilding-specific PLM platform comprising defined data models and the selected elements of CAE/CAD/CAM and PDM solutions

This project has received funding from the Horizon Europe Framework Programme (HORIZON) EU programme under grant agreement No 101096224.

4. Develop a flexible platform that supports multiple instances of workflows to facilitate rapid early designs, and is fit to support AI tools and virtual prototyping
5. Ensure openness and interoperability of the platform while keeping it cyber secure
6. Test and implement in an industrial environment – developing the concept of the digital shipyard.
7. Quantify added value gains provided by the developed platform, creating a business model of exploitation, and dissemination of project results

The technology readiness level (TRL) targeted by the project is 8-9, corresponding to the maturity level of a completed and qualified (tested in a large-scale pilot installation) platform, ready for a commercially competitive operational environment. The aimed shipbuilding platform will integrate existing computational tools with TRL 9, commercially exploited in shipbuilding. It will incorporate Industry 5.0 concepts (human-centricity, sustainability, and circular economy) and progress through the process of maturing TRL from level 4 (initial technology validated by combining existing software parts, including AI and ML) to level 7-9 (integrated platform with developed use cases, tested in shipyards).

2. Smart Platform - SEUS

The core of the project lies on the development of a smart PLM platform incorporating CAD/CAM/CAE elements in line with shipbuilding practices. It consists of the assessment of products and practices already available in the consortium about the needs and standards compiled in the previous phase. Extensive software development will enhance existing toolsets and implement digital support for the use cases and scenarios, representing the computational tools for shipbuilding development stressed in the call. A detail of the desired elements in this development is observed in Figure 1.

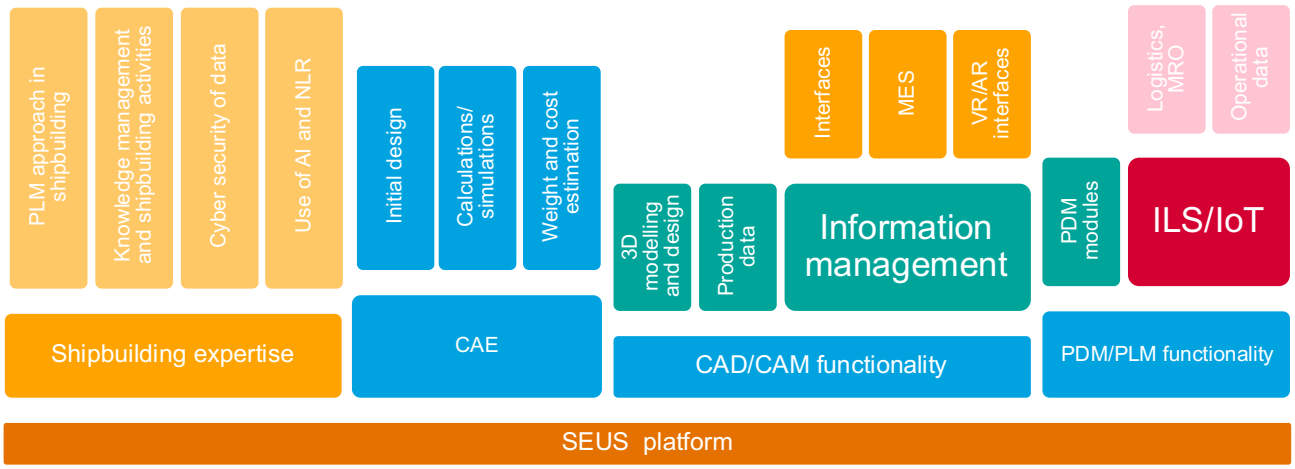

Figure 1 - SEUS Smart Platform Elements

The SEUS Smart CAD+PLM platform integrates the following main elements: CAE modules, CAD/CAM modules, PDM/PLM selected applications and features, and embedded shipbuilding expertise. CAE modules address functionality related to initial and early design stages, such as hull shape form calculations, stability, weight estimations, and interfaces for CFD and FEM calculations, incorporating AI and a data-driven approach to design.

CAD/CAM modules include specialized applications for functional ship design (P&IDs, Electrical schematics), 3D detailed, and production design. It incorporates the reuse of initial design models, 3D modeling, and arrangement (Hull, Piping, Outfitting, HVAC, Cable 3D design, and other outfitting elements) and provides an automated output of fabrication data in a traditional format of 2D

This project has received funding from the Horizon Europe Framework Programme (HORIZON) EU programme under grant agreement No 101096224.

documentation along with the direct output for CNC-controlled equipment and robotized manufacturing, all ready for an integrated virtual prototype environment.
PDM/PLM elements consist of selected modules for data management and product life cycle support, including project and change management, document management, Bill of Materials management, IoT integration, and ILS support. This sets a solid basis for the maturity management-based PLM concept that would enable support for functional safety, traceability, and compliance for the shipbuilding industry.
The partners' shipbuilding expertise guides the effective application of the platform elements to industrial setups. WAVE Architecture, being developed by CADMATIC, is an example of the platform. WAVE aims to have a key differentiator such as a data model that supports shipbuilding concepts, integrations to shipbuilding specific solutions, and strong visualization capabilities in context. The partners are building smart platforms to realize digital thread connecting data flow End to End, and preparing future ready & scalable PLM based solutions towards integrated Digital Shipbuilding. The WAVE Architecture by CONTACT through the SEUS project is as Figure 2.

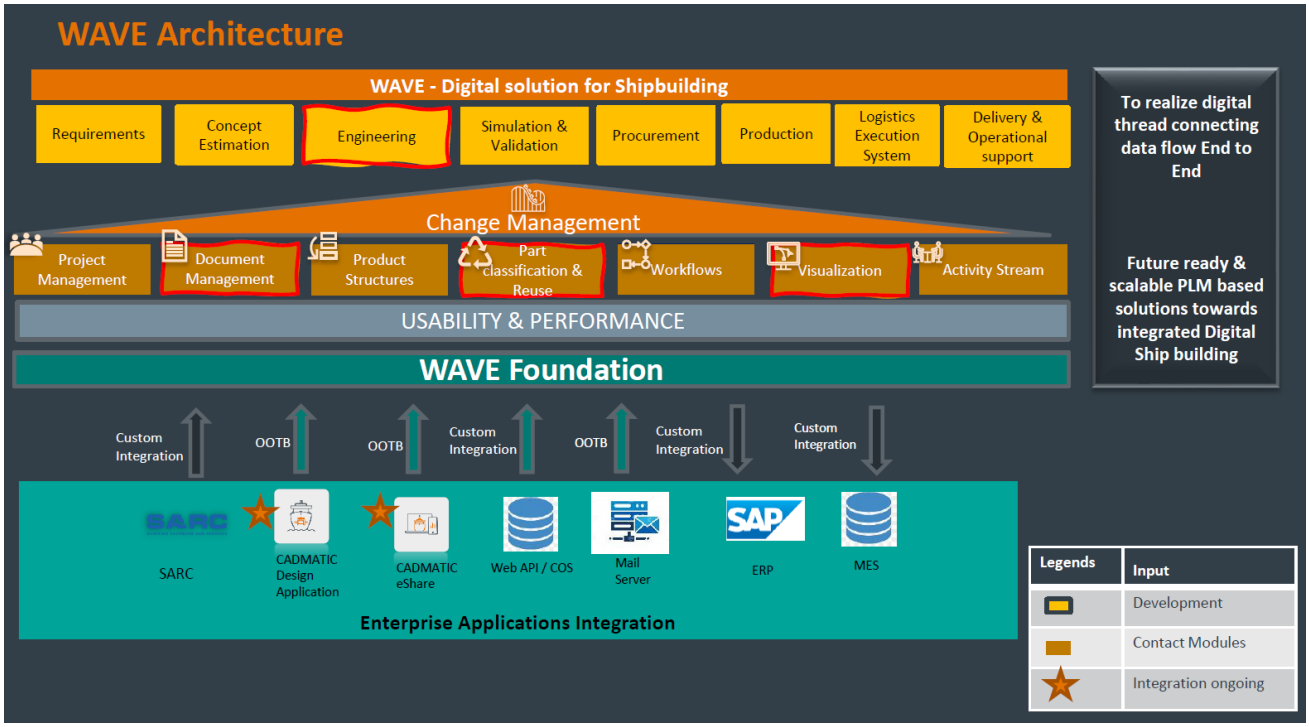

Figure 2 – WAVE Architecture: Digital Solution for Shipbuilding by CADMATIC

The WAVE demo being developed based on the proposed architecture is shown in Figure 3.

This project has received funding from the Horizon Europe Framework Programme (HORIZON) EU programme under grant agreement No 101096224.

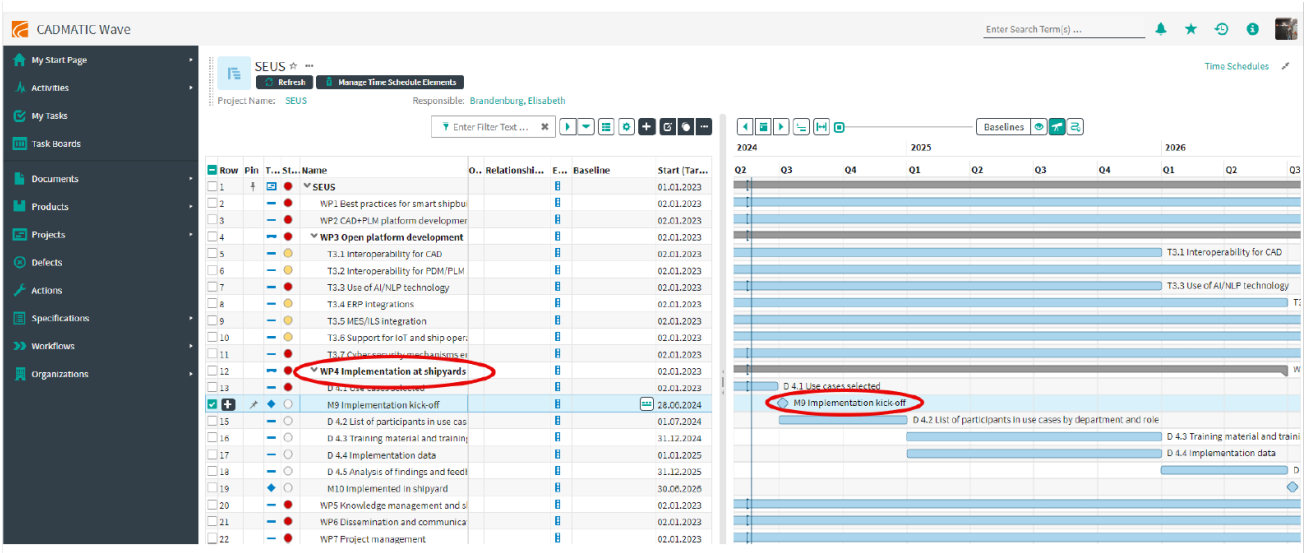

Figure 3 – WAVE demo by CADMATIC (obtained on 23rd May 2024)

As part of the broader cyber security solution for the project, a series of cyber security workshops is being conducted with project team members and support teams. Those workshops address issues of cyber threat awareness (including threats to AI apps), secure programming practices, active cyber security countermeasures, cyber security hygiene, and the development of the project's Information Security Management System (ISMS). A more complete public description of the project is found on its website, under resources: https://www.ntnu.edu/seus/resources.

3. Data Description and Management

3.1. Data Management and Sharing Plans

The following update is presented regarding SEUS Data Management and Sharing, compared to M6 delivery (D7.3).

General data from the SEUS project should be stored in the repository (SharePoint), managed by the coordinator (NTNU). Specific data connected to the software development is handled by each WP coordinator, depending on their level of openness (private, public, or partners only), taking into account the ethical, commercial, and confidentiality constraints of handling sensitive or closed data. Therefore, the project considers the use of different sharing mechanisms, with the aim of making the research data of the SEUS project replicable, or at least reproducible or reusable. The main strategies to make the data generated by the project both open and FAIR compliant are described below.
For data whose nature will be public, the following publication mechanisms will be used to ensure the openness of the data:

Website: With reference to the plan outlined in WP 6 (D6.6 - Plan for the Exploitation, Dissemination and Communication of results) the data produced by the research activities in the form of tangible and reusable knowledge (articles, publications, etc.) is online for the project since February 2023, at www.seus-project.eu (screenshot in Figure 4). The webpage contains an overview of the project, current status and in the future, it includes summaries of the public deliverables and compilations of achieved results, as well as practical results on the existing version of the SEUS Smart platform.

This project has received funding from the Horizon Europe Framework Programme (HORIZON) EU programme under grant agreement No 101096224.

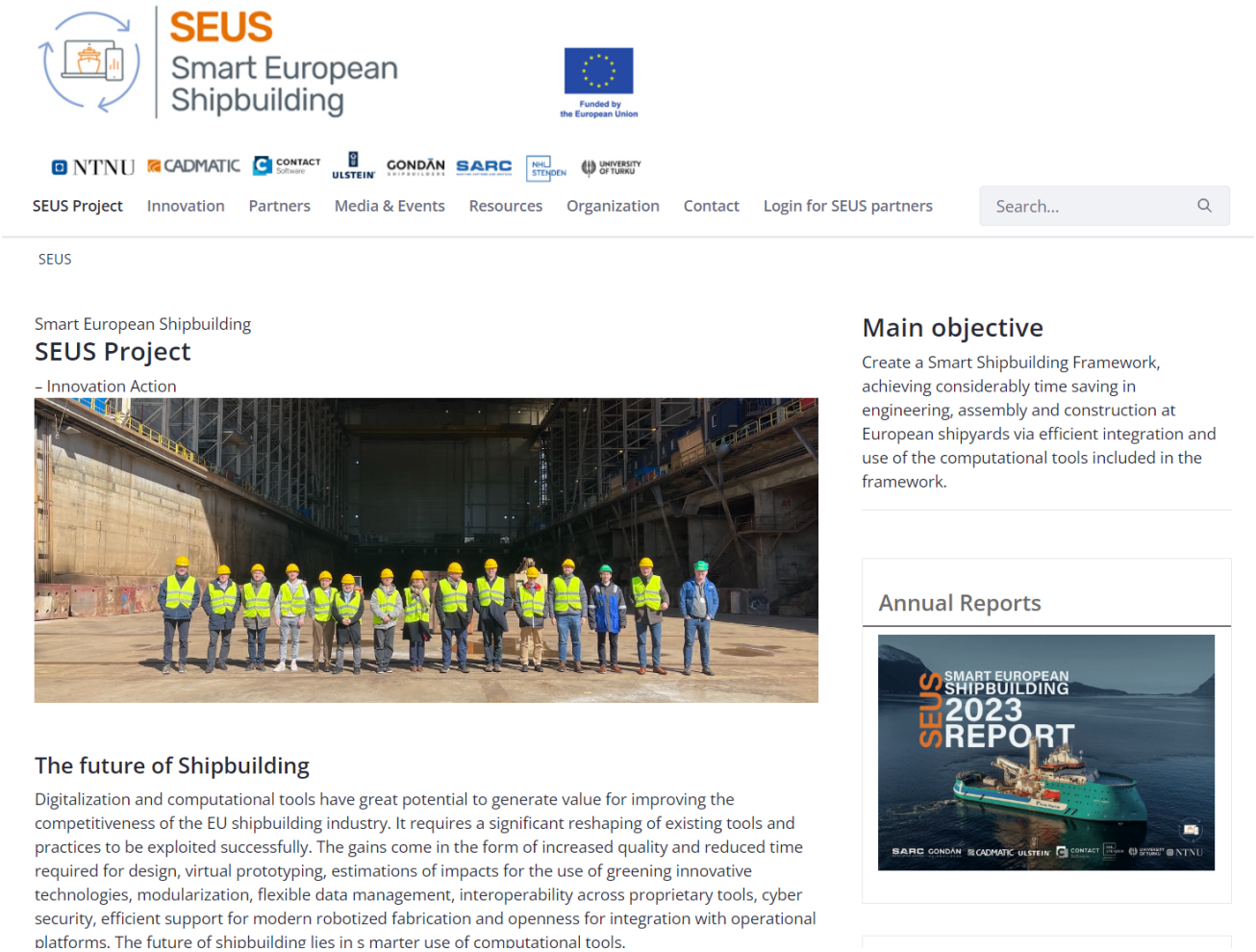

Figure 4 - SEUS Webpage screenshot (obtained on 11th June 2024)

The website is mainly used for the opening of the results and conclusions for the general public and also for the expert public (researchers, energy experts, professionals, etc.). Information is conveyed through scientific articles, e-learning materials, articles, dissemination materials, social media posts, local networks, and platforms.

Personal data (e.g., contact details of stakeholders/companies, newsletter subscriber data, etc.) are treated confidentially and in accordance with legal regulations on the protection of sensitive data, and the information is stored in accordance with the retention periods stipulated by law. Finally, confidential results that could harm the commercial interests of partners will not be published.

Open access to scientific publications: as specified in the GA (Art. 16 & 17) each beneficiary must ensure open access (free online access for any user) to all peer-reviewed scientific publications related to its results. In addition, the beneficiary must aim to deposit at the same time the research data needed to validate the results presented in the deposited scientific publications. Data underlying research activities will be provided as support material for research articles published in journals, typically with the data files published by the publisher of the article. A large number of journals and publishers support the addition of supplementary material to research articles, including datasets.

This project has received funding from the Horizon Europe Framework Programme (HORIZON) EU programme under grant agreement No 101096224.

Open-Data Repository: open data is data that can be freely shared and reused by anyone, FAIR data is data that follows a set of good practices for data sharing, respecting any ethical, legal or contractual restrictions (data may contain personal information, be subject to copyright, be protected by patents or trade secrets). In order to make open data in line with FAIR principles, the data produced by the research are deposited in Open-Data Repositories, GitHub (https://github.com/orgs/seus-project/repositories) and Zenodo (https://zenodo.org/records/10211090).

GitHub is a powerful tool that can be integrated to manage, share, and preserve research data effectively. GitHub is a web-based platform that uses Git for version control. It allows users to organize, collaborate, track, and maintain data. The GitHub repository of SEUS Project is in Figure 5.

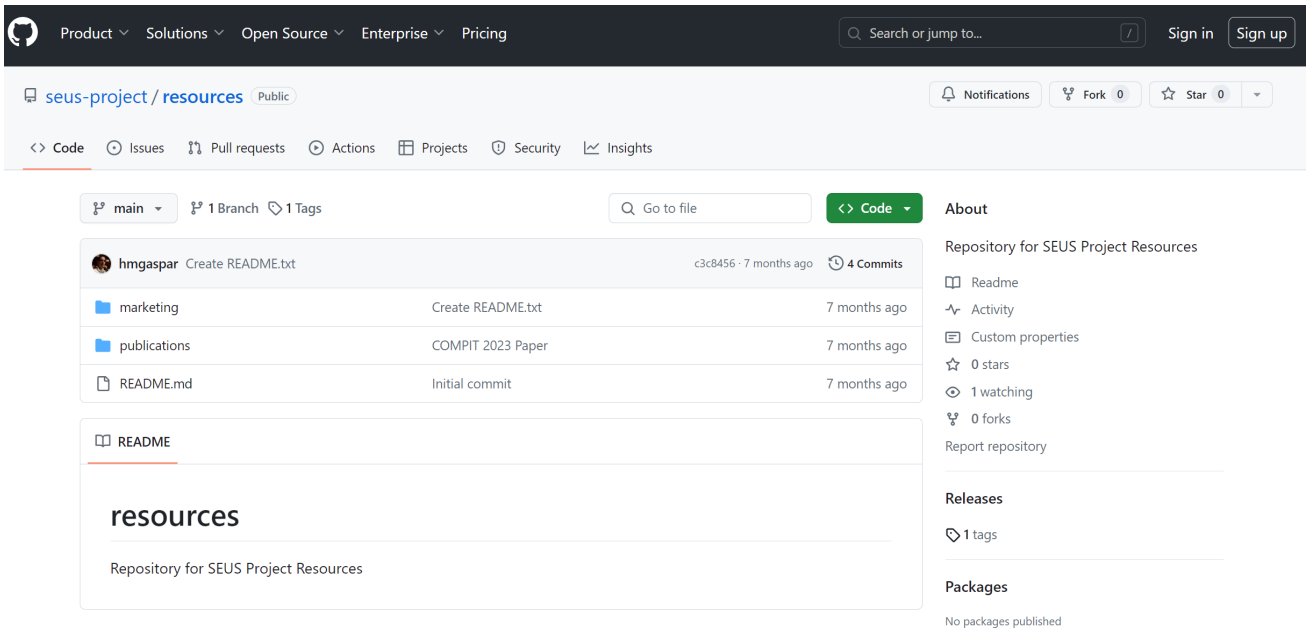

Figure 5 – GitHub repository of SEUS Project (obtained on 11th June 2024)

Zenodo is an open-access repository developed and operated by CERN and OpenAIRE. It can be integrated with GitHubto archive datasets and generate DOIs (Digital Object Identifiers). Zenodo can automatically archive GitHub releases, ensuring the long-term preservation of data. By assigning DOIs, Zenodo ensures that data are citable and easily referenceable. Zenodo is indexed in OpenAIRE (Open Access Infrastructure for Research in Europe) which is a European Union initiative aimed at promoting open access to research outputs and ensuring that scientific publications, datasets, and other research results are freely available to the public. Our research outputs deposited in Zenodo are automatically included in the OpenAIRE infrastructure, and it ensures that our outputs are part of the broader European open science ecosystem and are discoverable through the OpenAIRE portal. The Zenodo repository of SEUS Project is in Figure 6.

This project has received funding from the Horizon Europe Framework Programme (HORIZON) EU programme under grant agreement No 101096224.

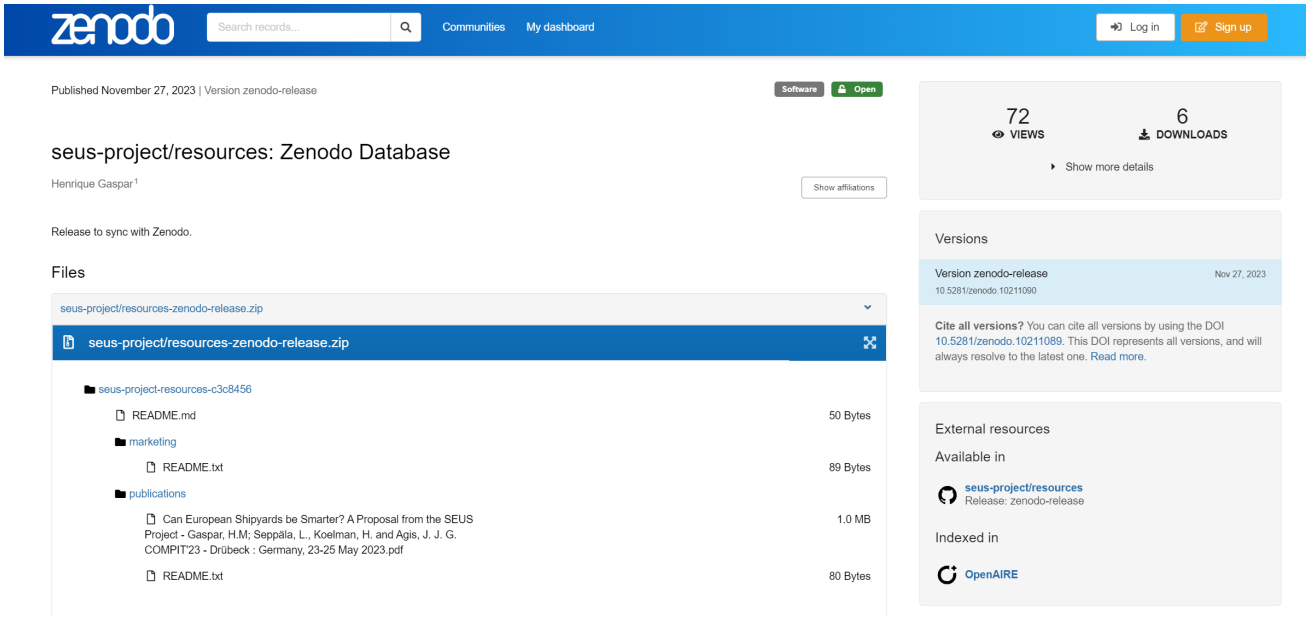

Figure 6 – Zenodo Repository of SEUS Project (obtained on 11th June 2024)

For data that are confidential, and only accessible to project partners, we plan to use internal tools provided by the software development partners (CADMATIC, SARC, and CONTACT). Other raw data generated by the project (used or unused) are stored in the repository (SharePoint) at NTNU, for at least 10 years after the project is finished. This can be extended if necessary.

Depending on the area of expertise, the data generated under the SEUS project may be useful to:

- SEUS consortium;
- Maritime Industry in Europe
- European Commission services and European Agencies;
- EU National Bodies;
- The general public including the broader scientific community;

A second update of the DMP will be produced in M36 (D7.5).

This project has received funding from the Horizon Europe Framework Programme (HORIZON) EU programme under grant agreement No 101096224.