

FWO DMP Template - Flemish Standard Data Management Plan

Project supervisors (from application round 2018 onwards) and fellows (from application round 2020 onwards) will, upon being awarded their project or fellowship, be invited to develop their answers to the data management related questions into a DMP. The FWO expects a **completed DMP no later than 6 months after the official start date** of the project or fellowship. The DMP should not be submitted to FWO but to the research co-ordination office of the host institute; FWO may request the DMP in a random check.

At the end of the project, the **final version of the DMP** has to be added to the final report of the project; this should be submitted to FWO by the supervisor-spokesperson through FWO's e-portal. This DMP may of course have been updated since its first version. The DMP is an element in the final evaluation of the project by the relevant expert panel. Both the DMP submitted within the first 6 months after the start date and the final DMP may use this template.

The DMP template used by the Research Foundation Flanders (FWO) corresponds with the Flemish Standard Data Management Plan. This Flemish Standard DMP was developed by the Flemish Research Data Network (FRDN) Task Force DMP which comprises representatives of all Flemish funders and research institutions. This is a standardized DMP template based on the previous FWO template that contains the core requirements for data management planning. To increase understanding and facilitate completion of the DMP, a standardized **glossary** of definitions and abbreviations is available via the following [link](#).

1. General Project Information

Name Grant Holder & ORCID	Jef Peeters, 0000-0003-1356-6508 Wim Dewulf 0000-0002-9184-051X Karel Kellens 0000-0002-0340-6669
Contributor name(s) (+ ORCID) & roles	
Project number ¹ & title	AUDRI
Funder(s) GrantID ²	C2E/23/032
Affiliation(s)	<input checked="" type="checkbox"/> KU Leuven <input type="checkbox"/> Universiteit Antwerpen <input type="checkbox"/> Universiteit Gent <input type="checkbox"/> Universiteit Hasselt <input type="checkbox"/> Vrije Universiteit Brussel <input type="checkbox"/> Other: Provide ROR ³ identifier when possible:

¹ "Project number" refers to the institutional project number. This question is optional since not every institution has an internal project number different from the GrantID. Applicants can only provide one project number.

² Funder(s) GrantID refers to the number of the DMP at the funder(s), here one can specify multiple GrantIDs if multiple funding sources were used.

³ Research Organization Registry Community. <https://ror.org/>

Please provide a short project description	<p>The AUDRI project aims to address the challenges outlined in the European Union's circular economy action plan, particularly in improving waste management strategies within the electronics sector. This initiative seeks to enhance recycling and reuse efforts, crucial for achieving closed material loops and reducing carbon emissions significantly by 2030. Given the high demand for critical raw materials (CRMs) and the need to manage hazardous components carefully, the project emphasizes the development of advanced recycling techniques. Specifically, AUDRI focuses on the reuse and recycling of batteries and other high-value components from waste electrical and electronic equipment (WEEE), leveraging novel technology for fully autonomous dismantling lines. This approach is critical for dealing with the wide variability of product models, conditions, and materials, aiming to significantly improve material recovery efficiency and support the transition towards a more sustainable and circular economy. The projects objectives are as follows:</p> <ol style="list-style-type: none"> 1) Enhancement of product identification through a multi sensor approach (e.g. RGB vision, point cloud surface data, and X-ray transmission imaging (XRT)). 2) Expansion from flat (2D) products towards complex waste stream mixes (e.g. electric toothbrushes, vacuum cleaners) with a distinct 3D shape. The project extends its focus to products with 3D shapes, such as small electronic appliances, facing challenges in feature detection and the development of autonomous dismantling strategies. This expansion aims to improve the recycling process's efficiency for items with intricate designs. 3) Expansion from destructive approaches to potential component reuse. Identifying and extracting reusable components like chips from end-of-life equipment is key to enhancing supply resilience and supporting sustainable industrial practices.
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2. Research Data Summary

List and describe all datasets or research materials that you plan to generate/collect or reuse during your research project. For each dataset or data type (observational, experimental etc.), provide a short name & description (sufficient for yourself to know what data it is about), indicate whether the data are newly generated/collected or reused, digital or physical, also indicate the type of the data (the kind of content), its technical format (file extension), and an estimate of the upper limit of the volume of the data⁴.

Dataset Name	Description	New or Reused	Digital or Physical	ONLY FOR DIGITAL DATA	ONLY FOR DIGITAL DATA	ONLY FOR DIGITAL DATA	ONLY FOR PHYSICAL DATA
				Digital Data Type	Digital Data Format	Digital Data Volume (MB, GB, TB)	Physical Volume
XRT image dataset	X-ray transmission (XRT) projections of objects collected with an x-ray scanner	Both	Digital	Observational	Common image file formats such as tiff and png.	< 5 TB	Objects for scanning
CT Reconstruction dataset	Reconstruction of 3d volume of WEEE	Generate new data	Digital	compiled/aggregated data	Volume graphics format (.vgl or similar)	< 5 TB	n/a
Component detection code	Code for performing detection of component information	Generate new data	Digital	Software	Python script	< 1 GB	n/a
WEEE image dataset	Image dataset of Waste from Electrical and Electronic Equipment (WEEE)	Both	Digital	Observational	Image file format (e.g. png)	< 100 GB	WEEE objects

WEEE point-cloud dataset	Dataset consisting of point-clouds of WEEE	Both	Digital	compiled/aggregated data	FLS, PCD, LAS	<100 GB	WEEE objects
Grasping code	Code for grasp pose estimation	Both	Digital	Software	Python script	<100mb	n/a
Object pose estimation code	Code for determining 6D pose of WEEE target objects	Both	Digital	Software	Python script + database	<100mb	n/a
Robotic Dismantling code	Code for path planning and robotic dismantling	Generate new data	Digital	Software	Val3/Python script	<100mb	n/a
Object re-identification and pose estimation code	Code for re-identification of objects based on what was stored during XRT phase	Generate new data	Digital	Software	Python script	<1GB	n/a
Robotic Scanning code	Code for Scanning objects, this will be code on the robot side for re-Identification and pose estimation	Generate new data	Digital	Software	Val3/Python script	<1GB	n/a

⁴ Add rows for each dataset you want to describe.

<p>GUIDANCE:</p> <p>DATA CAN BE DIGITAL OR PHYSICAL (FOR EXAMPLE BIOBANK, BIOLOGICAL SAMPLES, ...). DATA TYPE: DATA ARE OFTEN GROUPED BY TYPE (OBSERVATIONAL, EXPERIMENTAL ETC.), FORMAT AND/OR COLLECTION/GENERATION METHOD.</p> <p>EXAMPLES OF DATA TYPES: OBSERVATIONAL (E.G. SURVEY RESULTS, SENSOR READINGS, SENSORY OBSERVATIONS); EXPERIMENTAL (E.G. MICROSCOPY, SPECTROSCOPY, CHROMATOGRAMS, GENE SEQUENCES); COMPILED/AGGREGATED DATA⁵ (E.G. TEXT & DATA MINING, DERIVED VARIABLES, 3D MODELLING); SIMULATION DATA (E.G. CLIMATE MODELS); SOFTWARE, ETC.</p> <p>EXAMPLES OF DATA FORMATS: TABULAR DATA (.POR, .SPSS, STRUCTURED TEXT OR MARK-UP FILE XML, .TAB, .CSV), TEXTUAL DATA (.RTF, .XML, .TXT), GEOSPATIAL DATA (.DWG, .GML, ..), IMAGE DATA, AUDIO DATA, VIDEO DATA, DOCUMENTATION & COMPUTATIONAL SCRIPT.</p> <p>DIGITAL DATA VOLUME: PLEASE ESTIMATE THE UPPER LIMIT OF THE VOLUME OF THE DATA PER DATASET OR DATA TYPE.</p> <p>PHYSICAL VOLUME: PLEASE ESTIMATE THE PHYSICAL VOLUME OF THE RESEARCH MATERIALS (FOR EXAMPLE THE NUMBER OF RELEVANT BIOLOGICAL SAMPLES THAT NEED TO BE STORED AND PRESERVED DURING THE PROJECT AND/OR AFTER).</p>	
<p>If you reuse existing data, please specify the source, preferably by using a persistent identifier (e.g. DOI, Handle, URL etc.) per dataset or data type.</p>	<p>Data available from prior research conducted within the research team.</p>
<p>Are there any ethical issues concerning the creation and/or use of the data (e.g. experiments on humans or animals, dual use)? If so, please describe these issues further and refer to specific datasets or data types when appropriate.</p>	<p> <input type="checkbox"/> Yes, human subject data <input type="checkbox"/> Yes, animal data <input type="checkbox"/> Yes, dual use <input checked="" type="checkbox"/> No If yes, please describe: </p>

⁵ These data are generated by combining multiple existing datasets.

<p>Will you process personal data⁶? If so, briefly describe the kind of personal data you will use. Please refer to specific datasets or data types when appropriate. If available, add the reference to your file in your host institution's privacy register.</p>	<p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If yes: - Short description of the kind of personal data that will be used: - Privacy Registry Reference:</p>
<p>Does your work have potential for commercial valorization (e.g. tech transfer, for example spin-offs, commercial exploitation, ...)? If so, please comment per dataset or data type where appropriate.</p>	<p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If yes, please comment: The research results can be used to develop a system for autonomous demanufacturing of electronic waste. Individual components from within the demanufacturing pipeline can also be utilized in other systems in the industry.</p>
<p>Do existing 3rd party agreements restrict exploitation or dissemination of the data you (re)use (e.g. Material/Data transfer agreements, research collaboration agreements)? If so, please explain to what data they relate and what restrictions are in place.</p>	<p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If yes, please explain:</p>
<p>Are there any other legal issues, such as intellectual property rights and ownership, to be managed related to the data you (re)use? If so, please explain to what data they relate and which restrictions will be asserted.</p>	<p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If yes, please explain:</p>

⁶ See Glossary Flemish Standard Data Management Plan

3. Documentation and Metadata

<p>Clearly describe what approach will be followed to capture the accompanying information necessary to keep data understandable and usable, for yourself and others, now and in the future (e.g. in terms of documentation levels and types required, procedures used, Electronic Lab Notebooks, README.txt files, Codebook.tsv etc. where this information is recorded).</p>	<p>Publication and uniform format will be set up for collection of data from disassembly experiments. Software results will be developed with appropriate comments and readme files. Relevant dataset and codes will be documented in the GitHub of the research group.</p>
<p>Will a metadata standard be used to make it easier to find and reuse the data?</p> <p>If so, please specify which metadata standard will be used. If not, please specify which metadata will be created to make the data easier to find and reuse.</p> <p><i>REPOSITORIES COULD ASK TO DELIVER METADATA IN A CERTAIN FORMAT, WITH SPECIFIED ONTOLOGIES AND VOCABULARIES, I.E. STANDARD LISTS WITH UNIQUE IDENTIFIERS.</i></p>	<p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>If yes, please specify (where appropriate per dataset or data type) which metadata standard will be used:</p> <p>If no, please specify (where appropriate per dataset or data type) which metadata will be created: No standard metadata formats are available.</p>

4. Data Storage & Back-up during the Research Project

Where will the data be stored?	<p>For the X-ray transmission data and the reconstruction data: The data will be stored on a Network Attached Storage (NAS). The NAS is present on-site and a regular backup is created. Selective data may also be stored in the SharePoint directory mentioned below.</p> <p>For all other data: a SharePoint directory, linked to a MS Teams group, accessible to Life Cycle Engineering (LCE) research group staff. The Teams group's files will continue to be accessible to the LCE staff, and the file locations are not linked to any individual staff member.</p>
<p>How will the data be backed up?</p> <p><i>WHAT STORAGE AND BACKUP PROCEDURES WILL BE IN PLACE TO PREVENT DATA LOSS? DESCRIBE THE LOCATIONS, STORAGE MEDIA AND PROCEDURES THAT WILL BE USED FOR STORING AND BACKING UP DIGITAL AND NON-DIGITAL DATA DURING RESEARCH.⁷</i></p> <p><i>REFER TO INSTITUTION-SPECIFIC POLICIES REGARDING BACKUP PROCEDURES WHEN APPROPRIATE.</i></p>	<ul style="list-style-type: none"> • Internally managed within the SharePoint service. • Additionally, the SharePoint directory will be periodically backed up to external storage drives, stored in the LCE laboratory or office spaces.
Is there currently sufficient storage & backup capacity during the project? If yes, specify concisely. If no or insufficient storage or backup capacities are available, then explain how this will be taken care of.	<p><input checked="" type="checkbox"/> Yes</p> <p><input type="checkbox"/> No</p> <p>If yes, please specify concisely:</p> <p>If no, please specify:</p>

⁷ Source: Ghent University Generic DMP Evaluation Rubric: <https://osf.io/2z5g3/>

<p>How will you ensure that the data are securely stored and not accessed or modified by unauthorized persons?</p> <p><i>CLEARLY DESCRIBE THE MEASURES (IN TERMS OF PHYSICAL SECURITY, NETWORK SECURITY, AND SECURITY OF COMPUTER SYSTEMS AND FILES) THAT WILL BE TAKEN TO ENSURE THAT STORED AND TRANSFERRED DATA ARE SAFE. ⁷</i></p>	<p>The SharePoint directory, coupled to the MS Teams group, is only accessible to members of this group (in principle only LCE staff members). If required, a private channel could be setup, only accessible to a specific set of people.</p> <p>Regarding physical backups, they could be stored behind locked cabinet doors. The access to the lab is also only through staff cards, which are authorized by the department.</p>
<p>What are the expected costs for data storage and backup during the research project? How will these costs be covered?</p>	<p>For sharepoint: €0 Hosted on SharePoint and is included in general overhead for the university (KUL) Backups can be made on already owned hard drives that can be reformatted and repurposed.</p>

5. Data Preservation after the end of the Research Project

Which data will be retained for at least five years (or longer, in agreement with other retention policies that are applicable) after the end of the project? In case some data cannot be preserved, clearly state the reasons for this (e.g. legal or contractual restrictions, storage/budget issues, institutional policies...).	In principle, all data that is stored in the SharePoint directory or the NAS will remain accessible and managed by the LCE research group. There is no motivation to reduce the amount of stored data at this current time.
Where will these data be archived (stored and curated for the long-term)?	Online, in the SharePoint directory and on the NAS.
What are the expected costs for data preservation during the expected retention period? How will these costs be covered?	<p>€0</p> <p>Hosted on SharePoint and is included in general overhead for the university (KUL)</p> <p>Backups can be made on already owned hard drives that can be reformatted and repurposed.</p>

6. Data Sharing and Reuse

<p>Will the data (or part of the data) be made available for reuse after/during the project? Please explain per dataset or data type which data will be made available.</p> <p><small>NOTE THAT 'AVAILABLE' DOES NOT NECESSARILY MEAN THAT THE DATA SET BECOMES OPENLY AVAILABLE, CONDITIONS FOR ACCESS AND USE MAY APPLY. AVAILABILITY IN THIS QUESTION THUS ENTAILS BOTH OPEN & RESTRICTED ACCESS. FOR MORE INFORMATION: HTTPS://WIKI.SURFNET.NL/DISPLAY/STANDARDS/INFO-EU-REPO/#INFOEUREPO-ACCESSRIGHTS</small></p>	<p> <input type="checkbox"/> Yes, in an Open Access repository <input type="checkbox"/> Yes, in a restricted access repository (after approval, institutional access only, ...) <input type="checkbox"/> No (closed access) <input checked="" type="checkbox"/> Other, please specify: In principle: no. Only in case some experimental data is required to be published alongside a conference or journal article would data be (openly) shared. <i>6. Data Sharing and Reuse > Where will the data be made available? If already known, please provide a repository per dataset or data type.</i> </p>
<p>If access is restricted, please specify who will be able to access the data and under what conditions.</p>	<p>Not applicable</p>
<p>Are there any factors that restrict or prevent the sharing of (some of) the data (e.g. as defined in an agreement with a 3rd party, legal restrictions)? Please explain per dataset or data type where appropriate.</p>	<p> <input type="checkbox"/> Yes, privacy aspects <input type="checkbox"/> Yes, intellectual property rights <input type="checkbox"/> Yes, ethical aspects <input type="checkbox"/> Yes, aspects of dual use <input type="checkbox"/> Yes, other <input checked="" type="checkbox"/> No </p> <p>If yes, please specify:</p>
<p>Where will the data be made available? If already known, please provide a repository per dataset or data type.</p>	<p>If required in the context of scientific publications, specific, free accessible SharePoint directories can be setup, which will be included in the articles. This data will not include confidential data.</p>

<p>When will the data be made available?</p> <p><i>THIS COULD BE A SPECIFIC DATE (DD/MM/YYYY) OR AN INDICATION SUCH AS 'UPON PUBLICATION OF RESEARCH RESULTS'.</i></p>	<p>In the context of publications, when required (time of submitting or publishing). Other: never.</p>
<p>Which data usage licenses are you going to provide? If none, please explain why.</p> <p><i>A DATA USAGE LICENSE INDICATES WHETHER THE DATA CAN BE REUSED OR NOT AND UNDER WHAT CONDITIONS. IF NO LICENCE IS GRANTED, THE DATA ARE IN A GREY ZONE AND CANNOT BE LEGALLY REUSED. DO NOTE THAT YOU MAY ONLY RELEASE DATA UNDER A LICENCE CHOSEN BY YOURSELF IF IT DOES NOT ALREADY FALL UNDER ANOTHER LICENCE THAT MIGHT PROHIBIT THAT.</i></p> <p><i>EXAMPLE ANSWER: E.G. "DATA FROM THE PROJECT THAT CAN BE SHARED WILL BE MADE AVAILABLE UNDER A CREATIVE COMMONS ATTRIBUTION LICENSE (CC-BY 4.0), SO THAT USERS HAVE TO GIVE CREDIT TO THE ORIGINAL DATA CREATORS." ⁸</i></p>	<p>Results of prior research on ease of disassembly have always been openly published.</p> <p>All software developed for robotic disassembly experiments will be protected under copyrights.</p> <p>The IP strategy of the research group is to openly publish on achieved performances and adopted methodologies and technologies, whereas the software code developed is only shared under license agreements for specific applications, allowing future research and developments on the topic of robotic disassembly for other applications.</p>
<p>Do you intend to add a PID/DOI/accession number to your dataset(s)? If already available, please provide it here.</p> <p><i>INDICATE WHETHER YOU INTEND TO ADD A PERSISTENT AND UNIQUE IDENTIFIER IN ORDER TO IDENTIFY AND RETRIEVE THE DATA.</i></p>	<p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If yes:</p>
<p>What are the expected costs for data sharing? How will these costs be covered?</p>	<p>€0 Hosted on SharePoint and is included in general overhead for the university (KUL)</p>

⁸ Source: Ghent University Generic DMP Evaluation Rubric: <https://osf.io/2z5g3/>

7. Responsibilities

Who will manage data documentation and metadata during the research project?	Jef Peeters
Who will manage data storage and backup during the research project?	Jef Peeters
Who will manage data preservation and sharing?	Jef Peeters
Who will update and implement this DMP?	Jef Peeters