



DRIVEMODE

Integrated Modular Distributed Drivetrain for Electric & Hybrid Vehicles

Document title: Data Management Plan

D1.3: Data Management Plan
WP 1, T 1.1

Authors: Alexander Smirnov (VTT)



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Technical references

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* PU = Public

PP = Restricted to other programme participants (including the Commission Services)

RE = Restricted to a group specified by the consortium (including the Commission Services)

CO = Confidential, only for members of the consortium (including the Commission Services)

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 769989.

Executive Summary

This deliverable provides the DRIVEMODE data management plan. The Deliverable outlines how the research data collected or generated will be handled during and after the DRIVEMODE action, describes which standards and methodology for data collection and generation will be followed, and whether and how data will be shared. This document follows the template provided by the European Commission in the Participant Portal¹.

The deliverable contributes to tasks “1.1 Administrative and financial management”, “1.3 Technical coordination”, and “1.4 Quality control and risk management”.

¹ http://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/open-access-dissemination_en.htm



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Introduction

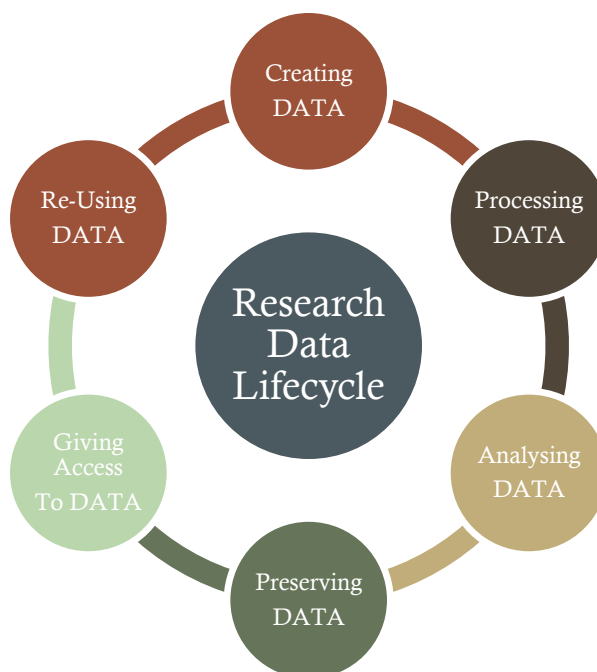


Figure 1 Research data lifecycle, adapted from ²

The purpose of the Data Management Plan (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 intellectual property rights (IPR) requirements.

Research data form the basis of the DRIVEMODE project. They play a crucial role and should be effectively managed to ensure the verification and reuse of research results, and the sustainable storage of the dataset.

This Data Management Plan aims at providing a timely insight into facilities and expertise necessary for data management both during and after the DRIVEMODE research, to be used by all DRIVEMODE researchers and their environment, including: DRIVEMODE's Project Coordination Committee, Technical Management Team, work packages (WPs), task leaders, research funders, and research users.

The most important reasons for setting up this Data Management plan are:

- Embedding the DRIVEMODE project in the EU policy on data management, which is increasingly geared towards providing open access to data that are gathered with funds from the EU;

² <https://www.ukdataservice.ac.uk/manage-data/lifecycle>



- Enabling verification of the research results of the DRIVEMODE project;
- Stimulating the reuse of DRIVEMODE data by other researchers;
- Enabling the sustainable and secure storage of DRIVEMODE data in the data repositories;
- Helping to streamline the research process from start to finish. The data management plan clarifies in advance the required data expertise and facilities to store data.

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, computational results 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.

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.



Data Summary

The project develops a new compact powertrain traction module with an optimal trade-off between efficiency, manufacturability, and cost. Therefore, the collected data are related to requirement specification based on the vehicle market. This information brings the ground for concept selection and top-level performance criteria definition. The generated data provide performance evaluation for each particular component and drivetrain as a whole. In that way, the achieved performance is validated against the specified one.

Research Data Types and Formats

The project will produce model data, design data, measurement data, simulation models, and algorithms. Some data will be collected as tables and stored in CSV format along with corresponding statistical results. The estimated types and quantities are the following:

- Model data, geometry models in common CAD format (e.g. STEP, IGES), estimated size is tens of MB.
- Measurement data from components and drivetrain, estimated size is few MB.
- Simulation models in Matlab, Excel, CAD tools, FE tool and other software packages estimated size is 1 GB.
- Qualitative data from the interviews and discussions with the designers, estimated size is few MB (structured forms, transcribed data, evaluation matrices).

It is expected to produce data sets according to Table 1, which corresponds to the project structure.

Table 1 Types of datasets in DRIVEMODE project

#	Dataset	Lead partner	Related WPs
1	Passenger cars and light duty vehicles statistical data	Chalmers	WP2
2	Transmission test and simulation data	BorgWarner	WP6
3	Electrical motor test and simulation data	AVL	WP3
4	Inverter test and simulation data	Danfoss	WP4
5	Drivetrain test and simulation data	Danfoss	WP2,WP3,WP4,WP6
6	Cooling test and simulation data	SCIRE	WP5
7	Vehicle test data	NEVS	WP7
8	Requirements, concepts evaluation and architecture decision tree	VTT	WP2

The initial set of data to define specification is a collection of available data on the market vehicle types and their properties. This information is obtained from the open sources and technical documentation from manufacturers. It is complemented by statistical analysis and clustering to specific groups according to which the performance specifications are defined. This type of data is stored in form of a table and then preserved in CSV format with accompanying metadata.



The research project will produce different quantitative measurement and simulation data. The results collected and then stored in the format convenient and traditionally used for the specific engineering area. Measurement data collected by data loggers and human observations will be stored in suitable ASCII format. The simulation data includes geometry files and files describing the physical model. Whenever possible the open source and vendor independent formats such as STEP, IGES will be used. Further, computation results will be stored in suitable text or binary documents.

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 Figure 2.

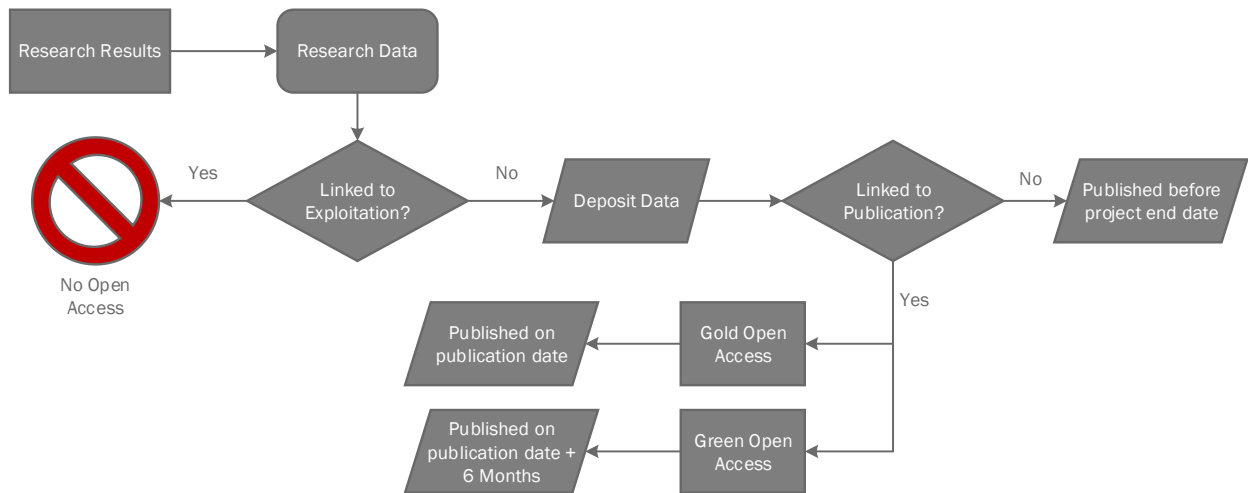


Figure 2 Research data options and publishing times

The open access is provided for the data that are not linked to exploitation. This data are stored to the selected repository and the open publication date is decided. Decision depends whether data belongs to the publication. In that case the date is defined by the type of the publication access model. When data are not linked to the publication it is openly published in the repository before the official end of the project.



FAIR Data

To ensure that data are findable the final data sets are stored on ZENODO repository³, which is open repository, does not have restrictions on research area, and has flexible licensing. Identifiers like digital object identifier (DOI) will be assigned to create persistent links. The versioning is ensured by functionality of the selected repository. As an alternative solution, the university partners can store data on their long-term preservation repositories under open access.

The research data will be provided with keywords description and corresponding metadata. As there is no predefined standard the selection of format and vocabulary will vary on the domain of expertise. However, to ensure consistency at least the minimum set compliant with DataCite's Metadata Schema⁴ will be utilized.

The data will be documented comprehensively, to ensure usability and interpretation of the data also in the future. The metadata accompanying the stored raw data will be saved in proper metadata standard format, describing all stored variables. Information about software and its version number used to obtain data will be included. The preference for open source tools will be given.

The data produced during the project and not related to exploitation will be shared, at least by the end of the project. The data are planned to be shared as soon as it is practically reasonable. The data are shared with Creative Commons Attribution 4.0 International (CC BY 4.0) license⁵ (or other relevant license), and persistent identifiers (PIDs) will be used to make the access to the data easier.

³ <https://zenodo.org/>

⁴ <https://schema.datacite.org/>

⁵ <https://creativecommons.org/licenses/>



Allocation of Resources

Each DRIVEMODE partner has to respect the policies set out in this DMP. Data sets 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 DRIVEMODE website are easily available, but also that backups are performed and that proprietary data are secured.

VTT, as the coordination partner, will ensure dataset integrity and compatibility for its use during the project lifetime by different partners.

Validation and registration of data sets 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.



Data Security

In everyday work, each consortium partner is responsible for maintaining their part of research data in safe environment. It includes storing the data in media that support regular back up and secured access. This should ensure safety and integrity of research results during project lifecycle.

For data exchange inside the DRIVEMODE consortium the common workspace is used. It is based on Nextcloud environment and ensures versioning of data files and secure back up in the cloud storage.

The DRIVEMODE project database will be designed to remain operational for 5 years after the project end. By the end of the project, the final dataset will be transferred to the ZENODO repository for long term preservation, 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 program defined for at least the next 20 years.

Data files and metadata are backed up on a regular basis, as well as replicated in multiple copies in the online system. All data files are stored along with a MD5 checksum of the file content. Regular checks of files against their checksums are made.



Ethical aspects

The DRIVEMODE partners are to comply with the ethical principles as set out in Article 34 of the Grant Agreement, which states that all activities must be carried out in compliance with:

- The ethical principles (including the highest standards of research integrity e.g. as set out in the European Code of Conduct for Research Integrity, and including, in particular, avoiding fabrication, falsification, plagiarism or other research misconduct) and Commission recommendation (EC) No 251/2005 of 11 March 2005 on the European Charter for Researchers and on a Code of Conduct for the Recruitment of Researchers (OJ L 75, 22.03.2005, p. 67), the European Code of Conduct for Research Integrity of ALLEA (All European Academies) and ESF (European Science Foundation) of March 2011. (<http://archives.esf.org/coordinating-research/mo-fora/research-integrity.html>)
- Applicable international, EU and national law.

Furthermore, activities raising ethical issues must comply with the ‘ethics requirements’ set out in Annex 1 of the Grant Agreement.

Confidentiality

All DRIVEMODE partners must keep any data, documents or other material confidential during the implementation for the project and for four years after the period set out in Article 3; as per Article 36 of the Grant Agreement. Further detail on confidentiality can be found in Article 36 of the Grant Agreement.

