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LIFE2M – Long Life to Micromobility



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**Deliverable D1.3
Data Management Plan**



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Dissemination Level

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Disclaimer/ Acknowledgment

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Executive Summary

The present Deliverable relates to the activities carried out in task 1.3.

It reports the Data Management Plan, designed to make the research data findable, accessible, interoperable, and reusable (FAIR).

It will cover how to make data FAIR, including the handling of data during and after the project, what data will be generated or reused, what methodology and standards will be applied, whether data will be shared/made open access (and how) and, if any, what data will not be shared/made open access (and why) and how data will be curated and preserved.

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Abbreviations and acronyms

Abbreviation / Acronym	Description
WP	Work Package
EC	European Commission
CINEA	Climate, Infrastructure and Environment Executive Agency, an agency of the European Commission
LIFE	L'instrument financier pour l'environnement
CFS	Certificate of the Financial Statement
VAT	Value Added Tax (a sales tax)
TBC	To be confirmed
DoA	Description of Action

Partner short name used in this document	Partner FULL name
UNIFI	UNIVERSITA' DEGLI STUDI DI FIRENZE
EUABOUT	EUROPEAN RESEARCHES AND PROJECTS FOR INNOVATION
USGM	UNIVERSITA' DEGLI STUDI GUGLIELMO MARCONI – TELEMATICA
UNEEED	UNEEED.IT S.R.L.
SILIDEA S.R.L.	SILIDEA S.R.L.
ESCO S.R.L.	ESCO MOBILITY
F&N COMPOSITI	F&N COMPOSITI SRLS
L'AQUILA	COMUNE DELL'AQUILA

Deviations

No deviation from the actions foreseen in the LIFE2M Grant Agreement.

1. Introduction

This document is Deliverable 1.3 of the LIFE2M project, funded by the European Union's LIFE Programme under Grant Agreement #101074307. The project data must be FAIR (Findable, Accessible, Interoperable, and Reusable) as much as it is possible, except when there are substantial reasons to keep the data confidential. Among other aspects, the Data Management Plan (DMP) also describes the possible levels of data openness within the LIFE2M project, the differences in their handling, and compliance with Intellectual Property Rights (IPR). The format of the plan is supported by the 4TU Centre for Research Data.

This DMP describes the data management life cycle for the datasets generated during the LIFE2M project. The specific goals of this document are:

1. To describe the types of data foreseen to be generated during this project, including the (meta) standards used.
2. To describe how data will be collected, handled, shared, and stored during and after the project lifetime.
3. To provide a plan to make the LIFE2M datasets findable and accessible for use in the broader research community and under which conditions, according to the FAIR principles.

As the project is in the first steps and no data has been yet collected, some changes in data management could occur while the project evolves. Thus, this version of the DMP is open to future changes and adaptations whenever significant modifications arise, such as (but not limited to):

- Addition of new data
- Changes in consortium policies (e.g., new innovation potential)
- Changes in consortium composition and external factors (e.g., consortium members and/or associated partners joining or leaving)

2. Data summary

This chapter of the DMP defines the purpose of the data collected/generated under the framework of LIFE2M along with a detailed description of data types and formats, data origins and expected size. It concludes with an overview of data utility and potential stakeholders that might find the data useful for re-use. Regarding personal data in particular, it should be noted that the LIFE2M consortium aims at ensuring that the General Data Protection Regulation (GDPR) guidelines are considered during the project and all personal data collected or generated within the activities are going to:

- (i) be transparent in terms of how they will be used (principle of transparency) and
- (ii) be restricted to the minimum required to fulfill the objective under which it was collected (principle of economy)

2.1 Purpose of the data collection

The LIFE2M project foresees demonstrative experimentation of vehicle prototypes developed in several Italian cities. Volunteers in each city will be recruited to test the vehicles. The recruitment of volunteers, which involves the processing of personal data, is necessary to carry out the intensive demonstration of the vehicle prototypes in different cities. This demonstration phase is among the main objectives of the project. During the demonstration activities, different types of data will be acquired. The required data will be the minimum set necessary to carry out the experimental activity. As regards the volunteers, they will receive an Information Sheet explaining the purpose of the trial, informed consent procedures, and how to operate and recharge the vehicle, how to return the vehicle and contacts in case of breakdowns, problems or theft of the vehicle.

They must sign in advance a free and fully Informed Consent Form that describes the aims, methods and implications of the research, the nature of the participation and any benefits and risks that might ensue. The Informed Consent Form will also indicate the methods of data processing, with reference to privacy, data protection and data management and the consent must be explicitly given for the collection of data and for the purposes for which they are used.

The data are generated for different purposes:

- To tune and optimize the vehicle, by different revision phases of prototype design, as foreseen in the Description of Action
- To gather information regarding the travel habits of the user sample and their satisfaction towards the vehicle and its prominent uses, to devise deployment plans subsequent to the project for vehicle commercialization

2.2 Type and formats of data

LIFE2M is set to utilize collected/generated data of diverse structures and formats. As a result, the data definition process can be based on the source and the physical format of the data¹. We note two main aspects:

- (i) the process under which the underlying data is created/captured
- (ii) the storage format of quantitative and qualitative data

The type and formats of the data collected/generated in the context of LIFE2M can be divided into the following categories.

2.2.1 Data collected through the vehicle development and exploitation activities (WP2, WP3, WP6)

These data are collected/generated through vehicle development activities (i.e., empirical data collected during laboratory experimentation on the vehicles), and data collected/generated by direct input methods (i.e., feedback from interviews and online surveys, feedback from users).

- The first are of technical nature, addressing the vehicle features (motor characteristics, stiffness of the platform, driving experience, consumption, etc.). They will be constituted of numerical data collected in the “Shared data” folder, shared among the partners in the LIFE2M space on Google Drive. For these data, their public availability is not foreseen, since they regard vehicle development.
- The second will mainly focus on User Needs Analysis (UNA) that will be carried out to identify the users’ needs. The results of the UNAs (run in Task 6.2 and Task 2.2) will be used as input for the demo designs, product designs, and all the other LIFE2M results.

2.2.2 Data collected through the pilot activities (WP5)

These data can be divided in:

1. data collected/generated by direct input methods (i.e., feedback from interviews and online surveys, feedback from users and stakeholders, etc.). During the trial period, volunteers will be asked to fill in a questionnaire on a special App, to give feedback on the vehicle itself. These data refer both to the vehicle and to the volunteer (sensitive data) because of insurance requirements in case of an accident and also as a guarantee of the value of the prototype lent to the volunteer. No transfer from one city to another or from one partner to another will take place regarding personal data. The data provided by the volunteer in the questionnaire (users periodic questionnaires) will only cover their riding feeling, comfort, reporting any problems or suggestions for improvement, how much they would be willing to pay for a similar vehicle,

¹ <https://dmeg.CESSDA.eu/Data-Management-Expert-Guide/1.-Plan>

whether they consider the range offered by the battery capacity to be sufficient, whether they consider the vehicle to be adequate as a daily mean of transport and whether it can be easily interfaced with public transport, etc. These data are the minimum set of information required to obtain relevant feedback on the performance of vehicles, batteries, and their use and enjoyment by users. Such feedback is indispensable for vehicle refinement and to ensure to get an attractive product that meets all the expectations of users. This is in order to obtain, at the end of the project, a secure positioning on the market. As for the personal data, to assign the vehicle, the volunteers will be asked to provide their name, address and telephone number, and the details of a valid identity document. This is limited to the purposes to be guaranteed about the restitution of the vehicle or in case of an accident. These are personal data and fall under the data privacy rules. These data are not collected in the data platform accessible to project partners. The coordinator partner will identify and appoint a Data Protection Officer. The Data Protection Officer (DPO) will be required to have a good command of computer processes, data security, and other matters relating to the maintenance and processing of personal and sensitive data. Whoever will process the data must be authorized and controlled by Data Protection Officer. As a security of the data from unauthorized access to personal data, the DPO will store the data on a PC isolated from the network. The contact details of the DPO will be made available to all data subjects involved in the pilots. The three partners who will host the demos (UNIFI, L'AQUILA, ESCO) will appoint a data processor (for example the person in charge of the trial management). The data processor will be the contact person with the DPO should it be necessary to access that data.

2. Data collected/generated through the LIFE2M platform and its services (i.e., input inserted by platform's users, data generated from the platform's services, data retrieved from other sources). These data will be automatically acquired by the App, concerning the kinematic parameters of the vehicle and the state of the batteries. All these data are completely anonymous, as they are not linked to the specific volunteer but only to the used vehicle. The names of the volunteers and the kinematic data are collected in separate databases. These data, related to the vehicles, are collected in the data platform accessible to project partners and do not fall under the data privacy rules. No data are acquired and recorded from which the identity of the volunteer, the routes taken in individual trips, the habits of the individual volunteer, his/her private, professional or public life can be inferred. The automatically acquired data will only be vehicle kinematics (vehicle speed and acceleration, kilometers travelled between one battery charge and another, while no position data will be acquired) and concerning the state of the battery (state of charge, temperature, anomaly log file).

2.2.3 Data collected/generated from dissemination activities (WP4)

The data collected/generated from dissemination, communication and stakeholder engagement activities are chiefly satisfaction data towards the vehicle and its possible use. They will be collected directly on the platform, through the distribution of questionnaires.

In this context, quantitative and qualitative data are going to be collected/generated during the project:

- Quantitative data is numerical and acquired through counting or measuring. This data may be represented by ordinal, interval or ratio scales and lend themselves to statistical manipulation.
- Qualitative data, sometimes referred to as categorical data, are data that can be arranged into categories based on physical traits, gender, colors or anything that does not have a number associated with it. Moreover, written documents, interviews, and various forms of in-field observations are all sources of qualitative data.

With that in mind, further details with respect to the different types and formats of data that are going to be collected through direct input methods under the frame of LIFE2M are going to be provided in the future in the form of a report on the official project website.

2.2.4 Data format

Final format of data to be collected in the platform will be decided in subsequent steps of the project and finalized in Task 3.4. Specifically, activities related to the realisation of the platform and the App, in cooperation with Tasks 3.1-3.2, will be considered, during which the On Board Unit (OBU) will be developed. The platform, developed on the basis of an ESCO project, will additionally provide functionalities to the requesting entities related to MaaS.

Nevertheless, well-established formats (as JSON, xml, and csv for acquisition data) will be prioritized.

Data originated in the vehicle will be internally acquired and timestamped at specific regular intervals depending on the dynamics of the corresponding signal. Some local aggregation and edge processing is also envisaged to optimize both the latency and the bandwidth needed to connect to the remote platform. Any outgoing data will be previously rugged and secured (e.g., data integrity - CRC32; encryption - AES128; traceability- UUID). Considering variable wireless conditions, some buffering and auto recovery mechanisms will also be included to overcome link issues between platform elements. An example of JSON raw data is reported below.

```

1  {
2  |
3  |   "Header":{
4  |     "Version": 1.0,
5  |     "timestamp": "2021/01/01 - 12:00:00:123",
6  |     "CRC32": 12345678
7  |   },
8  | }
9  |
10 |   "IdData":{
11 |     "VehicleSN": "ABC012345",
12 |     "cfgId": "fg987",
13 |   },
14 |
15 |   "kinematic":{
16 |     "speed": 12.0,
17 |     "accel": 0.5,
18 |     "distance": 24.345
19 |   },
20 |
21 |   "IntBat":{
22 |     "SoC": 87.03,
23 |     "Temp": 45.6,
24 |     "SoH": 87.3
25 |   },
26 |
27 |   "RemBat":{
28 |     "SoC": 87.03,
29 |     "Temp": 45.6,
30 |     "SoH": 87.3
31 |   }
32 | }
    
```

Figure 1

The questionnaire tool will likely be SurveyMonkey and data will be exploited in Power BI or similar.

During the project, some data will be taken directly from the vehicles and others will be processed from the database using the formulas described in the table below:

Parameter	Unit
Microvehicles operation characteristics	
Odometer, dist	km
Vehicle speed	Km/h
Time in service	h/day
State of charge	%
Energy consumed, EE_c	kWh
Energy recharged, EE_{rec}	kWh
Recharging time	min
GPS data	Lat, Long
PV Charging stations	
Energy produced by PV, EE_{prod}	kWh
Energy provided to microvehicles, EE_{prov}	kWh
Operational period	h/day

State of charge	%
Data to be obtained by operators	
N. batteries substituted	#
N. failures	#
Formulas	
Specific energy consumption	$SEC = EEc/dist$ (kWh/km)
Primary energy used by SC microvehicle	$PEsc = EEc/56.2\%$ (kWh)
Primary energy used by Li microvehicle	$PE,Li = PEsc/15\%$ (kWh)
Emission Nox	$Pi_{NOX} = PEsc * 0.210 * 10^{-3}$ (kg)
Emission COVNM	$Pi_{COVNM} = PEsc * 0.048 * 10^{-3}$ (kg)
Emission CO	$Pi_{CO} = PEsc * 0.094 * 10^{-3}$ (kg)
Emission PM10	$Pi_{PM10} = PEsc * 0.002 * 10^{-3}$ (kg)
Emission CO2	$Pi_{CO2} = PEsc * 415.5 * 10^{-3}$ (kg)
Primary energy saved using microvehicles vs cars	$PES = (0.66 - SEC) * dist$ (kWh)
Emission saved Nox using microvehicles vs cars	$ES_{Nox} = 0.66 * dist * 0.084 * 10^{-3}$ (kg)
Emission saved COVNM using microvehicles vs cars	$ES_{COVNM} = 0.66 * dist * 0.152 * 10^{-3}$ (kg)
Emission saved CO using microvehicles vs cars	$ES_{CO} = 0.66 * dist * 1.18 * 10^{-3}$ (kg)
Emission saved PM10 using microvehicles vs cars	$ES_{PM10} = 0.66 * dist * 0.001 * 10^{-3}$ (kg)
Emission saved CO2 using microvehicles vs cars	$ES_{CO2} = 0.66 * dist * 123 * 10^{-3}$ (kg)
Primary energy saved due to PV	$PV_PES = PEsc - EE_{prov}$ (kWh)

Table 1 – Vehicle parameters data

2.3 Data utility

The stakeholder groups that may find meaningful utility for the data to be collected/generated by the project (both within and outside the LIFE2M consortium), along with the benefits that could arise for them by utilizing this data, are concisely presented in the following Table.

Stakeholder group	Data utility
<p>Policy makers, urban planners, local authorities</p>	<p>The project will provide substantial primary sources of data, including their processed output, which are essential for analyzing and supporting policymakers and decision-makers in the EU, nationally and locally. These data can be used to study a wide range of relevant fields, such as the planning, and design of bicycle lanes and city roads, and also to broaden the understanding of citizens' mobility needs.</p>
<p>Academics/Researchers</p>	<p>LIFE2M vehicles are set to collecting/generating data that are of considerable interest to academia and researchers. With this respect, the produced datasets pave the way for addressing questions concerning the micro-mobility, the development of new vehicles, the energy demands for mobility and urban planning, and so on. Given that most of these areas are characterized by a fast-growing interest, we expect the usefulness of our dataset to be significant for researchers.</p>
<p>Project partners</p>	<p>Data collected/generated under the frame of LIFE2M are set to provide real-life directions and insights to project partners which will ultimately utilize them towards reaching the project's objectives. These data will provide valuable information to empower the design of the microvehicles, improve the technologically innovative equipment, and develop sustainable business models which will enhance the impact and market competitiveness. Capitalization of interesting ideas and concepts created during the project's lifespan will foster post-project exploitation and long-term sustainability of the vehicle design.</p>

Table 2. Classification of data types based on the utility form different stakeholder groups.

3. Fair data

The Guidelines on Data Management of the European Commission highlight the importance of making the data produced by projects Findable, Accessible, Interoperable as well as Reusable (FAIR), with a view to ensuring its sound management. This means using standards and metadata to make data discoverable, specifying data sharing procedures and which data will be open, allowing data exchange via open repositories as well as facilitating the reusability of the data. The following sections of the DMP lay out the methodology followed in the framework of LIFE2M with respect to making data findable, accessible and interoperable, as well as ensuring their preservation and open access, with a view to increasing its re-use.

3.1 Increasing the Findability

Fundamental data regarding the use of the vehicles and satisfaction with the experience by the users will be collected on the LIFE2M website. Information regarding the availability of new data will be advertised on social media like LinkedIn and Twitter. Relevant associated metadata (such as public reports and highlights) will be quality checked and linked with a Digital Object Identifier (DOI), being uploaded also in researcher aggregation websites such as ResearchGate. Links to web pages of international journals in which LIFE2M - related research will be published in Open Access will be also reported on the website.

3.2 Data Accessibility

Processed data presented on the LIFE2M website will be freely accessible. No raw data will be made available since they will be only functional to obtain specific feedback regarding the LIFE2M vehicles. No particular methods or software tools will be required to access the processed data, being them presented as .pdf files, in the form of articles and reports, or the likes. Publication in international journals will be performed contributing to an Article Processing Charge (APC) to make the research results fully accessible in Open Access.

3.3 Data Interoperability

A glossary for proper interpretation and re-elaboration of concepts expressed by the LIFE2M metadata will be presented in the website repository, in an appropriate document, or on the website page itself.

3.4 Data Reusability

Processed data presented in scientific publications will become accessible via the LIFE2M website directly after publication. LIFE2M data will be accessible for at least three years after the end of the project.

4. Allocation of resources

The cost for storage, collection, and analysis of collected data will be covered by the partner responsible for this activity. The data acquired by the App will be automatically transferred to the platform, developed and maintained by ESCO. More details can be found in the description of the action (Part A), list of work packages, WP3.

As for the publications, Open Access costs will be covered by project budget of the partner organization for which the corresponding author is originating from.

5. Conclusion

This DMP aims at describing the process for the management of the data collected/generated during the project's activities across their entire lifecycle, while also making them compatible with the FAIR scheme. It describes the underlying processes of the LIFE2M data management, collection, and generation, in accordance with the GDPR guidelines, and sheds light on (i) the data foreseen to be collected/generated under the project activities, (ii) the specific objectives under which each dataset will be collected/generated.

If any instance in this document is ambiguous or further assistance/advise is required, please refer to the Project Management Team:

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