High Performance Zinc-Air Batteries

Deliverable 1.2. Data Management Plan

Elena Guinea Marca
CIC EnergiGUNE

Deliverable No.	HIPERZAB D1.2	
Grant Agreement No	101115421	
Related WP	WP1. Project coordination and management	
Deliverable Title	Data Management Plan	
Deliverable Date	2024-03-31	
Deliverable Type	REPORT	
Dissemination level	Sensitive (SEN)	
Written By	Elena Guinea (CICE) Francesc Fabrega (Zabala)	2024-02-26 2024-03-01
Checked by	Nagore Ortiz Vitoriano (CICE)	2024-03-05
Reviewed by (if applicable)	Elena Guinea (CICE) Mattia Felice Palermo (CICE)	2024-03-15
Approved by	Steering Committee	2024-03-20
Status	Final	2024-03-20

Disclaimer / Acknowledgment

This project has received funding from the European Union's Horizon Europe programme for research and innovation under grant agreement No. 101115421. This document reflects the views of the author and does not reflect the views of the European Commission. While every effort has been made to ensure the accuracy and completeness of this document, the European Commission cannot be held responsible for errors or omissions, whatever their cause.

Summary

The Data Management Plan (DMP) has been collaboratively developed with active participation and input from all partners, ensuring comprehensive coverage of all potential data processing requirements. Consequently, the successful attainment of the objective to formulate a robust data management strategy can be affirmed. All partners have been duly briefed on the finalized and endorsed plan, assuming responsibility for its implementation within their respective organizations. Reviews of the plan are scheduled for M12, M30 and M48 to incorporate any necessary adjustments imposed by project developments.

Contents

List of Tables

List of Abbreviations

SYMBOL	SHORTNAME
ADVENST	Advenst enerji depolama sistemleri sanayi ve ticaret anonim sirketi
AI	Artificial intelligence
CA	Consortium Agreement
CICe	CIC energiGUNE
CEGASA	Cegasa Energía S.L.U
DLR	Deutsches Zentrum für Luft und Raumfahrt EV
DMP	Data management plan
DoA	Description of action
DOI	Digital object identifier
EC	European Commission
EU	European Union
GA	Grant Agreement
IREC-CERCA	Fundació institut de recerca de l´energia de Catalunya
IPR	Intellectual Property Rights
KPI	Key Project Indicators
R&D	Research and development
PC	Project Coordinator
PO	Project Officer
POLITO	Politecnico di Torino
RP	Reporting period
PR	Periodic Report
SC	Steering Committee
DFT	Density Functional Theory
MD	Molecular Dynamics

Executive summary

This document serves as the deliverable "D1.2 Data Management Plan" for the HIPERZAB project, providing the initial version of the Data Management Plan.

The Horizon Europe Model Grant Agreement requires the establishment and periodic updating of a data management plan (DMP). The DMP is a crucial component of effective data and research output management, outlining procedures for handling scientific data in alignment with FAIR principles.

The DMP outlines the procedures for collecting, generating, managing, and preserving data throughout the duration of the HIPERZAB project. It has been organized following the Data Management Plan Template issued by the European Commission in May 2021: EC Guidelines on Data Management in Horizon EUROPE. The primary objective is to ensure that research data becomes findable, accessible, interoperable, and reusable (FAIR). This includes providing guidelines for handling research data during and after the project, specifying the types of data involved in the project's collection, processing, and generation, outlining the applied methodology and standards, determining whether data will be shared or made open and the manner in which this will be done, as well as detailing the procedures for curating and preserving the data.

The DMP describes the collection, generation, management, and preservation of data during HIPERZAB project runtime. It has been structured by following the Data Management Plan Template provided by the European Commission in May 2021: EC Guidelines on Data Management in Horizon EUROPE[1] , and aims at making Research data findable, accessible, interoperable and reusable (FAIR) including:

- Guidelines on the handling of research data during and after the project;
- The type of data collected, processed and generated by the project;
- The methodology and standards applied;
- Whether data will be shared/made open and how;
- How data will be curated and preserved.

Furthermore, this document draws upon earlier Data Management Plans submitted by CIC energiGUNE in its role as the Coordinator, such as the Data Management Plan for the HELENA project (Grant Agreement No. 101069681).

The initial iteration of the Data Management Plan (DMP) is presented in March 2024 as deliverable D1.2. This document will undergo periodic updates throughout the project's lifecycle to enhance and revise the existing information, incorporating any new issues or modifications in project procedures. In this project, three updates of the document are scheduled in months 12, 30 and 48 (D1.3, D1.4, D1.5), following the internal approved procedures in the Consortium Agreement.

All partners involved in the HIPERZAB project will share the responsibility for implementing the guidelines outlined in this document.

[1] HORIZON_EUROPE_Data-Management-Plan-Template.pdf (openaire.eu)

Data Summary

1.1.1 Purpose of the data collection and generation

The main objective of HIPERZAB is to develop an electrically rechargeable Zn-air battery (ERZAB) for medium-term storage. HIPERZAB will improve the performance, lifetime, safety, sustainability and costs of liquid electrolyte Zn-air batteries (ZAB) by developing three innovative components: (i) a 3D porous Zn/biopolymer composite anode, (ii) an eco-friendly bilayer gel biopolymer electrolyte, and (iii) a CRM-free structured cathode.

The goal is to integrate these components in a single device proposing a new gel-electrode-assembly (GEA) battery design with a channeled current collector to enable the water/air management control during cycling.

Thus, research focused on achieving these goals will generate data related to each component and the final prototype.

As a first analysis of data generated in **HIPERZAB** and the procedure to be managed, it is noteworthy them following research outputs: synthesis routes parameters (SINTEF, IREC, CICE, POLITO), fabrication process parameters (ADVENST, CICE, DLR, CEGASA), material characterization results (SINTEF, IREC, CICE, DLR, ADVENST, POLITO), digital models (CICE, DLR), battery performance (CICE, POLITO, CEGASA), and LCA inventory (SINTEF, CEGASA). To all of them, accessibility will be given through European Open Science Cloud as FAIR Sharing Initiative under Creative Commons license.

The purpose of the DMP is to provide an analysis of the main elements of the data management policy that will be followed by the HIPERZAB consortium regarding all datasets that will be generated by the project.

1.1.2 Data storage systems

Cloud services

TEAMS

Throughout the project, a project folder on TEAMS was created to facilitate the sharing of information between consortium members. Access to the folder requires validation by the workflow tool administrator for the HIPERZAB workspace. Beneficiaries can request access to the coordinator.
HIPERZAB Partners are urged to employ SharePoint as a collaborative platform for sharing information related to the project. The key functionalities recommended for utilization involve the uploading and downloading of documents. This encompasses a range of items, including contact lists, templates, deliverables, meeting minutes, agendas, presentations, the Technical Annex of the Grant Agreement, and other pertinent materials.

Network File Shares

Sensitive project data, including confidential information and other data utilized internally by partners for daily operations contributing to project outcomes but not shared in reports or partner interactions, are customarily housed within each partner's dedicated storage infrastructure. This may involve intranet platforms, SharePoint sites, or file servers tailored to ensure secure storage and convenient access to project-related

materials.

Website

The designated website (https://hiperzab.eu/en) serves as an alternative platform for disseminating information and engaging with the community beyond the confines of the project. Publicly accessible deliverables and additional project-related information, including upcoming events and news, will be made available on this site.

1.1.3 Data description

The main data generated by the project are presented below:

Table 1: Data description

WP	DATA TYPE	PURPOSE	DATA PRODUCTION METHODS	DATA FORMAT/SIZE	USEFUL FOR WHICH STAKEHOLDERS(/USERS)
WP1	1) Data regarding the internal communication among project partners such as internal presentations. 2) Data regarding the internal reporting and the reporting to the EU such as technical and financial reports.	The data will be used for internal project management such as internal presentations, technical reports and financial reports.	Completed by all consortium participants and compiled in the project's shared SharePoint.	.ppt, .doc or .xls.	• HIPERZAB consortium members. • General population. • Scientific community. • Industrial stakeholders
WP2	Data regarding the inputs and outputs of materials, energy consumption and emissions across all stages of the product life cycle, transportation data, product use data (including energy and water consumption) and end-of-life (disposal) data	The data collected will be used to calculate the LCA	Completed by all consortium participants and compiled in the project's shared SharePoint.	.xls.	• The output from the LCA will be used to identify potential environmental impacts resulting from the design and material selection for the electrode. • Consortium members, relevant industry, European Commission
WP3	• Test parameters and protocols for cold sintering of Zn electrodes. • Test parameters and protocols for forming the biopolymer matrix and integration with the cold sintered Zn electrode. • Data on different materials properties of the cold sintered electrode, selected biopolymers and the formed biopolymer structure and integration with the cold sintered Zn.	• The data collected will be used as input for evaluation of the properties of the cold sintered porous Zn and Zn/biopolymer composite electrode developed Task 3.1-3.3. • The data collected for the LCA will be used in Task 2.2 to perform a holistic environmental assessment of ZAB design and selected electrodes.	Observational: images Experimental data: from investigation and characterization of electrode structure and performance	Text: Reports, notes, guidelines: txt, docx, PDF Numeric: .XLSX, .CSV … Audiovisual: JPEG, .JPG, .PNG, .TIFF, AIFF, WAVE, .MP3, .MP4… /Up to 100 GB	Consortium members, relevant industry, European Commission

	• Data on electrochemical performance and structural and mechanical properties of the cold-sintered Zn electrode and the Zn/biopolymer composite electrode under basic lab-cell configuration and at different charge/discharge stage and number of cycles. • Collection of all material flows and energy consumption data to perform a screen cradle to cradle LCA of the anode, cathode and electrolyte.				
WP4	Data from Reflectometry measures.	Reflectometry will be used to determine the thickness of GDLs. The thickness of the GDLs may hinder the mass transfer of oxygen and the capacity and performance of the batteries.	Measured reflectometry data of ultra-thin GDLs	.xls, .txt / kb to MB	Consortium members
	Electrochemical data	Electrochemical characterization data to analyze cycling behavior half-cells (GDE)	Measured data	.txt, .csv, hdf (hierarchical data format) / MB to GB	Consortium members
	Data on chemical structure and characterization of GDL from FTIR analysis.	FTIR measurements are performed to evaluate the chemical composition of GDL.	FTIR spectroscopy measurements	.xls, .txt//kb to MB	Consortium members, researchers
	• Scanning Electron Microscopy (SEM) analysis of GDLs to investigate microstructure and surface morphology.	• SEM images will provide proof for solid conformal GDL films with no defects, cracks or pinholes.	Electron Microscopy analysis	.pdf, .tiff/MB	Consortium members, researchers

	• Energy Dispersive X-ray Spectroscopy (EDX) for chemical composition analysis of GDLs.				
	• Gas permeability tests results for oxygen and water vapor transport properties of GDLs. • Data on contact angle measurement of GDLs	• The electrochemical performance of the air electrode is improved by increasing oxygen permeability and reducing moisture permeation. Oxygen permeability of GDL film will be higher than 10 Barrier. • Hydrophobic film of GDL will provide to suppress the moisture uptake and electrolyte evaporation. The contact angle value of GDL should be higher than 110o	Gas transmittance measurement	.xls, .txt//kb to MB	Consortium members, researchers
	Data on complex oxide materials properties. Structural properties and electrochemical performance on the generated battery of materials.	The material screening will be carried out in the frame of WT4.1 and the results will be used for the generation of a bifunctional cathode in WT4.3.	The data will be produced using a combination of different techniques available in the laboratory such as ellipsometry (n,k optical properties), and Raman spectroscopy, GDOES, drop-probe electrochemical cell tests. Other data might be generated to complete the characterization such as synchrotron x-ray diffraction, fluorescence, or XPS.	.txt (or .csv)/ /kb to MB s	Consortium members involved in the tasks T4.3

WP5	• Specification of laboratory-scale cell(s) components, their quantities and workflow of materials preparation. • Definition of conditions for electrochemical characterization, including test parameters and protocols for seasonal storage as well as other applications. • Data on biopolymer electrolyte materials properties, structure and characterizations needed for the Zn-air battery components (electrolyte). • Benchmarking of new literature reports to define properties of electrolyte biopolymers and their manufacturing process. • Rapid screening and evaluation of the biopolymer electrolyte and other composite materials • Data on electrochemical performance and mechanical properties at materials level under basic lab-cell configuration. • Definition of cell designs, and assembly of laboratory-scale cells.	All collected and validated data are needed to evaluate the final physico-chemical and electrochemical properties of the biopolymer electrolyte materials, to reach the specific objectives of the project. This data is necessary to demonstrate the possible use of the developed and optimized materials in rechargeable Zn-air batteries. More in detail, the validated data will serve as input for Task 5.1 and 5.2: Development of the acid and basic layers and electrochemical validation and Task 5.3: Bilayer electrolyte fabrication and characterization. The electrochemical data set will be used to define the composition of materials and cell configuration to develop the prototype in WP7.	Data from laboratory equipment (physico-chemical characterization of biopolymer electrolyte materials by XRD, NMR, SEM/TEM analyses, thermo-mechanical properties by DSC/TGA/DMA and rheological measurements and electrochemical methods like impedance, galvanostatic cycling and cyclic voltammetry, as well as decomposition products and compatibility analysis).	Laboratory notes and raw data files (e.g., DSC and TGA analysis, electrochemical characterization, etc.), paper results. The data format is potentially under csv, docx, xlsx, jpg and png formats/ MB to GB	The data can be used by project partners given interdependencies between activities, but also by the scientific community, independent experts, and private industrial actors in the relevant energy sector.
	Computational activities: • Input and output data files for DFT calculations of the	The input data is descriptive of the system properties and simulation	Data will be produced via molecular simulation tools, either	Geometry structures in XYZ, PDB, MOL, GRO.	Other researcher involved in the development of the electrolyte system. If

	simulated systems, including atomic coordinates, calculation settings, output energies, volumetric data, etc. • Input and output files of MD simulations, including atomic coordinates, topologies, force field parameters, simulation settings, trajectory coordinates, velocities and forces, etc. • (optional) GitHub/CONDA/PIP repositories for Force Fields and possibly any ad-hoc developed code • Calculation protocols documented either in text format or with workflow managers, if applicable • Plots and graphs representative of the studied observables	algorithms/parameters to be used to model the studied system. The output data will be used to interpret the simulation data, extract patterns and observables to be compared with experimental data to gain further insight into the molecular mechanisms of the studied system. If classical force field parameterization work is required, the data will be used to distill interaction parameters to reproduce the energy landscape and geometries of the studied molecules.	classical or electronic structure methods, e.g. ORCA, GROMACS, xTB, Psi-4.	Output files format is typically in CSV or plain text format. GitHub/CONDA/PIP repositories will be in their respective formats. Data interpretation will be in either vectorial or rasterized formats (PDF, PS, SVG, PNG, TIFF, JPEG / MD simulations: up to 1 M particles is in the order of Gigabytes. DFT output data: tens/hundreds of Megabytes, unless volumetric mesh data is needed.	development of novel force fields is required, ab-initio tailored force fields of biological systems used in the electrolyte can be of interest to the broader scientific community.
WP6	• Setups for the operando characterization of the cathodes during oxygen evolution and reduction. • Physical, chemical and electrochemical parameters as well as design parameters will serve as input for the modelling activities, electrochemical data will be used for validation of the simulation results. • Electrochemical data, ex-situ post-mortem and	• The designs Setups for the operando characterization of the cathodes during oxygen evolution and reduction in WP6. T6.1 • Electrochemical characterization data to analyze cycling behavior and degradation in full- (WP6), benchmark of different material combinations, designs and architectures. • Physical-chemical characterization data of	• Cad Design of the setups • Measured data (except the baseline parameters which are derived from own preliminary research and scientific literature)	• .png, .jpg or cad formats • Imaging data, 2D and 3D images, 3D volumes (FIB-)SEM, TEM, CT): .tiff, .stl/up to GB • Electrochemical datasets (cycling, impedance): .txt, .csv, hdf (hierarchical	Consortium members involved in the tasks: • Results and design parameters will be useful to all other partners in the consortium, results will be re-iterated to material/component development WPs • Results on performance and electrochemical behavior for techno-economic analysis

	operando analysis data will serve the objective to derive a more comprehensive understanding of the correlation between material, component, cell properties and performance-related characteristics (efficiency, cycling stability, achievable current density and cycle depth) • Conclusion from the data will be fed back to the material/component development WPs to iteratively optimize	materials and components (structural, kinetic, transport-related, chemical composition) to correlate properties, manufacturing/synthesis parameters with electrochemical behavior. • Post-mortem characterization data of components (electrodes, electrocatalysts) and operando analysis on component and cell-level to better understand system and optimize materials/components. • Test parameters and protocols for full-/half-cell cycling, lifetime testing, operando analysis.		data format)/ MB to GB (depending on cycle life) • Parametrization and physical-chemical characterization data: .txt, .csv, .hdf, .json /kb to MB	(CEGASA) and for sustainability assessment (WP2)
WP7	• Initial estimation of system, pack, cell and components of the ZAB • Data of similar/equivalent references to compare with the solution developed in the project. • Guide to address a profitable ZAB system.	The validated data will serve as input or guide for the rest of the WP	Data from current li-ion systems and primary Zn-air batteries will be considered as reference data. The sources will be scientific literature, catalogues, and internal documents from CEGASA. Data will be mainly estimated and calculated.	pptx, xlsx, docx., pdf (MB)	Consortium members, Industry
WP8	1) Data regarding the dissemination and communication actions along the project	The data will serve as input for WP8 deliverables to have a strategy and follow up of the dissemination,	Completed by all consortium participants and compiled in the	.xls. or .txt	• HIPERZAB consortium. • Stakeholders involved in batteries' field. • Scientific community.

	2) Data regarding the exploitation intentions of the consortium partners for the ER. This information includes: • description of the project result, • legal and ethical considerations, • expected technology readiness levels, • associated risks and mitigation strategies, • market details, • intellectual property rights, • exploitation strategy, • estimated efforts for market entry.	communication, and exploitation of project results.	project's shared SharePoint.		• European Commission services and European Agencies. • General audience.
WP9	1) Data regarding the communication among project partners and with external stakeholders 2) Data regarding exploitation, interactions with other initiatives and also interactions with stakeholders.	The data will be used forWP9 to generate a portfolio plan for exploitation results and interaction with another initiatives and stakeholders.	Completed by all consortium participants and compiled in the project's shared SharePoint.	.ppt, .doc or .xls.	• HIPERZAB consortium members. • General population. • Scientific community. • Industrial stakeholders • Technology developers • Policy makers

The project's execution does not anticipate the collection of any personal data.

Handling research data provided by different partners was a key aspect of these activities. To streamline the efficient management and distribution of the collected data among all HIPERZAB consortium partners, the decision was made to utilize the webtool platform, TEAMS Shared folder, for data sharing.

1.1.4 Re-use of existing data

The re-use of existing data available from research projects and other European projects and activities is encouraged. This section will be updated at a later stage of the project and be included in the next version of DMP in M12 or M30.

In this project it is expected that:

Data from scientific literature and from preliminary research will be used as baseline to define test protocols, recipes, and component design parameters.

POLITO will re-use data from the literature (reviews, scientific publications, books, instructions, existing standards, etc.) to define the functional *requirements* of the given electrolyte material and electrochemical cell and integrate these data in the generated technical specification document. However, most of the data will be derived from benchmarking with standard materials developed in the laboratory and by the partners with various sizes and real operation conditions.

ADVEST will re-use previous data from FTIR measurements for comparison purposes.

DLR and **CICE** will use data from literature as starting point in the modelling activities and will be later gradually complemented by own measurements.

CEGASA will not reuse any existing data to define ERs and their exploitation intentions. However, they may search bibliography to draft the exploitation plan and gather results or knowledge obtained from other projects for comparison with those identified in this project. Also, bibliography and state of art regarding technology readiness levels of the ERs will be studied.

SINTEF will re-use previous work as baseline for the cold sintering process and electrolyte composition.

IREC will use previously published data in scientific publications to establish the first exploration of oxide electrodes materials families. Data from previous studies on complex oxides generated in the lab will be also used.

1.1.5 Data utility

HIPERZAB anticipates the accumulation and synthesis of a substantial volume of research data. These data serve a dual purpose: firstly, to fulfil the project's objectives, and secondly, to offer potential utility beyond the project's scope. The dissemination strategy for data generated within the HIPERZAB project is designed to cater to various stakeholders:

- **HIPERZAB Consortium**: Members within the consortium will have access to the collected data to support collaborative efforts and drive project advancements.

- **Battery Industry Stakeholders**: This includes manufacturers, remanufacturers, retailers, researchers, and end users who will benefit from insights derived from the data to inform their practices and innovations.
- **Scientific Community**: The broader scientific community will have access to the data, fostering knowledge sharing, collaboration, and potential avenues for further research and development.
- **EC Services and Agencies**: Data generated within HIPERZAB will be accessible to European Commission services and agencies, facilitating alignment with broader EU objectives and policies.
- **General Audience**: Certain datasets may be made available to the general public to enhance transparency and public engagement in battery-related research and development efforts.

Furthermore, data generated within the consortium will be categorized based on their accessibility:

- **Open Data**: These datasets will be made readily available through the project's webpage, ensuring accessibility to a wide audience.
- **Public Data**: Data deemed suitable for broader dissemination within the scientific community will be shared accordingly.

Confidential Data: Certain data will be designated as confidential and will only be accessible to project partners. In cases where stakeholders or advisory board members require access, they will be subject to non-disclosure agreements to safeguard sensitive information.

FAIR Data

FAIR data adheres to the principles of findability, accessibility, interoperability, and reusability. The overarching objective of FAIR is to facilitate and enhance the reuse of data. In the HIPERZAB project, the data to be generated can be categorized into two types:

- **Datasets**. Datasets consist of tabulated data within any structured data storage system. This term pertains to a singular source database, connectable to other databases, where each column in the dataset represents a variable, and each row corresponds to the specific data under consideration.
- **Project documents: Publications / report / handbooks**. A publication, report, or handbook is a structured document presenting information on a specific subject, akin to a dataset in its organization. Each section or chapter represents variables, offering insights or data points, while the document as a whole functions like a comprehensive source.

1.1.6 Making data findable, including provisions for metadata

Datasets
In the context of HIPERZAB, a dataset refers to the collection of information generated throughout the stages of data collection, research, and data validation. It typically corresponds to the contents of a single database table or statistical data matrix. Each column in the dataset represents a specific variable, while each row represents an individual member or observation within the dataset.

Project documents
Publications issued during the project must include the Grant number (GA n: 101115421), acronym and reference to the Horizon Europe programme funding, including the following sentence:

"Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or [name of the granting authority]. Neither the European Union nor the granting authority can be held responsible for them."

Moreover, the EU flag must be displayed in public documents according to the Article 17 of the GA. When displayed together with another logo, the EU logo will have appropriate prominence.

Reports will be published using Zenodo as a repository. Zenodo (zenodo.org) is an open and trusted repository of scholarly work that enables researchers from all disciplines to share and preserve their research results, regardless of size or format. Zenodo offers free access and ensures that scientific results of various kinds can be cited, shared and discovered over the long term.

When uploading information to Zenodo, the following rules will be followed:

- **Search keywords**. When uploading datasets and documents in Zenodo, key words will be provided in order to facilitate the search of data.
- **Use of persistent and unique identifiers**. The assignment and management of persistent identifiers (PIDs) to the data will be automatically done when uploading the data in Zenodo repository.

- **Naming conventions**. Archives will be named using the following convention: HIPERZAB_Document name_version. Underscore (_) will be used to separate concepts.
- **Clear versioning**. The versioning of the documents will be clearly specified at the beginning of each document. Also, in the title of the files the version of the document will be indicated.

1.1.7 Making data accessible

Datasets
Accessibility of the datasets will be guaranteed through meticulous labelling of the generated data. It is imperative to consistently ensure that units are precisely specified, with a preference for utilizing units from the international metric system whenever possible.

Project documents
Access to confidential project information will be restricted to project partners, and with the European Commission (EC) when necessary. Project deliverables, along with technical and financial reports, will be made available to the EC through the System for Grant Management (SyGMa).

Deliverables deemed as public by the General Assembly (GA) will be published on the project website for broader dissemination. Additionally, other channels such as leaflets, brochures, newsletters, etc., may be utilized to disseminate HIPERZAB information.
Any further information intended for accessibility will be deliberated upon by the General Assembly and coordinated by the project coordinator.

1.1.8 Making data interoperable

Datasets

Ensuring data interoperability is crucial for much of the scientific information generated throughout the project, as data from certain tasks serve as input for others. In this regard, the required information sharing, formats, and software tools have been thoroughly examined in preceding sections of this document. Furthermore, in the work breakdown structure (WBS) of the proposal, which outlines the activities, individuals responsible for each task and deliverable have been identified. Consequently, the person accountable for data generation is simultaneously responsible for employing suitable methods and procedures to guarantee data interoperability. Similarly, when a partner requires data from another partner for their tasks, it is their responsibility to communicate with the other partner to ensure timely provision of the data using appropriate means.

Project documents
To streamline compatibility with document readers, all project-generated public documents will be stored in PDF format. This decision is aimed at preventing any potential compatibility issues with diverse document viewing applications.

Similarly, content accessible on the HIPERZAB website, such as brochures, deliverables, and videos, will be formatted according to HTML5 and CSS web standards. This adherence to standardized web protocols ensures smooth interoperability across multiple platforms, enhancing accessibility and user experience.

1.1.9 Increase data-reuse

Upon agreement by both the general assembly (GA) and the project coordinator, HIPERZAB public documents will be made available for re-use, with licensing terms clarified. Once the data are made public, they will remain public.

Allocation of resources

1.1.10 Datasets

Each participating partner will be accountable for managing the registration, storage, sharing, and safeguarding of project-related datasets. All datasets generated throughout, and post-project will adhere to confidentiality and FAIR data principles. The Teams repository, overseen collaboratively by CICe, will serve as the shared platform for file exchange among partners.

Hosting data in repositories like Zenodo is provided free of charge. Any expenses related to staff costs for inputting project data into the repository will be funded through the project budget. Partners involved in HIPERZAB will not incur any ongoing expenses for upkeeping the data repository.

1.1.11 Project documents

The HIPERZAB project's documents will consistently adhere to the FAIR data principles outlined in section 3 of this DMP. This commitment extends to maintaining the web domain, other computer systems, and any printed materials. CICe will jointly manage the website and social media responsibilities. As for long-term preservation, we will explore storing this document and especially the webpage later.

Updates to the DMP are scheduled at months 12, 30, and 48 to reflect any changes or modifications during project execution. Data and publications intended for open access will undergo review and approval by the project coordinator (PC) before being uploaded to public repositories.

1.1.12 Data Management After Project Completion

After the project HIPERZAB concludes, various measures are anticipated to be put in place to effectively oversee the data and guarantee its sustained availability and preservation. These measures will encompass:

- **Fortified Data Storage:** Rigorous security measures will be implemented to safeguard the project's data. A secure repository with robust backup and redundancy systems will be established to prevent unauthorized access, loss, or corruption of data.
- **Detailed Documentation:** A meticulous documentation process will be undertaken to catalog the structure, format, content, and metadata of all generated datasets. This comprehensive documentation will serve as a roadmap for future researchers, enhancing the usability and understanding of the data beyond the project's conclusion.
- **Continued Data Sharing and Dissemination:** The ethos of data sharing and collaboration instilled during the project will persist post-completion. Efforts to disseminate and share project-generated data will be sustained, fostering collaboration and advancing scientific knowledge in relevant fields.
- **Sustainable Preservation Strategies**: Long-term preservation strategies will be devised to ensure the enduring accessibility and integrity of the project's data. These strategies may involve adhering to standardized file formats, implementing

regular data backups, and adopting emerging technologies as needed to future-proof data preservation efforts.

By enacting these measures, the HIPERZAB project aims to uphold the availability and utility of its data for future research endeavors. Further refinements and updates to the Data Management Plan (DMP) will be provided to ensure transparency and adherence to best practices in data management post-project completion.

Data Security & Ethics Aspects

1.1.13 Specific responsibilities regarding data protection

If necessary, partners must collaborate to facilitate compliance with legal obligations stipulated by relevant data protection laws, including Regulation (EU) 2016/679 and pertinent national data protection legislation applicable to each Party. This cooperation pertains to the execution and management of the Project and the previously executed Consortium Agreement involving all partners. Specifically, partners will arrange separate agreements for data processing, data sharing, and/or joint control as needed before engaging in any such activities.

1.1.14 Confidentiality and integrity of data

To safeguard data confidentiality and integrity within HIPERZAB, measures are taken through partners' data access policies and the security protocols of the storage system.

HIPERZAB partners have implemented a rigorous policy governing data access for all personnel, including employees, collaborators, and subcontractors. This policy entails:

- Limiting the creation of copies on local devices to the duration of data processing, with guaranteed deletion after processing.
- Applying access control policies to regulate local copies of the data.
- Enforcing contractual clauses outlining data handling responsibilities.
- Requiring individuals to consent to specified terms and conditions prior to accessing the data.

In addition, data stored in Zenodo repository will be protected against unauthorized access due to[2]:

- Data center at CERN restricts physical access to trained staff.
- Servers follow CERN's security guidelines, allowing remote access only to authorized Zenodo staff.
- CERN's Security Team monitors traffic for potential threats, and all access to Zenodo.org is encrypted.
- User passwords are securely stored, and access tokens are encrypted for added protection.

1.1.15 Sharing data with confidential access

When dealing with confidential data, partners are ensuring that they comply with the non-disclosure policy detailed in Section 10 of the Consortium Agreement already signed by all partners. Particularly, the partners undertake without prejudice to any commitment on non-disclosure under the Grant Agreement, for a period of 5 years after the end of the project:

- Utilize Confidential Information solely for its disclosed purpose.
- Refrain from disclosing Confidential Information without prior written consent from the Disclosing Party, unless shared with entities under the same control listed in Attachment 4 of the Consortium Agreement, provided that these entities adhere to

[2] https://about.zenodo.org/infrastructure/

Article 10 terms of the Consortium Agreement and have a legitimate need to know about the project.
- Ensure internal distribution of Confidential Information among partners is restricted to a need-to-know basis.
- Upon request, return or destroy all Confidential Information, including copies, and delete all machine-readable data to the extent practically possible.

Confidential information will also be shared within the consortium via email. However, attachments will be safeguarded with a password within .rar or .zip files, with the password communicated separately to recipients via email.

1.1.16 Archiving confidential information

In accordance with the guidelines stipulated in Section 10 of the Consortium Agreement, partner organizations responsible for gathering sensitive data will securely store them on internal servers with stringent security measures in place. Data associated with the HIPERZAB project are disseminated among the collaborating partners via a structured Teams folder system. Oversight of access to these folders is maintained by the project coordinator, who regularly updates the access list and manages permissions for personnel within partner teams, thereby ensuring the confidentiality and integrity of the information contained within the files.

1.1.17 Ethic aspects

The data collection, data storage, data usage, data generation and data dissemination in this project do not affect to ethical issues.

As HIPERZAB is a very low TRL project related to battery development, no ethical conflicts are expected. However, a dedicated work package (WP10) has been created to monitor any kind of ethical conflicts that can arise. Regarding possible ethical issues related to the data, the following two aspects will be monitored:

- **Use of AI**. In package 6 it is expected that artificial intelligence will be used, which will be monitored in the next updates of this deliverable. In principle, no ethical issues are expected as this is a battery project.
- **Knowledge sharing with countries outside the EU**. The project consists of two non-European partners: SINTEF (Norway) and ADVENST (Turkey). The ethical aspects of data exchange with these partners will also be monitored here.

Conclusions

This Data Management Plan (DMP) outlines the procedures for collecting, managing, and processing data utilized throughout the HIPERZAB project. Serving as a comprehensive guide, this deliverable is essential for all project partners to effectively handle their data.

To ensure inclusivity, the insights of the beneficiaries have been incorporated into this document, which will be made accessible to all once finalized, serving as a reference point.

The present deliverable will be updated in months 12 (D1.3), 30 (D1.4) and M48 (D1.5). Nevertheless, any relevant changes will be collected in this period and shared with the partners if needed.

Acknowledgement

The author(s) would like to thank the partners in the project for their valuable comments on previous drafts and for performing the review.

Project partners

Table 2: Project Partner

#	PARTICIPANT SHORT NAME	PARTNER ORGANISATION NAME	COUNTRY
1	CICE	CENTRO DE INVESTIGACION COOPERATIVA DE ENERGIAS ALTERNATIVAS FUNDACION, CIC ENERGIGUNE FUNDAZIOA	SPAIN
2	CEGASA	CEGASA ENERGIA S.L.U.	SPAIN
3	SINTEF	SINTEF AS	NORWAY
4	POLITO	POLITECNICO DI TORINO	ITALY
5	IREC-CERCA	FUNDACIO INSTITUT DE RECERCA DE L'ENERGIA DE CATALUNYA	SPAIN
6	ADVENST	ADVENST ENERJI DEPOLAMA SISTEMLERI SANAYI VE TICARET ANONIM SIRKETI	TURKEI
7	DLR	DEUTSCHES ZENTRUM FUR LUFT – UND RAUMFAHRT EV	GERMANY

Appendix A – Quality Assurance

The following questions should be answered by all reviewers (WP Leader, peer reviewer 1, peer reviewer 2 and the technical coordinator) as part of the Quality Assurance Procedure. Questions answered with NO should be motivated. The author will then make an updated version of the Deliverable. When all reviewers have answered all questions with YES, only then the Deliverable can be submitted to the EC.
NOTE: For public documents this Quality Assurance part will be removed before publication.

Table 3. Quality Assurance

Question	WP Leader	SC1	SC2	SC3	SC4	SC5	SC6
	Elena Guinea*	Nagore Ortiz	Elena Guinea*	Daniel González	Sara Andrenacci	Ozgenc Ebil	Dennis Kopljar
1. Do you accept this deliverable as it is?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. Is the deliverable completely ready (or are any changes required)?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3. Does this deliverable correspond to the DoW?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4. Is the Deliverable in line with the HIPERZAB objectives?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
a. WP Objectives?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
b. Task Objectives?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5. Is the technical quality sufficient?	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*Miriam García substitute