PLUG-N-HARVEST

Plug-n-play passive and active multi-modal energy Harvesting systems, circular economy by design, with high replicability for Self-sufficient Districts & Near-Zero Buildings

768735, H2020-EEB-2017

Deliverable D6.1.2:

Data Management Plan

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Deliverable SUMMARY SHEET

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Project Coordinator:	Centre for Research and Technology Hellas (CERTH)
Participating Partners:	CERTH – Centre for Research and Technology Hellas – Greece RWTH – RWTH Aachen University – Germany CU – Cardiff University – United Kingdom ALUMIL – Alumil Aluminium Industry S.A. – Greece AIGUASOL – Sistemes Avancats d' Energia Solar Termica SCCL – Spain ODINS – Odin Solutions S.L – Spain SIE – Siemens SRL – Romania ETRA – Etra Investigacion y Desarrollo S.A. – Spain ET – Energy Transitions Limited – United Kingdom EIG – Eco Intelligent Growth, SL – Spain

	AHC – Agencia de l'Habitatge de Catalunya – Spain RWM – Region of Western Macedonia – Greece CCC – County Council of the City and County of Cardiff – United Kingdom
Instrument:	
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Deliverable D6.1.2: Short Description
This report is the first version of project's Data Management Plan, presenting the various datasets that will be produced by PLUG-N-HARVEST project. The main management principles together with potential exploitation prospects and storage requirements, for each of those datasets, are investigated also.
Keywords: data collection, dataset, data management plan, storage methodology, data protection

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Executive Summary

D6.1.2 entitled “Data Management Plan” is a deliverable of the PLUG-N-HARVEST project, funded by the European Commission’s Directorate-General for Research and Innovation (DG RTD), under its Horizon 2020 Research and Innovation programme (H2020).

It presents the first version of the project Data Management Plan (DMP). This first version lists, at a preliminary stage, the various datasets that will be produced by the project, the main exploitation perspectives for each of those datasets, and the major management principles the project will implement around them. It paves the way for the specification of a Data Management Repository, to be created by the project in the next period.

1 Introduction

In Horizon 2020 the European Commission has been encouraging open access to and reuse of digital research data generated by Horizon 2020 projects through the Open Research Data Pilot (ORD Pilot), following FAIR data principles - all research data should be Findable, Accessible, Interoperable and Reusable (FAIR).

Data Management Plans (DMPs) are a key element of good data management. A DMP describes the data management life cycle for the data to be collected, processed and/or generated by a Horizon 2020 project. As part of making research data FAIR, the DMP will include information on:

- the handling of research data during & after the end of the project;
- what data will be collected, processed and/or generated;
- which methodology & standards will be applied;
- whether data will be shared/made open access; and
- how data will be curated & preserved (including after the end of the project).

In the context of PLUG-N-HARVEST project, a DMP will be generated and maintained for whole project's lifetime addressing in full the lifecycle of the data to be generated in the demonstrators. A data repository will be available, conforming to potential ethical issues, in which the DMP will describe in details the models, anonymised data/metadata that will be included in the repository. The project foresees adoption of open data and access to scientific research results applying to certain anonymised parts of the research results according to EU OpenAIRE. The generated data supporting open access will be identified within the first version of the Data Management plan which will be updated when or if considered necessary throughout the project's lifetime. Such policy is expected to improve conditions for conducting research by reducing duplication of efforts and by minimising the time spent searching for information and accessing it. Structured metadata generated will be stored and available for open access (green open access) on appropriate open data repositories (e.g. Zenodo).

This DMP will be updated over the course of the project whenever significant changes arise such as new data, changes in consortium policies (e.g. new innovation potential, decision to file for a patent) or changes in consortium composition and external factors (e.g. new consortium members joining or old members leaving). As a minimum this report will be delivered/updated three times during the project. The first version in M6, the second one in M24 and the last one in M36.

2 General Principles

In order to follow the Horizon 2020 open public data strategy, the PLUG-N-HARVEST project will voluntary participate in the Open Research Data Pilot. In this section, a Data Management Plan (DMP) is introduced, which fully describes the procedures that will be followed, in order to ensure that the data management process complies with national (i.e., German, British, Spanish and Greek), as well as with EU legislations.

In more detail, the consortium's approach is in full compliance with the EU legislative and regulatory framework[1] for data protection based on the uniform approach of the EC Directive 95/46/EC, the EU General Data Protection Regulation - Regulation (EU) 2016/679 (GDPR)[2] upon its date of application, and the national legislative and regulatory framework for data protection of each project member country. Note that, although, the PLUG-N-HARVEST project introduces no critical ethical issue or problem, several considerations typical to ICT applications and on-site trials need to be taken into consideration. The consortium is fully aware of these and has the necessary experience to address them seamlessly.

2.1 Data to be collected within PLUG-N-HARVEST pilot use cases

In the context of the use-case realization, contextual conditions monitoring and validation in the pilot sites, the project involves the collection of data. Specifically, PLUG-N-HARVEST will collect the following types of data:

- Domestic energy needs.
- Energy consumption/generation data.
- Context-data from sensors (temperature, humidity, weather etc.).
- Data related to the occupancy evaluation techniques (questionnaires, interviews and workshops with key building users and managers).

Since some of the collected data may involve sensitive personal data, all provisions for data management will be made in compliance with national and EU legislation.

Additionally, pictures or video of subjects using the PLUG-N-HARVEST tools might be recorded for demonstration and dissemination purposes; in these cases, specific written authorization will be requested by any identifiable subjects.

2.2 Data collection and storage methodology

Overall, data will be stored in secure server systems and will be anonymised. Only the Project Coordinator and the members of the External Advisory Board will possess the key to re-identification. No data, related to personal information of the involved pilot participants (such as habitants of assisted living buildings etc.) will be collected and stored. Instead, all pilot participants will be granted with an identification number based on each participant's role in each of the pilot use case (role ID), allowing mapping of participants' actions during the use case execution and pilot realisation phase. The relationship between the role ID and the participant will be recorded at the repository and will be stored separately and securely. This file will be accessible only to the corresponding leader of the each of the pilot sites. The key to link the participant's name to the code which identifies the data file will not be provided to anyone and the privacy of the data will be protected. Furthermore, data will be kept for the least period of time necessary to accomplish the goals of the project and the population of the PLUG-N-HARVEST Repository. In any case, all data that will be considered confidential from the pilots will be discarded by the project completion, whereas only the public models and respective datasets that will be described in details in the DMP will be kept open.

2.2.1 Data collection process

The vast majority of the data will be automatically collected by smart sensors and other proprietary equipment installed at the selected pilot areas during the execution of the four (4) envisaged Pilot Use Cases and will be further investigated in T1.1 (*End-User and Business Requirements*), T1.2 (*Use Cases, Test Scenarios and Evaluation Plans*) and respective tasks of pilot deployment and realization (WP4). In most cases, the collected data will be data needed for monitoring the contextual conditions of the pilot areas (domestic energy needs, energy consumption behaviour, energy generation, temperature, humidity, weather etc.). Since some of the collected data may involve sensitive personal data, all provisions for data management will be made in compliance with national and EU legislation. In particular, including the European Network for Information and Security Agency security measures to minimise the risk to data protection arising from smart metering and the British Sociological Association's Statement of Ethical Practice as described in the following paragraphs. Furthermore, the data collection process will always be made by means that guarantees the user's anonymity. Further measures will be taken to ensure that all sensors and behaviour monitoring data, which involve personal information, will not be possible to be intercepted. Finally, special measures will be taken with user generated data, such as consumption data, in order to avoid any capacity of their use in any form of ethnic, racial, and/or gender discrimination profiling.

2.2.2 Data protection

In order to protect the collected data and control unauthorised access to the PLUG-N-HARVEST data repositories, only authenticated personnel will have access to pilot-specific data collected. During the proposed system lifecycle, a holistic security approach will be followed, in order to protect the pillars of information security (confidentiality, integrity availability) from a misuse perspective. During task T3.4 (*Operational Security Mechanisms*), the security approach will be identified by a methodical assessment of security risks followed by their impact analysis. This analysis will be performed on the personal information and data processed by the proposed system, their flows and any risk associated to their processing.

Towards the protection of personal data of volunteer pilot participants, the following issues will be taken into account:

- All data associated with a recognizable person will be held private.
- Individual data on subjects will be used in strictly confidential terms and will only be published as statistics (anonymously).
- Any data or information about a person will be held private, regardless of how this data was acquired. Therefore, data obtained incidentally within PLUG-N-HARVEST project will be handled with confidentiality. This accidental obtainment does not substitute the compulsory procedure, in which researchers need each participant's explicit consent to obtain, store and use information about them.
- All individual information will be anonymised (or encrypted) in full and at the earliest possible point in time during data processing.
- The acquired data will under no circumstances be used for commercial purposes or outside the scope of the PLUG-N-HARVEST project.

During the PLUG-N-HARVEST project, responsibilities will be clearly assigned for the overall management and control of research findings and the controlling of access rights. The person who will be responsible on issues for data security will directly inform to the Quality Control Board, the Ethical Advisory Board and the Project Coordinator for any possible secure risk.

2.2.3 Data retention and destruction

Within the PLUG-N-HARVEST DMP, the open research data retention and destruction strategy will be also reported along with the limits on their secondary use and their disclosure to third

parties. A number of critical factors that are relevant for data retention will be taken into account, namely:

1. Purpose of retaining data;
2. Type of open data collected;
3. Policy access to the open data;
4. Data storage, security and protection measures; and
5. Confidentiality and anonymity of data.

In all cases, the data protection and privacy of personal information will be governed by the following principles, which consist of part of an overall information security policy:

- Protective measures against infiltration will be provided;
- Physical protection of core parts of the systems and access control measures will be provided;
- Logging of PLUG-N-HARVEST system and appropriate auditing of the peripheral components will be available.

Regarding data destruction, as computerized data (hard disk drives) will be used for data storage, existing methods for permanent and irreversible destruction of the data will be utilized (i.e. full disk overwriting and re-formatting tools) at most within three (3) years after the end of the project.

3 Dataset List

All PLUG-N-HARVEST partners have identified the data that will be produced in the different project activities. The list is provided below, while the nature and details for each dataset are given in the subsequent sections.

This list is indicative and allows estimating the data that PLUG-N-HARVEST will produce - it may be adapted (addition/removal of datasets) in the next versions of the Data Management Plan to account for the progress of the project activities.

Table 1. PLUG-N-HARVEST Dataset list

#	Dataset Name
1	DS.CERTH.IMCS_modules_dataset
2	DS.ETRA.DRFFO
3	DS.ETRA.OEMS
4	DS.ODINS.Security
5	DS.SIE.Safety
6	DS.ODINS.BMS_dataset
7	DS.CU.Building_information_survey_dataset
8	DS.CU.Building_services_system_survey_dataset
9	DS.CU.Building_energy_consumption_survey_dataset
10	DS.CU.Occupants_satisfaction_survey_dataset
11	DS.AHC.Pilot's_Sensing_&_Actuating_infrastructure
12	DS.CCC.Pilot's_Sensing_&_Actuating_infrastructure
13	DS.RWM.Pilot's_Sensing_&_Actuating_infrastructure
14	DS.RWTH.Pilot's_Sensing_&_Actuating_infrastructure
15	DS.ADBE_frame
16	DS.ADBE_tech_elements
17	DS.ADBE_aesthetics
18	DS.EIG.material_DB

4 Data Management Plan

DS.CERTH.IMCS_modules_dataset	
Data identification	
Data set description	Context-data from BMS database: ▪ Indoor: temperature, humidity, presence, CO2. ▪ Outdoor (current & forecasted): temperature, total solar radiation. ▪ Energy metering: radiators (thermal), electric heaters (electricity), bidirectional energy meters at power supply node (electricity), ADBE solar-based power generation (electricity), bidirectional energy meters for ADBE batteries (electricity), energy consumption of ADBE HVAC. ▪ Control set point from existing indoor radiators. ▪ Control set point from existing indoor electric heaters. ▪ Control set point from ADBE HVAC. ▪ Control set point for battery charging. ▪ Control set point for grid supply.
Source (e.g. which device?, type, location of the device)	BMS-hosting local server and database.
Activities & responsibilities	
Partner owner of the device/module	CERTH
Partner in charge of the data collection (if different)	CERTH (supported by ODINS)
Partner in charge of the data analysis (if different)	CERTH
Partner in charge of the data storage (if different)	ODINS and CERTH
WPs and tasks involved	WP3: T3.1, T3.5
Standards	

Info about metadata (Production and storage dates, places) and documentation?	To be defined with a detailed documentation during the pilot implementation phase. Indicatively: ▪ Production timestamps. ▪ Physical units. ▪ Room ID. ▪ Consuming Actuator ID.
Standards, Format, Estimated volume of data	Internal-communication: RESTful protocol and JSON format for BMS data exchange.
Data exploitation and sharing	
Data exploitation (purpose/use of the data analysis)	Data analysis for Task 3.1 ICT service (IMCS) and public project deliverables (D3.1) as well as optimization algorithm evaluation.
Data access policy / Dissemination level (Confidential, only for members of the Consortium and the Commission Services) / Public	Raw Data: Confidential only for members of the consortium and the Commission Services. Processed selected data: Public
Data sharing, re-use and distribution (How?)	Online upload to members of the Consortium (Sciebo) and embedded analysis in the public version of D3.1
Embargo periods (if any)	Raw Data: Forever Public processed data: None
Archiving and preservation (including storage and backup)	
Data storage (including backup): where? For how long?	Data storage will be done in local server in each pilot site. But it does not include backup in external services. Raw data: Sciebo project repository until the end of the project (backup and storage). Processed selected data: Public through D3.1

DS.ETRA.DRFFO	
Data identification	
Data set description	Statistical data from OEMS.
Source (e.g. which device?, type, location of the device)	OEMS Server, located at entry point of the energy network.
Activities & responsibilities	
Partner owner of the device	ETRA

Partner in charge of the data collection (if different)	ETRA
Partner in charge of the data analysis (if different)	ETRA, CERTH
Partner in charge of the data storage (if different)	ETRA
WPs and tasks involved	WP3: T3.2, T3.5
Standards	
Info about metadata (Production and storage dates, places) and documentation?	Storage in OEMS database.
Standards, Format, Estimated volume of data	Metadata stored in JSON documents in a MongoDB.
Data exploitation and sharing	
Data exploitation (purpose/use of the data analysis)	▪ Short-term predictions/forecasting. ▪ Estimation of the buildings' flexibility. ▪ Evaluation of different building operational states. ▪ Selection of the optimal state. ▪ Demand/response capabilities.
Data access policy / Dissemination level (Confidential, only for members of the Consortium and the Commission Services) / Public	Confidential, only for members of the consortium and the Commission Services.
Data sharing, re-use and distribution (How?)	Online upload in open data repositories.
Embargo periods (if any)	None
Archiving and preservation (including storage and backup)	
Data storage (including backup): where? For how long?	Data will be stored in the OEMS server database.

DS.ETRA.OEMS	
Data identification	
Data set description	Encrypted data from sensors.
Source (e.g. which device?, type, location of the device)	BMS located in each building.
Activities & responsibilities	
Partner owner of the device	ETRA

Partner in charge of the data collection (if different)	ETRA, ODINS
Partner in charge of the data analysis (if different)	ETRA
Partner in charge of the data storage (if different)	ETRA
WPs and tasks involved	WP3: T3.2, T3.5
Standards	
Info about metadata (Production and storage dates, places) and documentation?	Storage in OEMS database.
Standards, Format, Estimated volume of data	Metadata stored in JSON documents in a MongoDB.
Data exploitation and sharing	
Data exploitation (purpose/use of the data analysis)	Creation of strategies for energy efficiency in three levels: ▪ Link between PnH buildings. ▪ Link between PnH buildings and energy networks. ▪ Tool for ESCOs, Aggregators and Facility managers.
Data access policy / Dissemination level (Confidential, only for members of the Consortium and the Commission Services) / Public	Confidential, only for members of the consortium and the Commission Services.
Data sharing, re-use and distribution (How?)	Online upload in open data repositories.
Embargo periods (if any)	None
Archiving and preservation (including storage and backup)	
Data storage (including backup): where? For how long?	Data will be stored in the OEMS server database.

DS.ODINS.Security	
Data identification	
Data set description	Data for security context: ▪ Certificates. ▪ Public and private keys.
Source (e.g. which device?, type, location of the device)	BMS-hosting local server and BMS gateways.
Activities & responsibilities	

Partner owner of the device	ODINS is the owner of the BMS gateways. End users are the owners of the hosting PC for BMS system. CERTH is the owner of IMCS system. ETRA is the owner of OEMS system.
Partner in charge of the data collection (if different)	None
Partner in charge of the data analysis (if different)	None
Partner in charge of the data storage (if different)	ODINS is in charge of the data storage.
WPs and tasks involved	WP3
Standards	
Info about metadata (Production and storage dates, places) and documentation?	Production by ODINS, metadata storage in local hosting server of BMS system with Mongo Database.
Standards, Format, Estimated volume of data	Communication: RESTful protocol and JSON format.
Data exploitation and sharing	
Data exploitation (purpose/use of the data analysis)	To increase the security in the communications among gateways, BMS, IMCS and OEMS.
Data access policy / Dissemination level (Confidential, only for members of the Consortium and the Commission Services) / Public	Security data: Confidential, only for members of the consortium and the Commission Services.
Data sharing, re-use and distribution (How?)	None
Embargo periods (if any)	None
Archiving and preservation (including storage and backup)	
Data storage (including backup): where? For how long?	Data storage will be done in local server and gateways.

DS.SIE.Safety	
Data identification	
Data set description	Data readings (encrypted) from sensors.
Source (e.g. which device?, type, location of the device)	BMS present at each PnH deployment building.

Activities & responsibilities	
Partner owner of the device	ODINS Trial Partners
Partner in charge of the data collection (if different)	SIEMENS Trial Partners
Partner in charge of the data analysis (if different)	SIEMENS
Partner in charge of the data storage (if different)	Trial Partners
WPs and tasks involved	WP3
Standards	
Info about metadata (Production and storage dates, places) and documentation?	Data stored at the location of the trial partners. Distributed systems can exchange safety-relevant information, i.e. buildings belonging to the same partner. OEMS-based storage.
Standards, Format, Estimated volume of data	Services exposing REST APIs. Message broker. Data format as JSON (MongoDB document store).
Data exploitation and sharing	
Data exploitation (purpose/use of the data analysis)	Increase the safety of the operations performed within the system (IMCS OEMS) on available sensor data, based on quantitative measurement on its (the data's) trustworthiness in various contexts: e.g. when received, when communicated between multiple locations belonging to the same partner, etc.
Data access policy / Dissemination level (Confidential, only for members of the Consortium and the Commission Services) / Public	Confidential, only for members of the consortium and the Commission Services.
Data sharing, re-use and distribution (How?)	None
Embargo periods (if any)	None
Archiving and preservation (including storage and backup)	
Data storage (including backup): where? For how long?	Data stored at the trial partner's location. Data will be purged regularly (expire period to be set).

DS.ODINS.BMS_dataset	
Data identification	
Data set description	Context-data from installed sensors: ▪ Indoor: temperature, humidity, presence, CO2. ▪ Outdoor (current & forecasted): temperature, total solar radiation. ▪ Energy metering: radiators (thermal), electric heaters (electricity), bidirectional energy meters at power supply node (electricity), ADBE solar-based power generation (electricity), bidirectional energy meters for ADBE batteries (electricity), energy consumption of ADBE HVAC. Context-data from installed actuators: ▪ Control set point from existing indoor radiators. ▪ Control set point from existing indoor electric heaters. ▪ Control set point from ADBE HVAC. ▪ Control set point for battery charging. ▪ Control set point for grid supply.
Source (e.g. which device?, type, location of the device)	In each pilot site, end-users will select the type of devices (sensors and actuators) and the location for the installation. Specifically for weather data collection a web repository for data exploitation is optional instead of deploying weather sensors.
Activities & responsibilities	
Partner owner of the device	ODINS is the owner of the BMS gateways. End users are the owners of the sensors, actuators and the locally deployed data & control centre (services hosting PC).
Partner in charge of the data collection (if different)	ODINS is in charge of the data collection.
Partner in charge of the data analysis (if different)	SIEMENS, ETRA and CERTH are in charge of the data analysis.
Partner in charge of the data storage (if different)	ODINS is in charge of the data storage.
WPs and tasks involved	WP3, WP4, WP5

Standards	
Info about metadata (Production and storage dates, places) and documentation?	Production by ODINS, metadata storage in local hosting server of BMS system with Mongo Database: ▪ Production timestamps. ▪ Storage date. ▪ Physical units. ▪ Room ID. ▪ Producing sensing device ID.
Standards, Format, Estimated volume of data	External-communication: MQTT, Modbus. Internal-communication: RESTful protocol and JSON format. Volume: around 30 double precision numbers every 15 minutes per pilot.
Data exploitation and sharing	
Data exploitation (purpose/use of the data analysis)	Data analysis for ICT services (WP3) and project deliverables (WP3, WP4, WP5).
Data access policy / Dissemination level (Confidential, only for members of the Consortium and the Commission Services) / Public	Raw data: Confidential, only for members of the consortium and the Commission Services. Processed and anonymised selected data: Public
Data sharing, re-use and distribution (How?)	Online upload in open data repositories.
Embargo periods (if any)	None
Archiving and preservation (including storage and backup)	
Data storage (including backup): where? For how long?	Data storage will be done in local server in each pilot site. But it does not include backup in external services. Raw data: Sciebo project repository until the end of the project (backup and storage). Processed and anonymised selected data: According to the open data repository policy (storage) – Sciebo project repository until the end of the project (backup).

DS.CU.Building_information_survey_dataset	
Data identification	
Data set description	The dataset is the building information survey data from 4 pilots.

Source (e.g. which device?, type, location of the device)	The dataset will be collected using questionnaire which send to 4 pilots.
Activities & responsibilities	
Partner owner of the device	None
Partner in charge of the data collection (if different)	AHC, CCC, RWM, RWTH
Partner in charge of the data analysis (if different)	CU
Partner in charge of the data storage (if different)	CU, AHC, CCC, RWM, RWTH
WPs and tasks involved	WP1: T1.2, T1.3
Standards	
Info about metadata (Production and storage dates, places) and documentation?	Production by AHC, CCC, RWM, RWTH, storage date (TBC), place (Sciebo and Microsoft One Drive CU account).
Standards, Format, Estimated volume of data	Microsoft Word document, up to 10Mb.
Data exploitation and sharing	
Data exploitation (purpose/use of the data analysis)	Data analysis and project deliverables.
Data access policy / Dissemination level (Confidential, only for members of the Consortium and the Commission Services) / Public	Confidential, only for members of the Consortium and the Commission Services.
Data sharing, re-use and distribution (How?)	Online upload to members of the Consortium (Sciebo).
Embargo periods (if any)	None
Archiving and preservation (including storage and backup)	
Data storage (including backup): where? For how long?	Sciebo and Microsoft One Drive CU account. Minimum 10 years.

DS.CU.Building_services_system_survey_dataset	
Data identification	
Data set description	The dataset is the building information survey data from 4 pilots.
Source (e.g. which device?, type, location of the device)	The dataset will be collected using questionnaire which send to 4 pilots.
Activities & responsibilities	

Partner owner of the device	None
Partner in charge of the data collection (if different)	AHC, CCC, RWM, RWTH
Partner in charge of the data analysis (if different)	CU
Partner in charge of the data storage (if different)	CU, AHC, CCC, RWM, RWTH
WPs and tasks involved	WP1: T1.2, T1.3
Standards	
Info about metadata (Production and storage dates, places) and documentation?	Production by AHC, CCC, RWM, RWTH, storage date (TBC), place (Sciebo and Microsoft One Drive CU account).
Standards, Format, Estimated volume of data	Microsoft Word document, up to 10Mb.
Data exploitation and sharing	
Data exploitation (purpose/use of the data analysis)	Data analysis and project deliverables.
Data access policy / Dissemination level (Confidential, only for members of the Consortium and the Commission Services) / Public	Confidential, only for members of the Consortium and the Commission Services.
Data sharing, re-use and distribution (How?)	Online upload to members of the Consortium (Sciebo).
Embargo periods (if any)	Forever
Archiving and preservation (including storage and backup)	
Data storage (including backup): where? For how long?	Sciebo and Microsoft One Drive CU account. Minimum 10 years.

DS.CU.Building_energy_consumption_survey_dataset	
Data identification	
Data set description	The dataset is the building information survey data from 4 pilots.
Source (e.g. which device?, type, location of the device)	The dataset will be collected using questionnaire which send to 4 pilots.
Activities & responsibilities	
Partner owner of the device	None
Partner in charge of the data collection (if different)	AHC, CCC, RWM, RWTH

Partner in charge of the data analysis (if different)	CU
Partner in charge of the data storage (if different)	CU, AHC, CCC, RWM, RWTH
WPs and tasks involved	WP1: T1.2, T1.3
Standards	
Info about metadata (Production and storage dates, places) and documentation?	Production by AHC, CCC, RWM, RWTH, storage date (TBC), place (Sciebo and Microsoft one drive CU account).
Standards, Format, Estimated volume of data	Microsoft Word document, up to 10Mb.
Data exploitation and sharing	
Data exploitation (purpose/use of the data analysis)	Data analysis and project deliverables.
Data access policy / Dissemination level (Confidential, only for members of the Consortium and the Commission Services) / Public	Confidential, only for members of the Consortium and the Commission Services.
Data sharing, re-use and distribution (How?)	Online upload to members of the Consortium (Sciebo).
Embargo periods (if any)	Forever
Archiving and preservation (including storage and backup)	
Data storage (including backup): where? For how long?	Sciebo and Microsoft one drive CU account. Minimum 10 years.

DS.CU.Occupants_satisfaction_survey_dataset	
Data identification	
Data set description	The dataset is the building information survey data from 4 pilots.
Source (e.g. which device?, type, location of the device)	The dataset will be collected using questionnaire which send to 4 pilots.
Activities & responsibilities	
Partner owner of the device	None
Partner in charge of the data collection (if different)	AHC, CCC, RWM, RWTH
Partner in charge of the data analysis (if different)	CU

Partner in charge of the data storage (if different)	CU, AHC, CCC, RWM, RWTH
WPs and tasks involved	WP1: T1.2, T1.3
Standards	
Info about metadata (Production and storage dates, places) and documentation?	Production by AHC, CCC, RWM, RWTH, storage date (TBC), place (Sciebo and Microsoft one drive CU account).
Standards, Format, Estimated volume of data	Microsoft Word document, up to 10Mb.
Data exploitation and sharing	
Data exploitation (purpose/use of the data analysis)	Data analysis and project deliverables.
Data access policy / Dissemination level (Confidential, only for members of the Consortium and the Commission Services) / Public	Confidential, only for members of the Consortium and the Commission Services.
Data sharing, re-use and distribution (How?)	Online upload to members of the Consortium (Sciebo).
Embargo periods (if any)	None
Archiving and preservation (including storage and backup)	
Data storage (including backup): where? For how long?	Sciebo and Microsoft one drive CU account. Minimum 10 years.

DS.AHC.Pilot's_Sensing_&_Actuating_infrastructure	
Data identification	
Data set description	▪ Indoor: temperature, humidity, presence, CO2. ▪ Outdoor (current & forecasted): temperature, total solar radiation. ▪ Energy metering: radiators (thermal), electric heaters (electricity), bidirectional energy meters at power supply node (electricity), ADBE solar-based power generation (electricity), bidirectional energy meters for ADBE batteries (electricity).
Source (e.g. which device?, type, location of the device)	Temperature, CO2 and humidity sensors, Weather forecast data repositories, Energy/Electric meters.
Activities & responsibilities	

Partner owner of the device	AHC
Partner in charge of the data collection (if different)	AHC
Partner in charge of the data analysis (if different)	AHC
Partner in charge of the data storage (if different)	AHC
WPs and tasks involved	WP1, WP4, WP6, WP7
Standards	
Info about metadata (Production and storage dates, places) and documentation?	Sciebo
Standards, Format, Estimated volume of data	Excel, Word
Data exploitation and sharing	
Data exploitation (purpose/use of the data analysis)	Data analysis and project deliverables.
Data access policy / Dissemination level (Confidential, only for members of the Consortium and the Commission Services) / Public	Raw data: Confidential, only for members of the consortium and the Commission Services. Processed and anonymised selected data: Public.
Data sharing, re-use and distribution (How?)	Online upload to members of the consortium (Sciebo).
Embargo periods (if any)	None
Archiving and preservation (including storage and backup)	
Data storage (including backup): where? For how long?	Local servers.

DS.CCC.Pilot's_Sensing_&_Actuating_infrastructure	
Data identification	
Data set description	Indoor – house temperature and humidity. Energy use and energy generation. Historic energy use. Outdoor – temperature and solar radiation.
Source (e.g. which device?, type, location of the device)	Temperature and humidity sensors. Domestic gas and electric meter readings/bills Web depository for weather data. Location of sensors to be determined.

Activities & responsibilities	
Partner owner of the device	ODINS for BMS Gateway. CCC for PC for BMS system and sensors, system actuators and locally deployed data and control centre.
Partner in charge of the data collection (if different)	ODINS
Partner in charge of the data analysis (if different)	SIEMENS, ETRA and CERTH are in charge of the data analysis.
Partner in charge of the data storage (if different)	ODINS is in charge of the data storage.
WPs and tasks involved	WP3, WP4, WP5
Standards	
Info about metadata (Production and storage dates, places) and documentation?	Production by ODINS, metadata storage in local hosting server of BMS system with Mongo Database: ▪ Production timestamps. ▪ Storage date. ▪ Physical units. ▪ Room ID. ▪ Producing sensing device ID.
Standards, Format, Estimated volume of data	External-communication: MQTT, Modbus. Internal-communication: RESTful protocol and JSON format. Volume: around 30 double precision numbers every 15 minutes per pilot.
Data exploitation and sharing	
Data exploitation (purpose/use of the data analysis)	Data analysis for ICT services (WP3) and project deliverables (WP3, WP4, WP5).
Data access policy / Dissemination level (Confidential, only for members of the Consortium and the Commission Services) / Public	Raw data: Confidential, only for members of the consortium and the Commission Services. Processed and anonymised selected data: Public.
Data sharing, re-use and distribution (How?)	Online upload in open data repositories.
Embargo periods (if any)	None
Archiving and preservation (including storage and backup)	
Data storage (including backup): where? For how long?	Data storage will be done in local server on CCC pilot site. But it does not include backup in external services.

	Raw data: Sciebo project repository until the end of the project (backup and storage). Processed and anonymised selected data: According to the open data repository policy (storage) – Sciebo project repository until the end of the project (backup).

DS.RWM.Pilot's_Sensing_&_Actuating_infrastructure	
Data identification	
Data set description	▪ Indoor: temperature, humidity, presence, CO2. ▪ Outdoor (current & forecasted): temperature, total solar radiation. ▪ Energy metering: radiators (thermal), electric heaters (electricity), bidirectional energy meters at power supply node (electricity), ADBE solar-based power generation (electricity), bidirectional energy meters for ADBE batteries (electricity).
Source (e.g. which device?, type, location of the device)	Temperature, CO2 and humidity sensors, Weather forecast data repositories, Energy/Electric meters.
Activities & responsibilities	
Partner owner of the device	RWM
Partner in charge of the data collection (if different)	RWM, CERTH
Partner in charge of the data analysis (if different)	RWM, CERTH
Partner in charge of the data storage (if different)	RWM, CERTH
WPs and tasks involved	WP1, WP4, WP6, WP7
Standards	
Info about metadata (Production and storage dates, places) and documentation?	Sciebo
Standards, Format, Estimated volume of data	Excel, Word
Data exploitation and sharing	
Data exploitation (purpose/use of the data analysis)	Data analysis and project deliverables.

Data access policy / Dissemination level (Confidential, only for members of the Consortium and the Commission Services) / Public	Raw data: Confidential, only for members of the consortium and the Commission Services. Processed and anonymised selected data: Public.
Data sharing, re-use and distribution (How?)	On line upload to members of the consortium (Sciebo).
Embargo periods (if any)	None
Archiving and preservation (including storage and backup)	
Data storage (including backup): where? For how long?	Local servers.

DS.RWTH.Pilot's_Sensing_&_Actuating_infrastructure	
Data identification	
Data set description	Sensors: ▪ Temperature. ▪ Humidity. ▪ CO2. ▪ Window opening (contact sensor) Energy consumption heating, ventilation, cooling if necessary, electricity if necessary. ▪ Presence. ▪ Outdoor temperature, solar radiation, etc. Actuators: ▪ HK thermostat with regulation. ▪ If applicable, solar shading actuator.
Source (e.g. which device?, type, location of the device)	Product types and location not decided yet.
Activities & responsibilities	
Partner owner of the device	RWTH
Partner in charge of the data collection (if different)	RWTH
Partner in charge of the data analysis (if different)	ODINS and CERTH
Partner in charge of the data storage (if different)	RWTH
WPs and tasks involved	WP3, WP4
Standards	

Info about metadata (Production and storage dates, places) and documentation?	Metadata storage in local server: ▪ Timestamps. ▪ Date. ▪ Physical units. ▪ Room ID. ▪ Sensing device ID.
Standards, Format, Estimated volume of data	Between BMS and Server: MQTT, Modbus. Between Sensor/Actuators and BMS: RESTful protocol and JSON format.
Data exploitation and sharing	
Data exploitation (purpose/use of the data analysis)	Data analysis for ICT services (WP3) and project deliverables (WP3, WP4, WP5).
Data access policy / Dissemination level (Confidential, only for members of the Consortium and the Commission Services) / Public	Raw data: Confidential, only for members of the consortium and the Commission Services. Processed and anonymised selected data: Public.
Data sharing, re-use and distribution (How?)	Online upload in open data repositories.
Embargo periods (if any)	None
Archiving and preservation (including storage and backup)	
Data storage (including backup): where? For how long?	Data storage will be done in local server on RWTH pilot site. Periodic manual backup. Processed and anonymised selected data: According to the open data repository policy (storage) – Sciebo project repository until the end of the project (backup).

DS.ADBE_frame	
Data identification	
Data set description	Profile drawings, static calculations, thermal calculations, connection details.
Source (e.g. which device?, type, location of the device)	Product data from manufacturers and distributors. Drawings partly Alumil and RWTH.
Activities & responsibilities	
Partner owner of the device	Product data from manufacturers and distributors. Drawings partly Alumil and RWTH.

Partner in charge of the data collection (if different)	RWTH, Alumil
Partner in charge of the data analysis (if different)	RWTH, Alumil
Partner in charge of the data storage (if different)	RWTH
WPs and tasks involved	WP2
Standards	
Info about metadata (Production and storage dates, places) and documentation?	Storage in local servers.
Standards, Format, Estimated volume of data	.dwg, word, excel, open source calculation programs.
Data exploitation and sharing	
Data exploitation (purpose/use of the data analysis)	Verification of the application limits and optimization. Thermal modelling of construction. Lessons learned from structural, thermal and environmental requirements are to be used as references for choosing: ▪ Post/mullion construction and profiles material. ▪ Thermal insulation. ▪ Façade layer. ▪ Clamping profiles. ▪ Fasteners. ▪ Windows.
Data access policy / Dissemination level (Confidential, only for members of the Consortium and the Commission Services) / Public	Public
Data sharing, re-use and distribution (How?)	Online upload to members of the Consortium (Sciebo), Open Access at the end of the project.
Embargo periods (if any)	None
Archiving and preservation (including storage and backup)	
Data storage (including backup): where? For how long?	Sciebo project repository until the end of the project.

DS.ADBE_tech_elements	
Data identification	
Data set description	Technical devices product database. Simulation frameworks of CFD and Modelica Simulation. Technical drawings and connection details. Energy consumption/generation data using different energy conversion systems and modular zone models. Data examined by virtually demonstrating the smart integration of active facade with potential storage elements in an already existing energy distribution grid.
Source (e.g. which device?, type, location of the device)	Product data from manufacturers and distributors. RWTH and CERTH for simulations. Drawings partly Alumil and RWTH. Induced Flow Filed Simulations; Spatial distribution of temperature and aeration rates within typical building volumes affecting users comfort performance, Energy consumption models, being associated with storage solutions and electricity connection to the LV/MV grid on a district level.
Activities & responsibilities	
Partner owner of the device	Product data from manufacturers and distributors. RWTH (owner of the energy models) and CERTH (owner of the CFD, APROS and LCC calculator tools) for simulations. Drawings partly Alumil and RWTH.
Partner in charge of the data collection (if different)	CERTH CFD tool will run a parametric study on the effect of free air stream velocity and its angle of attack respect to the ADBE system for calculating important fluid flow parameters affecting thermal comfort levels of users, taking as a basis standardized room volumes/geometries. Typical range of values will be used as input data. CERTH APROS model will capitalize on the results of the OpenModelica provided by

	RWTH, to simulate dynamically in time the integration of the ADBE façade being installed on a building with the LV/MV distribution grid, especially for the case that excess of electricity is produced and can be of benefit for the electric grid with or without including BESS. CERTH LCC calculator will be used to calculate the life cycle benefits in terms of cost the ADBE system can offer, capitalizing on its design following a circular economy approach. Input data will be provided by the dimensioning of the system through simulation platforms (secondary data), actual measuring KPIs (primary data) and LCA analysis being done by AIGUASOL and EIG.
Partner in charge of the data analysis (if different)	CERTH is responsible for CFD, Apros and LCC input data post processing and results.
Partner in charge of the data storage (if different)	CERTH is responsible for CFD, Apros and LCC results data storage.
WPs and tasks involved	WP1: T1.5 (CFD by CERTH) WP2: T2.2 (Apros by CERTH), T2.3, T2.4, T2.5 WP5: T5.3 (LCC by CERTH), T5.5
Standards	
Info about metadata (Production and storage dates, places) and documentation?	Simulated data, Storage in local servers
Standards, Format, Estimated volume of data	CERTH CFD data storage will be in the range of GB (if necessary local space storing options can be acquired, but for a limited time period). Format: .plt (tecplot), .dat file format following specific formats used for visualization software. APROS and LCC format will be following .dat, Excel and .txt formats. Open Source at the end of the project.
Data exploitation and sharing	
Data exploitation (purpose/use of the data analysis)	Configuration of the façade system and individual façade elements, dissemination. RWTH's energy model approach will allow examine dynamic energy efficiency and economical as well as ecological costs of different set ups. In addition, the simulation

	results will give valuable feedback for the controls of such advanced systems. CERTH's CFD results will allow the extrapolation of 0D equations connecting far-field with important near-field physical parameters (e.g. heat transfer coefficients, aeration volume flow rates) affecting significantly thermal comfort evaluation in terms of important induced flow field characteristics 9temperature, velocity profiles) being exhibited by the operation f ADBE compared to more standard solutions. CERTH's dynamic in time platform (APROS) will be able to provide quantifiable information about the efficiency and dimensioning of possible energy storage solutions and other equipment, which can be used for reducing peak power demand through efficient planning. CERTH's LCC calculator will provide the output of cost parameters in connection with circular economy principles; thus promoting the introduction of new business models.
Data access policy / Dissemination level (Confidential, only for members of the Consortium and the Commission Services) / Public	Raw Data: Confidential, only for members of the consortium and the Commission Services. Processed selected data: Public
Data sharing, re-use and distribution (How?)	Online upload to members of the Consortium (Sciebo), Open Access at the end of the project.
Embargo periods (if any)	Raw Data: Forever Public processed data: None
Archiving and preservation (including storage and backup)	
Data storage (including backup): where? For how long?	Sciebo project repository until the end of the project. CERTH's own servers for a period of up to 1 year after the end of the project.

DS.ADBE_aesthetics	
Data identification	
Data set description	Cladding (technical and architectural) product database.

	Drawings and photos.
Source (e.g. which device?, type, location of the device)	RWTH, Alumil, Manufacturer, Pilot Owners, Project Partners.
Activities & responsibilities	
Partner owner of the device	Open source, Photographers (RWTH, Alumil, Pilot Owner, Project Partner, Others).
Partner in charge of the data collection (if different)	RWTH, Alumil
Partner in charge of the data analysis (if different)	RWTH, Alumil
Partner in charge of the data storage (if different)	RWTH
WPs and tasks involved	WP1, WP2, WP4, WP6
Standards	
Info about metadata (Production and storage dates, places) and documentation?	Time and Date.
Standards, Format, Estimated volume of data	.jpg, .dwg, .dxf, .pdf
Data exploitation and sharing	
Data exploitation (purpose/use of the data analysis)	Configuration of the façade system and individual façade elements, dissemination.
Data access policy / Dissemination level (Confidential, only for members of the Consortium and the Commission Services) / Public	Public
Data sharing, re-use and distribution (How?)	Online upload to members of the Consortium (Sciebo), Open Access at the end of the project.
Embargo periods (if any)	None
Archiving and preservation (including storage and backup)	
Data storage (including backup): where? For how long?	Sciebo project repository until the end of the project.

DS.EIG.material_DB	
Data identification	
Data set description	For all elements, products and devices proposed for the ADBE, OEMS and BLS the following information is required: 1. Product name and manufacturer.

	2. Contact person from manufacturer for each pilot site: Germany, Spain, Greece, UK. 3. Identification of materials and chemical composition up to 100ppm in each homogenous part of the product. 4. Fulfil Materials questionnaire for PnH Material database.
Source (e.g. which device?, type, location of the device)	Materials questionnaire for PnH Material database.
Activities & responsibilities	
Partner owner of the device	EIG
Partner in charge of the data collection (if different)	EIG, CERTH. Questionnaire will be uploaded in PnH website.
Partner in charge of the data analysis (if different)	EIG, AIGUASOL, RWTH
Partner in charge of the data storage (if different)	EIG, RWTH, CERTH
WPs and tasks involved	WP5, WP2; WP1
Standards	
Info about metadata (Production and storage dates, places) and documentation?	Storage in local servers. PnH website.
Standards, Format, Estimated volume of data	Microsoft Excel, Survey Monkey or Type Form for data collection.
Data exploitation and sharing	
Data exploitation (purpose/use of the data analysis)	KPI and DPI calculation. Circular economy Analysis with WP5 scope.
Data access policy / Dissemination level (Confidential, only for members of the Consortium and the Commission Services) / Public	Confidential, only for members of the Consortium and the Commission Services. In case Non- Disclosure Agreement is signed with specific supplier, then information will be keep confidential within the boundaries of the NDA requirements.
Data sharing, re-use and distribution (How?)	Online upload to members of the Consortium (Sciebo)
Embargo periods (if any)	Raw Data: Forever Public processed data: None
Archiving and preservation (including storage and backup)	

Data storage (including backup): where? For how long?	EIG local servers, and PnH website; other partners servers.

5 Conclusions

The first analysis contained in this report allows to anticipate the procedures and infrastructures to be implemented by PLUG-N-HARVEST to efficiently manage the data it will produce. In particular, this first version of project's Data Management Plan leads the project to draft the specifications of one of the key tools to be implemented: the PLUG-N-HARVEST Data Management Repository.

Another lesson from this report is that all technical Work Packages of the project will produce data. This means that the Data Management Repository will need to allow for specific access to each project partner, and that editing / access rights will need to be managed accordingly.

The PLUG-N-HARVEST Data Management Plan will put a strong emphasis of the appropriate collection – and publication should the data be published – of metadata, storing all the information necessary for the optimal use and reuse of those datasets. This metadata will be managed by each data producer, and will be integrated in the Data Management Repository.

Finally, the Data Management Repository will need to be flexible in terms of the parts of datasets that are made public. Special care will be given to ensuring that the data made public violates neither IPR issues related to the project partners, nor the regulations and good practices around personal data protection. For this latter point, systematic anonymization of personal data will be made.

This Data Management Plan provides an overview of the data that PLUG-N-HARVEST will produce, and of the challenges and constraints that need to be taken into account for managing it. Once the solutions to be tested by the project and the content of this testing are specified, the next step – which will be described in the updated version of this report – will be to finalize the specifications of the Data Management Portal of the project and to provide a detailed Management Plan for each data set.

6 References

[1] http://ec.europa.eu/justice/data-protection/law/index_en.htm

[2] "General Data Protection Regulation", https://www.eugdpr.org/