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Statement of originality

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Glossary

CA	Consortium Agreement
EIEB	External Industrial Exploitation Board
EPMB	Executive Project Management Board
GA	General Assembly
IM	Innovation Manager
PC	Project Coordinator
PO	Project Officer
PMP	Project Management Plan
TM	Technical Manager
QAP	Quality Assessment Procedure
SC	Steering Committee
WP	Work Package
WPL	Work Package Leader
AMSRM	Azimuthal Multitranslator Switched Reluctance Machine
SLSG	Superconducting Linear Switched Generator



1. INTRODUCTION

SEA TITAN project participates in the Pilot on Open Research Data (ORD) launched by the European Commission (EC) along with the H2020 programme [1]. This pilot is part of the Open Access to Scientific Publications and Research Data programme in H2020. The goal of the programme is to foster access to research data generated in H2020 projects. The use of a Data Management Plan (DMP) is required for all projects participating in the Open Research Data Pilot.

Open access is defined as the practice of providing on-line access to scientific information that is free of charge to the reader and that is reusable. In the context of research and innovation, scientific information can refer to peer-reviewed scientific research articles or research data.

Research data refers to information, in particular facts or numbers, collected to be examined and considered and as a basis for reasoning, discussion, or calculation. In a research context, examples of data include statistics, results of experiments, measurements, observations resulting from fieldwork, survey results, interview recordings and images. The focus is on research data that is available in digital form.

The Consortium strongly believes in the concepts of open science, and in the benefits that the European innovation ecosystem and economy can draw from allowing the reuse of data at a larger scale.

Furthermore, there is a need to gather experience in wave technology, especially power performance and operating data. In fact, there has been very limited experience in wave energy, which is essential in order to fully understand the challenges in device performance and reliability. The limited data and experience that currently exists are rarely shared, as testing is partly private-sponsored.

This project proposes to remove this roadblock by delivering for the first time, open access, high-quality power take-off (PTO) performance, reliability and operational data to the wave energy development community.

Nevertheless, data sharing in the open domain can be restricted as a legitimate reason to protect results that can reasonably be expected to be commercially or industrially exploited. Strategies to limit such restrictions will include anonymizing or aggregating data, agreeing on a limited embargo period or publishing selected datasets.



1.1 Purpose of the Data Management Plan

The purpose of the DMP is to provide an analysis of the main elements of the data management policy that will be used by the Consortium with regard to the project research data.

The DMP covers the complete research data life cycle. It describes the types of research data that will be generated or collected during the project, the standards that will be used, how the research data will be preserved and what parts of the datasets will be shared for verification or reuse. It also reflects the current state of the Consortium agreements on data management and must be consistent with exploitation and IPR requirements.

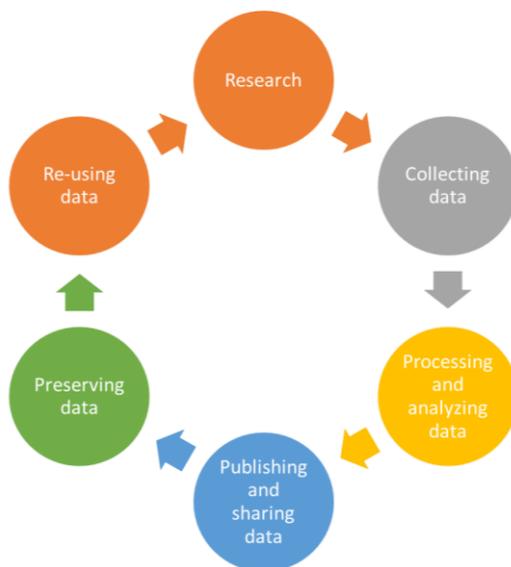


Figure 1. Research Data Life Cycle [2]

The DMP is not a fixed document, but will evolve during the lifespan of the project, particularly whenever significant changes arise such as dataset updates or changes in Consortium policies.

This document is the first version of the DMP, delivered in Month 3 of the project. It includes an overview of the datasets to be produced by the project, and the specific conditions that are attached to them. The next versions of the DMP will get into more detail and describe the practical data management procedures implemented by the SEA TITAN. At a minimum, the DMP will be updated in Month 18 (D8.6) and Month 36 (D8.7) respectively. This document has been prepared by taking into account the “Template horizon 2020 data management plan (DMP)” [Version 1.0. of 10 October 2016] and additional consideration described in ANNEX I: KEY PRINCIPLES FOR OPEN ACCESS TO RESEARCH DATA.



1.2 Research Data Types in SEA TITAN

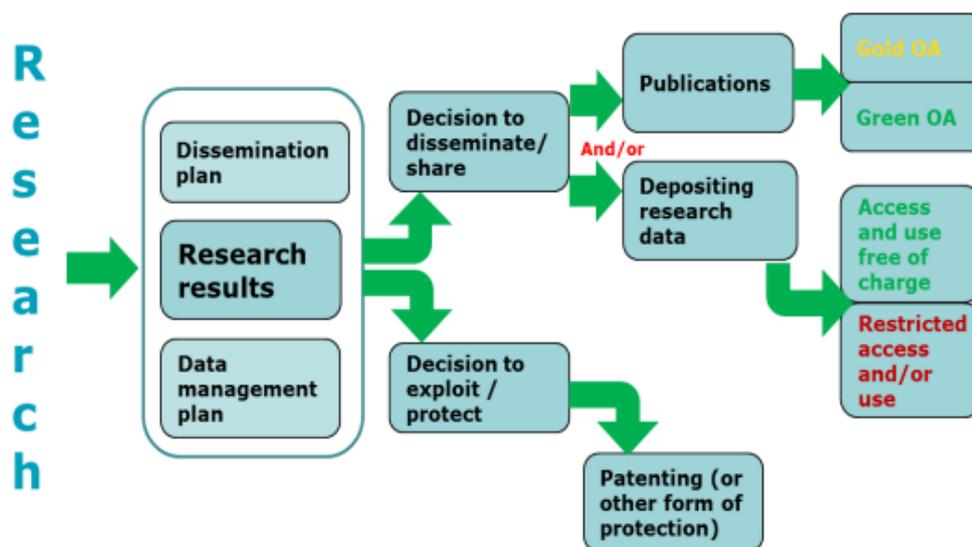
For this first release, the DMP highlights the data types expected to be produced during SEA TITAN project life span, these datasets will be revised on next iterations of the document if found redundant or insufficient.

According to such consideration, Table 1 reports a list of indicative types of research data that SEA TITAN will produce. This list may be adapted with the addition or removal of datasets in the next versions of the DMP to take into consideration the project developments. A detailed description of each dataset is given in the following sections of this document.

#	Dataset reference	Lead partner	Related WP(s)
1	DS_AMSRM_Performance	CIEMAT	WP2, WP3, WP4, WP5
2	DS_AMSRM_Feasibility	CIEMAT	WP2, WP3, WP4, WP5
3	DS_Cooling_System_performance	CIEMAT	WP6

Table 1. SEA TITAN types of data

Specific datasets may be associated to scientific publications (i.e. underlying data), public project reports and other raw data or curated data not directly attributable to a publication. The policy for open access are summarized in the following picture.



Research data linked to exploitable results will not be put into the open domain if they compromise its commercialization prospects or have inadequate protection, which is a H2020 obligation. The rest of research data will be deposited in an open access repository. When the research data is linked to a scientific publication, the provisions described in ANNEX II: SCIENTIFIC PUBLICATIONS will be followed.

Research data needed to validate the results presented in the publication should be deposited at the same time for “Gold” Open Access (*Authors make a one-off payment to the publisher so that the scientific publication is immediately published in open access mode*) or before the end of the embargo period for “Green” Open Access (*Due to the contractual conditions of the publisher, the scientific publication can undergo an embargo period up to six months since publication date before the author can deposit the published article or the final peer-reviewed*



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manuscript in open access mode). Underlying research data will consist of selected parts of the general datasets generated, and for which the decision of making that part public has been made.

Other datasets will be related to any public report or be useful for the research community. They will be selected parts of the general datasets generated or full dataset and be published as soon as possible.

1.3 Responsibilities

Each SEA TITAN partner has to respect the policies set out in this DMP. Datasets have to be created, managed and stored appropriately and in line with applicable legislation.

The Project Coordinator has a particular responsibility to ensure that data shared through the SEA TITAN website are easily available, but also that backups are performed and that proprietary data are secured.

WEDGE GLOBAL, as WP1 leader, will ensure dataset integrity and compatibility for its use during the project lifetime by different partners.

Validation and registration of datasets and metadata is the responsibility of the partner that generates the data in the WP. Metadata constitutes an underlying definition or description of the datasets and facilitate finding and working with particular instances of data.

Backing up data for sharing through open access repositories is the responsibility of the partner possessing the data. Quality control of these data is the responsibility of the relevant WP leader, supported by the Project Coordinator.

If datasets are updated, the partner that possesses the data has the responsibility to manage the different versions and to make sure that the latest version is available in the case of publicly available data.

WP1 will provide naming and version conventions. Last but not least, all partners must consult the concerned partner(s) before publishing data in the open domain that can be associated to an exploitable result.



2. DATASETS DESCRIPTION

2.1 DS_AMSRM_PERFORMANCE

Along the AMSRM development, the representative variables to be obtained during the different design and testing procedures are separated in the different stages: calculation of specifications and experimental tests performance.

Calculation of the specifications of the PTO

During the simulation of the system, corresponding to WP2, the data obtained to define and place the linear generator in the different WEC technologies will be:

- Available space. (Length, width, height)
- Maximum stroke
- Maximum velocity
- Maximum force

After evaluating the WECs in different scenarios proposed for each WEC technology, different values of: force, velocity and stroke will be obtained.

This data will be private, only shared internally for the project partners, since they are sensible data corresponding to the involved technologies.

Experimental tests performance

Finally, during the laboratory test performance, accomplished in WP5, a set of data will be collected, for each of the scenarios tested, corresponding to one type of WEC technology and a certain sea location, reproducing a certain sea state:

- Force values as a function of the current applied to the generator phases, for different velocities and current levels.
- Output power, supplied to the grid as a function of the force and velocity. Mechanical power will be also calculated, obtaining a complete global efficiency map.

This data will be mostly public, since it is considered they are part of the results obtained from the project and part of the dissemination plan.

2.2 DS_AMSRM_FEASIBILITY

The data set are obtained as a result of the design stage of the PTO solution. Based on that solution, a PTO module will be defined to develop a prototype. During the design of both the linear generator, the power converters and the control platform, corresponding to WP3, different variables will be defined as a result of the calculations:

- Based on Finite Elements Method (FEM) analysis, force map depending on the position, velocity and the current level. Force validation will demonstrate the feasibility of the proposed solution.
- Losses provided by the losses model, depending on the position, velocity and current level.
- Expected efficiency map depending on the position, velocity and current level. The losses model and efficiency map will allow to develop an energy matrix to explore the



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economic feasibility of the system when it is applied to the different WEC technologies.

- Thermal behaviour will be analysed along the different operation situations defined, validating the feasibility of the system.

This data will be private, only some of these data will be shared internally for the project partners, since they are sensible data corresponding to the know-how of the machine.

2.3 DS_COOLING_SYSTEM_PERFORMANCE

Related to the thermal behaviour of the system, considering that PTO will be evaluated for different WEC technologies and sea states, it will be analysed in those scenarios the time evolution of temperature in the following points:

- At the linear generator: temperature at the machine coils (at least two measurements), translator magnetic circuit and bearings (at least two measurements)
- At the power electronic converters: IGBT case, water cooling fluid, ambient.

Related to the SLSG, since only calculation and preliminary design is accomplished during the project, no thermal data will be provided. However, the superconducting solution requires, as one of the main results of the solution definition, a cryostat, being the system in charge of taking the system to the required low temperature. Anyway, only an engineering solution will be defined, no results or data set.



3. STANDARDS AND METADATA

This aspect will be defined as part of task 7.3 Standardization activities, identification and analysis of related existing standards and the contribution to the ongoing and future standardization developments from the results of the project.

The participation of a Standardization Body (UNE) provides the relevance, knowledge and experience in the standardization system and its internal procedures. Other project partners will provide the technical support to the development of this task.

It is expected to fulfill an analysis of the applicable standardization landscape by M6 and to define in detail the contribution to the ongoing and future standardization developments by M36. As so this part of the document will be updated as soon as more information is available for the consortium.



4. DATA SHARING

During the lifecycle of the SEA-TITAN project datasets will be stored and systematically organized in a database. An online data query tool will be operational by Month 18 and for open dissemination by Month 24. The database schema and the quarriable fields, will be also publicly available to the database users as a way to better understand the database itself. In addition to the project database, relevant datasets will be also stored in ZENODO [5], which is the open access repository of the Open Access Infrastructure for Research in Europe, OpenAIRE [4].

Data access policy will be unrestricted if no confidentiality or IPR issues are expected by the relevant Work Package leader in consensus with the Project Coordinator. All collected datasets will be disseminated without an embargo period unless linked to a green open access publication.

Otherwise, in order to protect the commercial and industrial prospects of exploitable results aggregated data will be used in order to limit this restriction. The aggregated dataset will be disseminated as soon as possible. In the case of the underlying data of a publication this might imply an embargo period for green open access publications.

Data objects will be deposited in ZENODO under:

- Open access to data files and metadata and data files provided over standard protocols such as HTTP and OAI-PMH.
- Use and reuse of data permitted.
- Privacy of its users protected.



5. ARCHIVING AND PRESERVATION

The SEA-TITAN project database will be designed to remain operational for at least 5 years after project end. By the end of the project, the final dataset will be transferred to the ZENODO repository, which ensures sustainable archiving of the final research data. Items deposited in ZENODO will be retained for the lifetime of the repository, which is currently the lifetime of the host laboratory CERN and has an experimental programme defined for at least the next 20 years.

Metadata and persistent identifiers in Zenodo are stored in a PostgreSQL instance operated on CERN's Database on Demand infrastructure with 12-hourly backup cycle with one backup sent to tape storage once a week. Metadata is in addition indexed in an Elasticsearch cluster for fast and powerful searching. Metadata is stored in JSON format in PostgreSQL in a structure described by versioned JSONSchemas. All changes to metadata records on Zenodo are versioned and happening inside database transactions. In addition to the metadata and data storage, Zenodo relies on Redis for caching and RabbitMQ and python Celery for distributed background jobs.



6. REFERENCES

- [1] What is the Open Aire research data pilot? <https://www.openaire.eu/what-is-the-open-research-data-pilot>
- [2] UK Data service. <https://www.ukdataservice.ac.uk/manage-data/lifecycle>
- [3] Guidelines on FAIR Data Management in Horizon 2020. http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-data-mgt_en.pdf
- [4] OpenAIRE repository. https://www.openaire.eu/search/project?projectId=corda_h2020::9731d27a6ffc974fff9a7ff23ce33735
- [5] ZENODO: Open Science knows no borders. <https://zenodo.org/>
- [6] DATACITE: Locate, identify, and cite research data with the leading global provider of DOIs for research data. <https://www.datacite.org/>
- [7] ORCID: Connecting Research and Researchers. <https://orcid.org/>



ANNEX I: KEY PRINCIPLES FOR OPEN ACCESS TO RESEARCH DATA

These principles can be applied to any project that produces, collects or processes research data. As indicated in Guidelines on Data Management in H2020 [3], scientific research data should be FAIR:

- Findable. The data and associated software produced and/or used in the project should be discoverable (and readily located), identifiable by means of a standard identification mechanism (e.g. Digital Object Identifier)
- Accessible. Information about the modalities, scope and licenses (e.g. licencing framework for research and education, embargo periods, commercial exploitation, etc.) in which the data and associated software produced and/or used in the project is accessible should be provided.
- Interoperable to specific quality standards. The data and associated software produced and/or used in the project should be interoperable allowing data exchange between researchers, institutions, organizations, countries, etc. (e.g. adhering to standards for data annotation, data exchange, compliant with available software applications, and allowing re-combinations with different datasets from different origins).
- Re-useable beyond the original purpose for which it was collected. The data and associated software produced and/or used in the project should be useable by third parties even long time after the collection of the data (e.g. data are safely stored in certified repositories for long term preservation and curation; they are stored together with the minimum software, metadata and documentation to make it useful; the data are useful for the wider public needs and usable for the likely purposes of non-specialists).



ANNEX II: SCIENTIFIC PUBLICATIONS

Project Partners are responsible for the publication of relevant results to scientific community by Scientific Publications. According to SEA TITAN Description of the Action (DoA), section 2.2.1, at least 6 indexed manuscripts will be produced. An initial list of Scientific Publications is available in Deliverable D7.1 Dissemination Plan.

The data (including associated bibliographic metadata) needed to validate the results presented in scientific publications will be deposited in a research data repository. This requirement is based on the fact that the concept of 'publication' has rapidly evolved over the past years and in the context of the digital era. Therefore, the notion of 'publication' increasingly includes the data underpinning the publication and results presented, also referred to as 'underlying' data. This data is needed to validate the results presented in the deposited scientific publication and is therefore seen as a crucial part of the publication and an important ingredient enabling scientific best practice.

Metadata will maximize the discoverability of publications and ensure the acknowledgment of EU funding. Bibliographic data mining is more efficient than mining of full text versions. The inclusion of metadata is necessary for adequate monitoring, production of statistics, and assessment of the impact of H2020. In addition to basic bibliographic information about deposited publications the following metadata information is expected:

- EU funding acknowledgement:
 - o Contributor: "European Union (EU)" & "Horizon 2020"
- Peer Reviewed type (e.g. accepted manuscript; published version).
- Embargo Period (if applicable):
 - o End date
 - o Access mode
- Project Information:
 - o Project number: "764014"
 - o Name of the action: "Research and Innovation action"
 - o Project Acronym: "SEA-TITAN"
 - o Project Name: "SEA-TITAN: Surging Energy Absorption Through Increasing Thrust And efficiency"
- Publication Date.
- Persistent Identifier:
 - o Authors and Contributors. Wherever possible identifiers should be unique, non-proprietary, open and interoperable (e.g. through leveraging existing sustainable initiatives such as ORCID [6] for contributor identifiers and DataCite [7] for data identifiers).
 - o Research Outcome
- License. The Commission encourages authors to retain their copyright and grant adequate licenses to publishers. Creative Commons offers useful licensing solutions.



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SEA-TITAN project will support the open access approach to Scientific Publications. Scientific Publications covered by an editorial copyright will be made available internally to the partners and shared publicly through references to the copyright owners web sites.

Whenever possible, a Scientific Publication, as soon as possible and at the latest six months after the publication time, will be deposited in a machine-readable electronic copy of the published version or final peer-reviewed manuscript accepted for publication in a repository for scientific publications. Moreover, the beneficiary should aim at depositing at the same time the research data needed to validate the results presented in the deposited scientific publications.

All scientific publications of the SEA-TITAN project will be available through OpenAIRE repository [4] which allows searching publications per project. The potential delayed access ('embargo periods') required by specific publishers and magazines will be negotiated in a case-by-case basis. Similarly, as with the scientific publications, ZENODO [5], which is the open access repository of OpenAIRE [4], will be used principally. As the time of writing this first version of the document, ZENODO repository is pending to be created and configured.