



Deliverable D1.3 Data Management Plan

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Publishable summary

This document represents deliverable D1.3 – “Data Management Plan” of the MUSIC project (Grant Agreement No. 101092080), funded under the Horizon Europe Research and Innovation Programme (HEU).

The MUSIC consortium has identified several areas that need to be addressed in the context of data management and the public sharing of research data, which are: Data protection and confidentiality, personal data from working with external experts and participants, and limitations in open data sharing to avoid the risk of IP loss.

For some activities carried out by the project (i.e. stakeholder engagement), it may be necessary to collect basic personal data (e.g. name, background, contact details), even though the project will avoid collecting such data unless necessary. Such data will be protected in accordance with the EU's Data Protection Directive 95/46/EC1 of the European Parliament and of the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data. National and local legislations applicable to the project will also be strictly applied.

By default, all personal data, or data directly related to the residents, will first be collected when the project has received a signed informed consent form from the subjects participating.

This is the first version of the project Data Management Plan (DMP). It contains preliminary information about the data the project will generate, whether and how it will be exploited or made accessible for verification and re-use, and how it will be curated and preserved. The purpose of the Data Management Plan is to provide an outline of the main elements of the data management policy that all consortium partners will have to comply with for all datasets that will be generated by the project. The DMP is not a final report but represents a living document that will evolve during the term of the project.

The datasets referred to in this document have been drafted during the first project year (between M1 and M6) of the project. The document therefore reflects the strategy of the project consortium and all individual partners for the overall project's data management and already foreseeable datasets. An updated DMP will be prepared as part of the first technical periodic report (due at the end of August 2024), This follows the Horizon Europe guidelines on Data Management Plans, and the MUSIC actions as stated in the Grant Agreement (GA No. 101092080).

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1 Introduction

The MUSIC initial Data Management Plan (DMP) has been developed using FAIR data principles, which means making data **f**indable, **a**ccessible, **i**nteroperable and **r**eusable. The DMP outlines which datasets the project will generate, compile and/or re-use, and how these datasets will be curated, stored and made accessible. The DMP also describes the measures that have been and will be taken to safeguard and protect sensitive data as well as the procedures that assure that the produced data and results that can be shared openly will be easy to locate and access by a wider public.

MUSIC has chosen to use the Data Management Plan Template that is provided by the European Commission and recommended for Horizon Europe beneficiaries.

At present, very little data has been generated and/or collected by the project. The MUSIC DMP is designed to be a 'living' document that will, in this initial version, provide the overall strategy and processes how the MUSIC research data will be handled during and after the project. During the course of the project the DMP will be extended, reviewed and updated whenever significant changes arise, such as (but not limited to):

- new data are being generated, re-used, collected and/or gathered in any way
- periodic reports are being developed and submitted (incl. the final project report)
- adjustments to the data management strategies become necessary
- changes in individual members' data policies occur
- changes in the consortium composition and external factors occur (e.g. new consortium members joining or existing members leaving).

In preparation for this report the MUSIC partners considered a number of issues to be addressed, which are described in this report in sections 2 'Data Summary' and 3 'Making data accessible'.

All aspects will have to be answered to for each update and for each generated dataset or data collection that will be added during the term of MUSIC.

EURIDA will be responsible for communicating this DMP to all project partners and for organising the regular reviews and updates of the DMP. Each project partner will be responsible for managing their data, metadata, and insuring their data meets the data quality and management standard set out in the MUSIC DMP. MUSIC coordinator CICE will be responsible for the overall coordination of data management and the compliance with rules, regulations and legal aspects of data management processes as part of the overall scientific coordination and management of MUSIC.

1.1 The overarching MUSIC data management strategy

MUSIC's overall data management strategy follows the principle of Responsible Research and Innovation (RRI). This entails to be as open as possible, but under the consideration of strict ethics and integrity principles and respecting the requirement to protect and exploit results and intellectual property for maximum societal benefit. For MUSIC, the ethics aspect refers to personal data that may be collected especially during engagement and exchange formats with external stakeholders, end users, civil society etc. Personal data may be collected during semi-structured interviews, questionnaires and similar formats and will be anonymised and kept strictly confidential. The MUSIC strategy for personal data is explained in more detail in Section 1.2.

MUSIC, with its focus on novel supercapacitors for application cases such as passenger electromobility and transport, renewable energy, power generation and grid, industrial

machinery and consumer electronics, faces particular challenges in terms of handling IP sensitive data and assuring its protection for future exploitation.

Even at lower technology maturity levels, MUSIC targets application cases with clear commercial prospects in a highly innovative energy storage and technology field that could put Europe in the lead of frontier research and innovation.

Resulting outputs and data require clear and sound management strategies to guarantee the non-disclosure of data, either for legal and/or ethical reasons or to secure maximum project impact.

Besides those types of confidential data, MUSIC will further generate data that will not underly any restrictions, neither for ethical, legal, nor for commercial reasons. Sharing such data openly, widely and proactively will increase the impact that MUSIC will have in a long term. Especially the scientific community will benefit from accessing and re-using the data generated by MUSIC.

Handling the different types of data will require a data management strategy that reflects the various needs for screening, categorising, curating, storing, protecting and/or sharing the data.

The overall workflow and procedures used in MUSIC to ensure the effective protection of sensitive data and the open access to non-confidential research data is shown in Figure 1.

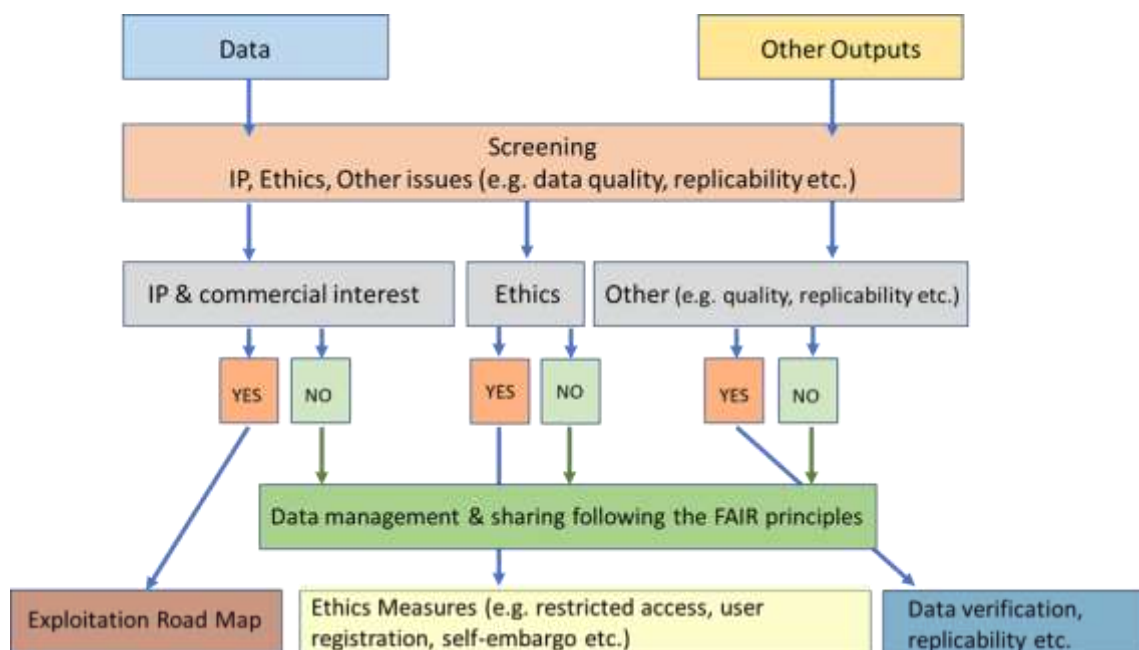


Figure 1 Workflow diagram for different types of data (open and confidential)

1.2 Personal data and individual participants

To protect the privacy of individual participants only data that can be irreversibly anonymised to the degree that it is impossible to identify individuals will be shared publicly. During the MUSIC project term personal data may be collected for signing up for the project newsletter and as part of the project website (cookies for analytical purposes). Where the

website is concerned, personal data will be stored according to the European and national GDPR.

Further, personal data will be required for dedicated stakeholder engagement formats. Results from round table discussions and semi-structured interviews will be processed to contribute to the project results (WP9). Especially the MUSIC Industrial End User Panel will involve the collection of personal data and target end user feedback and acceptance of the technology.

All participants in the Stakeholder Panel will sign an Informed Consent Form before the start of the activities, so they are aware of the action and an NDA which will assure the confidentiality of exchanges, including personal data where involved, the purpose of the activities and conditions of their participation.

In cases of feedback collection through interviews or questionnaires, all materials and responses will be anonymized or pseudonymized to guarantee the confidentiality of information. The data will be analysed using a code system and will be publicly shared grouped only by variables such as: Gender, age, country of origin, industrial sector, etc. No sensitive data will be collected throughout the project and no vulnerable groups will be involved.

Therefore, no specific Ethics issues and mitigation actions are expected for MUSIC. Public deliverables, publications and anonymised datasets will be shared openly through an open research data repository further described in Section 3.

1.3 Data underlying outputs for commercial exploitation

During the lifetime of the project, partners will very likely discover business opportunities based on the project's results that can lead to commercial exploitation. This will be monitored by the Exploitation and IP Manager, and if cases arise appropriate steps to protect such results for exploitation purposes will be taken. As explained in the overall data management strategy (Section 1.1) and displayed in Figure 1, data underlying such results will not be openly shared.

1.4 Legal frameworks

As of May 2018, the General Data Protection Regulation (GDPR)¹ is applicable in all Member States in the European Union, as well as in the countries in the European Economic Area (EEA). GDPR updates and modernises existing laws on data protection to strengthen citizens' fundamental rights and guarantee their privacy in the digital age.

GDPR regulates the processing by an individual, a company or an organisation of personal data relating to individuals in the EU. It does not apply to the processing of personal data of deceased persons or of legal entities. It sets down one set of data protection rules for all companies and organisations operating anywhere in the EU and European Economic Area (EEA), for two main reasons: 1) to give people more control over their personal data, 2) level the playing field for businesses and organisations operating in the EU and EEA. GDPR grant individuals a set of rights that must be protected by any actor who processes personal data. The individual rights include the right to:

- information about the processing of your personal data;
- obtain access to the personal data held about you;
- ask for incorrect, inaccurate or incomplete personal data to be corrected;

¹ <https://gdpr.eu/>

- request that personal data be erased when it's no longer needed or if processing it is unlawful;
- object to the processing of your personal data for marketing purposes or on grounds relating to your particular situation;
- request the restriction of the processing of your personal data in specific cases;
- receive your personal data in a machine-readable format and send it to another controller ("data portability"); and
- request that decisions based on automated processing concerning you or significantly affecting you and based on your personal data are made by natural persons, not only by computers. You can also have the right in this case to express your point of view and to contest the decision.

2 Data summary

The Annex to this report provides a list of all datasets currently envisaged to be generated and/or re-used by MUSIC and their planned management procedures. This list will be updated and refined as the project matures and progress is achieved.

In the following the general strategies for generating and/or re-using data and managing the individual datasets as well as the rules agreed by all MUSIC consortium partners for data curation, storage, accessibility and protection (where required for legal, ethical or IP protection requirements) are explained as far as possible at this stage of the project. Additional analyses will be performed and further plans and responses given as the project matures.

2.1 Purpose of the data generation or re-use and its relation to the MUSIC objectives and target groups

This section of the DMP and its future updates responds to the following questions:

- What is the purpose of the data generation or re-use and its relation to the objectives of MUSIC?
- To whom might your data be useful ('data utility'), outside your project (target groups and stakeholders, e.g. which end users, policymakers, scientific community for re-use etc.?)

▪ **Laboratory experimental characterisation data:**

Generated data covers the physicochemical and electrochemical as well as mechanical characterization. Data for the electrochemical characterization of SICs will include the influence of E-Lyte Innovation formulated electrolytes. Here it is expected to get a better understanding of the electrolyte characteristics applied in metal-ion supercapacitors, so that at the end of the project the science community and supercapacitor producers can take advantage of the generated knowledge to reach a higher metal supercaps TRL.

Generally, main beneficiaries of lab experimental data will be other researcher groups working with similar materials and chemistry, from batteries to capacitors field.

Further data cover the results of LIC and SIC cells in terms of electrical characterization and ageing tests. In addition, experimental data will also be generated when LIC and SIC modules are tested under different operating conditions. This data will be useful for manufacturers, industry and end users and wider target groups and stakeholders.

TALGO as end user and partner in the MUSIC consortium envisages using experimental data produced within the MUSIC project to model and integrate SIC technology for railway usage.

▪ **Simulation or modelling data:**

The generated data includes simulations of SIC-based use-cases. Purpose of the data is to define the applications of SIC cells and their requirements and specifications. In addition, information related to the algorithms will also be generated. Purpose of this data is to be used in the module design, integrating the information to the software.

TALGO's railway use case will be integrated in a digital twin for the SIC cells with the main focus on the models for braking energy recovery. Generated data will be used for optimising SICs for the railway application.

▪ **Process flow data:**

The generated data from process flow covers the slurry formulation, rheological properties, and coating and drying parameters for the specific equipment utilized. The beneficiaries of this data would be researcher working on same materials, both from batteries and capacitors, but would coating/drying parameters would be limited to those with a roll-to-roll equipment with similar design. However, insight of the process would be valid for all researcher working on the same type of MUSIC's electrodes.

▪ **Engineering and design data:**

The generated data includes the information in terms of mechanical design and performance of the SIC modules designed. The purpose of this data is to explain the module specifications as well as the validation done under the defined use-case. This information will be useful for end-users.

2.2 Types, formats, size and origin of data in MUSIC

This section of the DMP and its future updates responds to the following questions:

- What types and formats of data will MUSIC generate or re-use?
- What is the expected size of the data that you intend to generate or re-use?
- What is the origin/provenance of the data, either generated or re-used?

▪ **Laboratory experimental characterisation data:**

In terms of laboratory experiments the expected type of data include:

- Data on different materials properties, structure and characterisations needed for the SIC components.
- Properties of materials and their manufacturing process.
- Test parameters and protocols.
- Data on electrochemical performance and mechanical properties at materials level under basic lab-cell configuration, incl. novel electrolytes.
- Electrochemical cell designs.

Lab experiments involve a panel of analytical tools where each apparatus generates a file in its own format. The experimental data will be further processed, either using Excel or Origin, and made accessible using graphs and tables. In addition, for internal use within the MUSIC consortium, raw data from the equipment (e.g. cyclers) will be generated.

In general, all data will be available in *.csv, *.txt, *.xlsx, *.docx, *.pptx, or *.pdf formats.

In terms of electrolytes, E-Lyte will provide its evaluated data in PPTX and PDF formats, the raw data will not be made available for reasons of IP protection.

For experimental data, sizes can vary from a few hundreds of KB to several GB depending on the resolution and equipment used. Data sizes will therefore be easily shareable with common repositories.

▪ **Simulation or modelling data:**

For the Life Cycle Analysis data provided by materials developers and SIC manufacturers a dataset will be developed.

For easy use for all modelling data word/pdf documents will be generated with new information generated within the project.

▪ **Process flow data:**

Data types will include:

- Data about processing of prototype cells produced in industrial line.
- General data collected from manufacturing, lifetime estimation and recyclability.
- Safety behaviour of cells in terms of stability, energy, safety.

▪ **Engineering and design data:**

The engineering and design data will be generated in word/pdf format, with jpg images for the module design model as well as the required electronics.

Formats

The data formats will initially include Data and metadata, MS Word or other text formats (.doc, .docx, .csv), power point (.pptx), images (.jpg) and Excel (.xls, .xlsx) compatible files and PDF (.pdf) files. Nevertheless, new formats of the data might appear during the execution of the project, and they will be well- defined in the last version of the DMP accordingly.

Tabulated data can also be documentation data, but is mainly an exchange of batches of datasets with the same attributes such as:

- Simulation data
- Testing data
- Characterisations data
- Parameter files
- Matrices as for instance to define interacting responsibilities.

The size of data will be evaluated during the project and will depend on the extent and the nature of the data that are made available. Further detailed information will be provided in the final version of this DMP in M42.

2.3 Expected re-use of existing data

The re-use of existing data available from research projects and other European projects and activities is planned and will further be encouraged. This section will be updated for the coming versions of the DMP and a full list of re-used data be included in the last version of the DMP in M42.

MUSIC public documents will be available for re-use (through clarifying license) upon decision of the general assembly (GA) and the project coordinator. Once the data are made public, they will remain public.

3 FAIR data

The following details refer to openly shared data only. Measures for the curation and protection of sensitive data and/or data that underly IP protected results are described in *Section 6, Data Security*.

To comply with the principles of FAIR data, the MUSIC consortium decided to use Zenodo (<https://zenodo.org>) as the main repository for making the project's research data and other outputs, such as scientific publications, fact sheets and other info materials findable in accordance with the requirements towards open data as stated in the Grant Agreement and the Horizon Europe Open Data principles.

We will create a MUSIC community in the Zenodo repository, so all open datasets, public deliverables, publications and other public outputs can be uploaded in this community by all consortium partners.

Through Zenodo, all uploads will be linked to OpenAire (<https://www.openaire.eu/>). This will ensure maximum visibility of MUSIC data and results among the European scientific and expert community and make data findable via the Zenodo metadata standards.

3.1 Making data findable, including provisions for metadata

This section of the DMP and its future updates responds to the following questions:

- How will MUSIC data be identified, e.g. via persistent identifier?
- Will rich metadata be provided to allow discovery? What metadata will be created? What disciplinary or general standards will be followed? In case metadata standards do not exist in your discipline, please outline what type of metadata will be created and how.
- Will search keywords be provided in the metadata to optimize the possibility for discovery and then potential re-use?
- Will metadata be offered in such a way that it can be harvested and indexed?

Making data findable with metadata

The following principles are used by Zenodo to make research data findable (F1-F4). Those principles also apply for all open datasets shared by MUSIC via Zenodo:

- F1: (meta)data are assigned a globally unique and persistent identifier
 - A DOI is issued to every published record on Zenodo.
- F2: data are described with rich metadata ((meta)data are richly described with a plurality of accurate and relevant attributes; each record contains a minimum of DataCite's mandatory terms, with optionally additional DataCite recommended terms and Zenodo's enrichments.
 - Zenodo's metadata is compliant with DataCite's Metadata Schema minimum and recommended terms, with a few additional enrichments.
- F3: metadata clearly and explicitly include the identifier of the data it describes
 - The DOI is a top-level and a mandatory field in the metadata of each record.
- F4: (meta)data are registered or indexed in a searchable resource
 - Metadata of each record is indexed and searchable directly in Zenodo's search engine immediately after publishing.
 - Metadata of each record is sent to DataCite servers during DOI registration and indexed there.

Metadata associated with each data set that will be published by MUSIC in Zenodo will by default include:

- Digital Object Identifiers
- Version numbers
- Bibliographic information
- Keywords
- Abstract/description
- Associated project and community
- Associated publications and reports
- Grant information
- Access and licensing info
- Language

Project name and Grant Agreement number represent standard details as part of the grant information.

Keywords for optimised discovery

The researchers collecting the data at each organisation involved in the project will be responsible for uploading the specific datasets that they have created. All datasets will include a set of keywords associated with the data. The keywords must be descriptive to the content of the dataset. Before publishing, public datasets and suggested keywords will be submitted to the Project Coordinator, Jon Ajuria, and the Project Managers, Ignacio Castillo and Rita Clancy, for review and feedback.

For general guidance and as part of the MUSIC content branding, a set of general keywords that shall be used for all public datasets, scientific publications and public deliverables have been defined. These are as follows:

- Supercapacitors
- Capacitors
- Sodium-ion capacitor // Na-ion capacitor
- Metal-ion capacitor
- Hybrid capacitor // device
- Sustainable
- Green
- Materials
- Carbons
- Pre-sodiation
- Prototype
- Pouch cell
- Electromobility
- Asymmetric device
- Electrolyte
- Na salt
- Additive
- Solvent

3.2 Making data accessible

Data Repository:

This section of the DMP and its future updates responds to the following questions:

- *Will the data be deposited in a public/trusted repository?*
- *Have you explored appropriate arrangements with the identified repository where your data will be deposited?*
- *Does the repository ensure that the data is assigned an identifier? Will the repository resolve the identifier to a digital object?*

As highlighted in *Section 3.1 Making data findable*, all public datasets, scientific publications and deliverables that are assessed as 'open' and can therefore be shared with the public, will be uploaded to Zenodo and made openly available free of charge. Publications and underlying data sets will be linked through the use of persistent identifiers (DOI issued by Zenodo). Datasets that have been assessed as "confidential" (for personal, ethics or exploitation reasons) will not be shared. This is further explained under 'Data' below.

Zenodo takes the following measures to make all data accessible (A1-A2):

- **A1:** (meta)data are retrievable by their identifier using a standardized communications protocol
 - Metadata for individual records as well as record collections are harvestable using the [OAI-PMH](#) protocol by the record identifier and the collection name.
 - Metadata is also retrievable through the public [REST API](#).
- **A1.1:** the protocol is open, free, and universally implementable
 - See point A1. OAI-PMH and REST are open, free and univesal protocols for information retrieval on the web.
- **A1.2:** the protocol allows for an authentication and authorization procedure, where necessary
 - Metadata are publicly accessible and licensed under public domain. No authorization is ever necessary to retrieve it.
- **A2:** metadata are accessible, even when the data are no longer available
 - Data and metadata will be retained for the lifetime of the repository. This is currently the lifetime of the host laboratory CERN, which currently has an experimental programme defined for the next 20 years at least.
 - Metadata are stored in high-availability database servers at CERN, which are separate to the data itself.

The list of expected datasets in Annex A represents a first version which will be updated and extended as the project evolves. Furthermore, not all details are already known at this stage. This includes the size of datasets or other specific information which will only become available once the data has been generated. Therefore, updated versions of the datasets listed in the Annex will be delivered during either one of the updated versions of the DMP or, the latest, for its final version at the end of the project.

Data:

This section of the DMP and its future updates responds to the following questions:

- *Will all data be made openly available?*
- *If an embargo is applied to give time to publish or seek protection of the intellectual property (e.g. patents), specify why and how long this will apply, bearing in mind that research data should be made available as soon as possible.*
- *Will the data be accessible through a free and standardized access protocol?*

- *If there are restrictions on use, how will access be provided to the data, both during and after the end of the project?*
- *How will the identity of the person accessing the data be ascertained?*
- *Is there a need for a data access committee (e.g. to evaluate/approve access requests to personal/sensitive data)?*

In accordance with the Horizon Europe Open Access Mandate MUSIC commits to making all project data and results openly accessible with as few restrictions as possible. The European Commission’s open access principle however entails the strict protection of personal and sensitive data for reasons of personal rights, ethics and/or for commercial exploitation.

MUSIC will fully comply with those requirements. Management strategies that are currently foreseen are listed below. Further plans and updates will be added as the project matures.

Restrictions on data due to commercial use and IP protection:

MUSIC will protect all data that will be essential for commercialisation and/or the protection of intellectual property. The exact strategy as regards embargo periods, future access of data one IP has been protected, data ownership etc. will be discussed, agreed and fixed in the DMP per dataset. Updates will be included in future DMP versions and become part of the respective periodic technical report.

3.3 Making data interoperable

This section of the DMP and its future updates responds to the following questions:

- *What data and metadata vocabularies, standards, formats or methodologies will you follow to make your data interoperable to allow data exchange and re-use within and across disciplines? Will you follow community-endorsed interoperability best practices? Which ones?*
- *In case it is unavoidable that you use uncommon or generate project specific ontologies or vocabularies, will you provide mappings to more commonly used ontologies? Will you openly publish the generated ontologies or vocabularies to allow reusing, refining or extending them?*
- *Will your data include qualified references to other data (e.g. other data from your project, or datasets from previous research)?*

Zenodo uses the JSON schema as the internal representation of metadata and offers export to other formats such as Dublin Core, MARCXML, BibTeX, CSL, DataCite and export to Mendeley. The data record metadata will utilise the vocabularies applied by Zenodo. For certain terms, these refer to open, external vocabularies, e.g.: license (Open Definition), funders (FundRef) and grants (OpenAIRE). Reference to any external metadata is done with a resolvable URL.

3.4 Increase data re-use

This section of the DMP and its future updates responds to the following questions:

- *How will you provide documentation needed to validate data analysis and facilitate data re-use (e.g. readme files with information on methodology, codebooks, data cleaning, analyses, variable definitions, units of measurement, etc.)?*
- *Will your data be made freely available in the public domain to permit the widest re-use possible? Will your data be licensed using standard reuse licenses, in line with the obligations set out in the Grant Agreement?*
- *Will the data produced in the project be useable by third parties, in particular after the end of the project?*
- *Will the provenance of the data be thoroughly documented using the appropriate*

standards?

- *Describe all relevant data quality assurance processes.*

The Zenodo digital repository uses the following principles to assure maximum re-usability of open data:

- **R1:** (meta)data are richly described with a plurality of accurate and relevant attributes
 - Each record contains a minimum of DataCite's mandatory terms, with optionally additional DataCite recommended terms and Zenodo's enrichments.
- **R1.1:** (meta)data are released with a clear and accessible data usage license
 - License is one of the mandatory terms in Zenodo's metadata, and is referring to an [Open Definition](#) license.
 - Data downloaded by the users is subject to the license specified in the metadata by the uploader.
- **R1.2:** (meta)data are associated with detailed provenance
 - All data and metadata uploaded is traceable to a registered Zenodo user.
 - Metadata can optionally describe the original authors of the published work.
- **R1.3:** (meta)data meet domain-relevant community standards
 - Zenodo is not a domain-specific repository, yet through compliance with DataCite's Metadata Schema, metadata meets one of the broadest cross-domain standards available.

4 Other research outputs

Overall strategy for managing other research outputs

MUSIC focuses on developing novel concepts and credible exploitation pathways for its sodium-ion supercapacitors to market those as energy storage solutions for promising value chains. This will be complemented by novel business models which consider the inclusion of potential environmental and societal benefits, i.e., by reducing the burden of ecological and climate impacts associated with fossil resources or emissions from transport, boosting a European industrial 'energy storage' value chain.

During its research and development MUSIC will create novel concepts, processes, methods, technology solutions, and scientific know-how to progress the entire field of supercapacitors from materials to market applications and will set future benchmarks and standards which will live on after the project ends.

It is essential to ensure that the widest possible group of stakeholders is reached with the results of MUSIC. That way the biggest possible scientific, economic and societal impact in Europe is secured. As Intellectual Property Rights (IPR) will have to be respected, dissemination activities will be designed and implemented in close cooperation with the exploitation partners who are responsible for maturing the overall supercapacitor technology (Beyonder), individual components such as novel electrolytes (E-LYTE), and for implementing the MUSIC use case electromobility (Talgo).

While MUSIC is committed to openly sharing all results with its target communities, the protection of IP for future commercialisation pose restrictions towards the full disclosure of results, which is coherent with data sharing and disclosure strategies.

As an example, no dissemination of results may take place before a decision is made regarding its role in the exploitation plan and the possible protection through IPR. In advance of any disclosure all project partners have therefore to be contacted for their authorisation. Communication & Exploitation Manager Rita Clancy, supported by the project management team will oversee the action.

Results sharing (aka dissemination, exploitation and communication activities) in MUSIC are based on the principles of Responsible Research and Innovation (RRI). This is one of the key priorities in the 'Innovation Union' Flagship Initiative of the European Commission which aims to maximise projects' impacts by engaging the civil society in Research and Innovation activities and making know-how openly accessible to wide user groups.

Applying the FAIR principles to other research outputs

MUSIC will for all results sharing activities assure that the FAIR principles will be used as widely as possible, which mainly means making other (non-data) results findable, accessible, interoperable and reusable.

Efforts to apply those principles are briefly summarised below and explained in detail in the MUSIC Advanced Dissemination, Communication and Exploitation Plan (Advanced DEP, deliverable D9.2 and regular updates thereof as part of the technical periodic reports).

- **Making outputs and results findable and accessible:** To make research outputs findable, suitable keywords will be used through which interested parties can easily find them either via Google, social media channels or other channels used by MUSIC. In addition, common channels established and widely used by the energy storage and renewable energy community and the application sectors 'electromobility', 'grid',

'renewable power' and 'consumer electronics' will be used as multipliers to increase the findability of outputs.

Reports, fact sheets and policy briefs will be used as proven formats for highlighting outputs of relevance. All related materials that target an improved findability of outputs will include the grant information and keywords like 'Horizon Europe', 'HEU', which will further improve the findability of outputs for the Horizon Europe community and other EU funded projects.

For social media posts, respective keywords will be used and target community representatives tagged in posts to assure key stakeholders will find outputs and results. All outputs, associated info materials and posts will be made accessible through the project website as single access point for project outputs.

- **Making outputs interoperable and reusable:** The MUSIC technology has many appealing characteristics for future uptake by various target sectors and communities. Interoperability in the sense of non-data research outputs can be understood as interoperability and integrability with future industrial applications. In the centre of MUSIC are applications that require the performance parameters and strengths of supercapacitors. The most interesting one has already been chosen as target application within the project, which is electromobility, precisely electrified trains.

To assure the highest levels of interoperability and re-use of MUSIC outputs, we utilise an End User Panel, which is a group of selected end users from the possible future application fields for the MUSIC technology. This Panel will give insight into industry requirements and needs, including the viability and usability of technology outputs and the specifics for smooth technology integration in existing devices or processes.

At the end of the project, the Panel members will get the chance to participate in a demonstration round of the lab prototype and provide feedback for example on application-specific requirements towards MUSIC technology including usability, costs and other parameters that are critical for target applications and markets. Follow up plans will be discussed for the maturing of TRLs and the upscaling of MUSIC technology. Potential members of the Panel will be contacted through the wider consortium partner networks and client bases. Furthermore, the panel may include representatives of standardisation bodies or expert groups, above all CEN/CENELEC as the European official authority, to receive input on the latest developments. By engaging end-users already at lower TRL levels, we will be able to increase and maximise the compatibility, integrability, feasibility and viability of MUSIC outputs, hence their interoperability and re-usability.

5 Allocation of resources

Costs

MUSIC uses standard tools and a free of charge research data repository. The costs of data management activities are limited to project management costs and will be covered by allocated resources in the project budget.

Long-term preservation of the public data is ensured through Zenodo. Other resources needed to support reuse of data after the project ends will be solved on a case-by-case basis.

Data Manager

The overall responsibility for data management lies with the project coordinator, Jon Ajuria from CICE, supported by MUSIC's project management team.

Additional support on necessary data confidentiality due to IP protection needs will be given by the IP expert office at CICE. Main contact for the MUSIC project is Aloña Salazar who will act as CICE internal IP Manager and closely cooperate with the Dissemination Manager Miriam Gutierrez (CICE) and Exploitation & Communication Manager Rita Clancy (EURIDA) who will assure that no confidential data will be disclosed during dissemination, communication and exploitation activities, and secure the systematic and timely release and proactive sharing of open, non-confidential project data to wide user groups for maximum accessibility and re-use.

This will guarantee the tracking of IP sensitive data that underly patentable results (in accordance with IP Management procedures detailed in the Consortium Agreement).

6 Data security

Data security – The MUSIC internal repository

MUSIC uses MS Teams as single Sharepoint for all internal project resources, including data and other project outputs (e.g. reports, deliverables). Members to the MUSIC MS Teams are individually invited with their email addresses.

Microsoft Teams is built on the Microsoft 365 and Office 365 hyper-scale, enterprise-grade cloud, delivering advanced security and compliance capabilities.

Teams enforces team-wide and organization-wide two-factor authentication, single sign-on through Active Directory, and encryption of data in transit and at rest. Files are stored in SharePoint and are backed by SharePoint encryption. Notes are stored in OneNote and are backed by OneNote encryption. The OneNote data is stored in the team SharePoint site. The Wiki tab can also be used for note taking and its content is also stored within the team SharePoint site. Therefore, all shared and stored content is subject to the two-factor authentication.

Security protocols for the Teams channels follow the recommended security roadmap provided by Microsoft²

Data security – The Zenodo digital repository

The following list describes the security settings for Zenodo:

- Versions: Data files are versioned. Records are not versioned. The uploaded data is archived as a Submission Information Package. Derivatives of data files are generated, but original content is never modified. Records can be retracted from public view; however, the data files and records are preserved.
- Replicas: All data files are stored in the CERN Data Centres, primarily Geneva, with replicas in Budapest. Data files are kept in multiple replicas in a distributed file system, which is backed up to tape on a nightly basis.
- Retention period: Items will be retained for the lifetime of the repository. The host laboratory of Zenodo CERN, has defined a lifetime for the repository of the next 20 years minimum.
- Functional preservation: Zenodo makes no promises of usability and understandability of deposited objects over time.
- File preservation: Data files and metadata are backed up nightly and replicated into multiple copies in the online system.
- Fixity and authenticity: All data files are stored along with an MD5 checksum of the file content.
- Files are regularly checked against their checksums to assure that file content remains constant.
- Succession plans: In case of closure of the repository, Zenodo guarantees to migrate all content to suitable alternative institutional and/or subject based repositories.

² <https://docs.microsoft.com/en-us/microsoft-365/security/office-365-security/security-roadmap?view=o365-worldwide>

7 Ethics

No specific ethics issues have been identified for the MUSIC project besides the general ethics implications that come from working with personal data. Data protection measures related to personal data have been described in Section 1.2.

8 Other issues

No other data management issues have been identified so far. Should organisational, national or other data management rules or standards be considered in addition to those underpinning this initial DMP, they will be included in the next version of the DMP.

9 Conclusions

This deliverable report represents the initial version of the MUSIC Data Management Plan (DMP). While the general strategy for data handling and sharing can be laid out at this early stage of the project alongside an overall view of what type of data is expected during the course of the project and who will benefit from this data, specific still have to be discussed and agreed. Therefore, this DMP will be used as working basis for data management throughout the project. It will be continuously assessed, revised and updated where needed and matured until the project end.

Updates will be provided for the Periodic Technical Reports to the EC and the following DMP versions, scheduled for project month 30 and 48.

10 ANNEX A – MUSIC Datasets

WP	Origin of Data	Name of dataset	Description	Format	Responsible for data management	Classification	Timeline
WP2	Guidelines and specifications	MUSIC_guide_design	Explanation of cell and module design guidelines and specifications	*.docx, *.pdf	BCARE	Public	Deliverable in M6
WP2	Testing protocols	MUSIC_test_prot	Testing procedure and protocols for SIC cells and modules	*.docx, *.pdf	BCARE	Sensitive	Deliverable in M6
WP2	Use-case requirements and specifications (models)	MUSIC_usecase_spec	Modelization of use-cases	*.docx, *.pdf (data extracted and converted from simulation software)	BCARE	Sensitive	Deliverable in M6
WP2	Simulation/modelling	MUSIC_sim_N.N	Results delivered during WP works	*.pdf, *.docx, *xlsxl	BCARE	Sensitive	M6
WP3	Lab experiments	MUSIC_exp_electrolytes	Electrochemical characterisation and influence of electrolytes	*.pptx, *.pdf	E-LYTE	Sensitive	TBA
WP5	Lab experiments	MUSIC_exp_physics_demo	Physicochemical characterization	*.jpg, *.xls, *.docx, *.pptx, *.pdf	CICE	Public	M48
WP5	Lab experiments	MUSIC_exp_electrochem_demo	Electrochemical characterization	*.jpg, *.xls, *.docx, *.pptx, *.pdf	CICE	Public	M48
WP7	Testing results	MUSIC_test_#n	LIC and SIC testing results	*docx, *.pdf	BCARE	Public	M24 and M42
WP7	LIC module design	MUSIC_LICmod_design	LIC module design	*.docx, *.pdf	BCARE	Public	M30
WP7	SIC module design and validation	MUSIC_SICmod_design	i-SMS with SIC module design (prototypes)	*.docx, *.pdf	BCARE	Sensitive	M48
WP8	LCA/LCC	MUSIC_LCA_#N.N MUSIC_LCC_#N.N	Results from sustainability assessment and modeling – LCA and LCC	ILCD https://eplca.jrc.ec.europa.eu/ilcd.html	KIT	Public	M48



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Project partners

#	PARTICIPANT SHORT NAME	PARTNER ORGANISATION NAME	COUNTRY
1	CICE	CENTRO DE INVESTIGACION COOPERATIVA DE ENERGIAS ALTERNATIVAS FUNDACION, CIC ENERGIGUNE FUNDAZIOA	Spain
3	KIT	KARLSRUHER INSTITUT FUER TECHNOLOGIE	Germany
4	CNRS	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS	France
4.1	IMN	NANTES UNIVERSITE (Affiliated)	France
5	UPS	UNIVERSITE PAUL SABATIER TOULOUSE III	France
6	FSU	FRIEDRICH-SCHILLER-UNIVERSITAT JENA	Germany
7	IRT-JV	INSTITUT DE RECHERCHE TECHNOLOGIQUE JULES VERNE	France
8	ELY	E-LYTE INNOVATIONS GMBH	Germany
9	BYD	BEYONDER AS	Norway
10	BCARE	BATTERYCARE S. L.	Spain
11	TALGO	PATENTES TALGO SL	Spain

Table 1: Project Partners



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