TWINERGY

Data Management Plan

D1.2

February 2023

Twinergy has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 957736

Deliverable

PROJECT ACRONYM	GRANT AGREEMENT #	PROJECT TITLE
TWINERGY	**957736**	**Intelligent interconnection of prosumers in positive energy communities with twins of things for digital energy markets**

DELIVERABLE REFERENCE NUMBER AND TITLE

D1.2

Data Management Plan

Revision: v4.0

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DISSEMINATION LEVEL

✓ **P** **Public**

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Version History

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v0.1_ rev[AL]	27.03.2021	Arthur van der Wees Dimitra Stefanatou	AL	1st draft review by AL, provision of comments/suggestions for changes and document approval
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v3.0	04.03.2022	Anastasios I. Karameros Stylianos Karatzas Athanasios Chassiakos	UoP	Draft of v3.0 submitted to EC by the PC
V3.1	20.02.2023	Athanasios Chassiakos, Stylianos Karatzas, Vasiliki Lazari, Antonis Papamanolis	UoP	1st Draft version of the DMP v4.0 to be reviewed internally
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V3.4	01.03.2023	Alexandros Tsitsanis	SUITE5	Revised draft provided by SUITE5
V3.5	02.03.2023	Dimitra Stefanatou	Arthur's Legal	Revised draft provided by Arthur's Legal
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Statement of Originality

This deliverable contains original unpublished work except where clearly indicated otherwise. Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation, or both.

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Executive Summary

This deliverable contains an updated version of the Data Management Plan (DMP) of the TwinERGY project funded by the European Union Horizon 2020 Programme, under Grant Agreement No. 957736, covering the period starting as of M1(November 2020) until M28 (February 2023) of the project. The purpose of this document is to outline how TwinERGY data have been handled both during the project lifespan and after it, covering all aspects of data management, in accordance with the applicable FAIR Principles in H2020.

In this context, the TwinERGY DMP follows the structure of the proposed Horizon 2020 FAIR Data Management Plan (DMP) Template[1]. The DMP template provides for the status of the collected, processed and/or generated data, the adoption of methodology and standards, as well as information about the process of how data are shared and/or made open, and how they are curated and preserved. This deliverable focuses on the procedures that will take place/ or are taking place as part of the data management process in TwinERGY, including the catalogues about the available project data, which are incorporated in the corresponding chapters (chapter 4 and annexes) of this deliverable.

The DMP is intended to be a living document in which information will be made available on a finer level of granularity through updates, as the project implementation progresses. The DMP provides an overview of the deliverable purpose along with information about dependencies with other elements and tasks of the project (Chapter 1) and a summary of data generation and use process in TwinERGY (Chapter 2). It further defines the general policy and approach to data management and related issues at the administrative and technical level (Chapter 3). Chapter 4 describes the data catalogues referring to pilot related activities, which are the main data generation/use sources, and the ways of data update during the course of the project.

The initial version of the Data Management Plan was submitted in M6 covering for the period M1-M6. An updated version was submitted in M10 covering for the period M7-M10. The current version of the deliverable enhances the previous version (M16 – February 28th, 2022) with amendments that have resulted from the work of the project

[1] Horizon 2020 FAIR Data Management Plan (DMP) Template
https://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/open-access-data-management/data-management_en.htm

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partners performed in the meantime. Further updates will be provided in the following version due in M36.

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Index

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Twinergy has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 957736

List of Figures

Twinergy has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 957736

List of Tables

Twinergy has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 957736

1. Introduction

1.1 Deliverable scope and structure

The TwinERGY project focuses on introducing a first of a kind demand response framework, which enables the realization of novel business models, allowing electricity retailers and local energy communities to introduce themselves in energy markets, under the role of an aggregator. In this way, consumer representation in energy markets is facilitated. In line with this vision and taking into account the need for data acquirement and analysis towards developing the TwinERGY system and providing innovative/value-adding services to its users, the project Data Management Plan is introduced. The purpose of this document is to outline how TwinERGY data have been handled both during the project lifespan and after it, covering all aspects of data management, in accordance with the applicable FAIR Principles in H2020.

The consortium has recognized that demand response and consumer engagement will be achieved via: (i) the deployment of dynamic pricing schemes by retailers, (ii) the automated, human-centric demand response schemes with the introduction of appropriately selected loads in automated control programs (Direct Load Control on the basis of consumer digital twins), (iii) the introduction of novel business models, allowing electricity retailers and local energy communities to introduce themselves in energy markets, while (iv) providing a secure blockchain-enabled energy market infrastructure.

The project Data Management Plan (DMP) is considered as a living document that will be continuously updated and reviewed throughout the project lifespan with updated versions being disclosed as public deliverables (four updates have been scheduled). This document constitutes the fourth version of the TwinERGY project Data Management Plan, adhering to the conditions of the European Commission Open Research Data Pilot (ORDP)[2], which the consortium has decided to opt-in. The TwinERGY DMP is produced in the context of WP1 'Project Management and Quality Assurance', task 1.5 'Knowledge Management & IPR' and this fourth version (which is marked as v4.0) incorporates results related to the type of data that will be gathered during the Pilot activities along with other types of data that are publicly disseminated.

The analysis covers the ethics management process and elements about data management and dissemination policies to be followed. The work performed mainly

[2] https://www.openaire.eu/what-is-the-open-research-data-pilot

under work package WP5 'Data Collection and Communication Platform' and more specifically, under the work related to the deliverables D5.1-"TwinERGY Common Information Model", D5.2- "Data Collection, Security, Storage & Management Services Bundles – Beta Release", D5.3-"TwinERGY Integrated Data Management Platform – Alpha, Mockups Release", D5.4-"TwinERGY Integrated Platform– Beta Release", D5.5-" Data Collection, Security, Storage & Management Services Bundles – Release 1.00", D5.6-" TwinERGY Integrated Data Management Platform– Release 1.00" and D5.7-" Data Collection, Security, Storage & Management Services Bundles – Release 2.00" that were submitted by the 28th of February 2023. The TwinERGY Core Data Management Platform (CDMP), which is running its final development phase, and which is based on existing open energy standards, will incorporate proper data security, privacy, authentication, and authorization techniques to ensure end-user data confidentiality and non-repudiation of DER assets. Following the TwinERGY Common Information Model (CIM) creation methodology, the TwinERGY CIM has been delivered in order to capture and map the semantics and structure of each concept data, their fields, and relations to other concepts.

The data management plan presented in this document is drafted at the 28th of February 2023 covering any updates arising in the period M17-M28. The documentation reflects the intentions of the project partners in regard to developing the overall project datasets. Following the decision of the task leader (UoP) to provide updated versions as new data become available, additional versions to the one indicated in the Grant Agreement No. 957736 are expected to come along. The schedule of updates is presented in the next section, where issues related to the DMP deliverables are discussed.

1.2 Data Management Plan update schedule

The TwinERGY DMP is considered as a living document, which is to be updated based on the project progress and the work conducted under its different tasks. In this section, a record of the DMP connection with various work packages and deliverables is presented. Based on the H2020 online manual[3], it is described that the DMP should be updated in the context of the periodic evaluation/assessment of the project as a minimum ("If there are no other periodic reviews envisaged within the grant agreement, an update needs to be made in time for the final review at the latest"). As there is no such reference made in the Grant Agreement of the project, though there are significant

[3] https://ec.europa.eu/research/participants/docs/h2020-funding-guide/index_en.htm

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DMP related information produced during the project lifecycle, there will be four updated version submissions of the DMP besides the original one (v1.0), which has a delivery time in M06 of the project, the version (v2.0) in M10, the version (v3.0) in M16 the current version (v4.0) in M28 and the final one (V5.0) in M36.

Month 10 of the project marks the completion of several tasks, such as T5.1 'Open standards review and common information model adaptation', T9.1 'Pilot specifications and quality assurance', T9.2 'Pilot management plan development' as well as the start of T9.4 'Pilot validation, impact realization & recommendations'. This time coincides with the delivery period of important DMP related deliverables, such as D4.3 'Methodological framework' (due in M10 - responsible partner UNIVBRIS), D5.1 'TwinERGY common information model' (due in M10 - responsible partner SUITE5), and D7.1 'Modules interoperability' (due in M8 - responsible partner ETRA).The second updated version of the DMP (v3.0) is scheduled to be released in M16, which marks the submission deadline of major project deliverables related to the data management. These deliverables are: D4.4 'System architecture' (due in M12 - responsible partner ETRA), D12.5 'Data use license template' (due in M12 - responsible partner KWMC), and D5.4 'TwinERGY integrated platform - beta release' (due in M16 - responsible partner SUITE5).

In the period between M16 and M28, significant DMP related information is anticipated to be produced, which will be included in a third updated version of the DMP (v4.0). The delivery milestone of this version has been set to coincide with the finalization of deliverable D5.7 'Data collection, security, storage & management services bundles - release 2.00' (due in M28 - responsible partner SUITE5). The last updated version of the DMP is anticipated at the end of the project (M36), along with the due dates of several deliverables. At that time, the final results will be summarized and presented in a final DMP version (v5.0). Figure 1 highlights a graphical representation of the DMP update evolvement along the project timeline with an indication of the main milestones. The projected plan is subject to adjustments depending on the progress of the actual work.

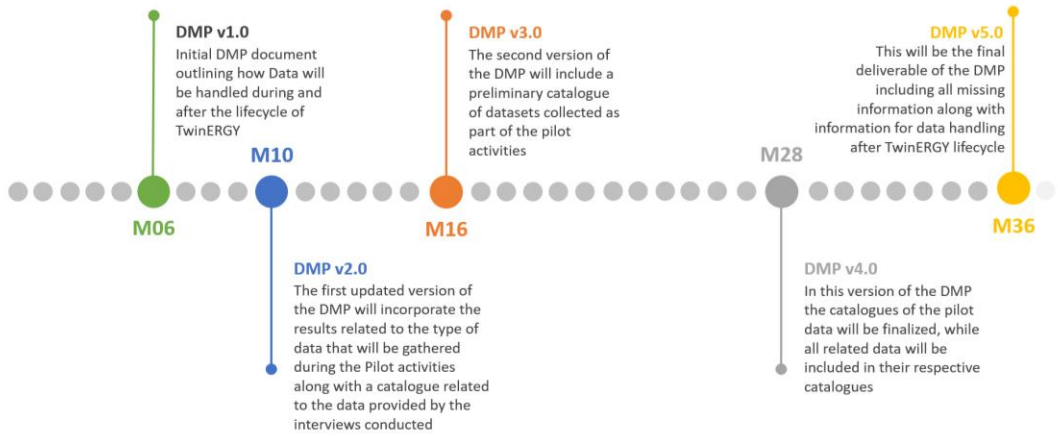

Figure 1. Data Management Plan evolvement

1.3 Deliverable structure

The deliverable consists of the following chapters:

- Chapter 1 is the introductory section which presents the purpose, structure, reference documents and deliverables related to the Data Management Plan.
- Chapter 2 refers to the data used during the project and specifies the WPs and related tasks where they will be used.
- Chapter 3 presents the TwinERGY data management framework and the way that the 'FAIR' principles will be implemented and followed during and after the project lifecycle. In addition, the general principles framework is illustrated, based on which the TwinERGY partners comply with subjects such as ethics, personal data protection, and security. References to the services that enable and safeguard the data management procedures is also provided.
- Chapter 4 is dedicated to the Open Data catalogues that will be produced during the project lifecycle and updated with every new version release.
- Chapter 5 provides some concluding remarks regarding the data management plan.

1.4 Abbreviation list

Table 1 presents the main abbreviations used in this document.

Table 1. Abbreviation List

Abbreviation	Full Form
H2020	Horizon 2020

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EC	European Commission
EU	European Union
DoA	Description of Action
GA	Grant Agreement
WP	Work Package
T	Task
D	Deliverable
DMP	Data Management Plan
GDPR	General Data Protection Regulation
FAIR	Findable, Accessible, Interoperable and Re-usable
IPR	Intellectual Property Rights
DOI	Digital Object Identifier
PDM	Project Data Manager
DMC	Data Monitoring Committee
DPC	Data Protection Coordinator
DPO	Data Protection Officer
PO	Project Officer
DB	Database
OA	Open Access
PDF	Portable Document Format
XML	Extensible Markup Language

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2. Data Summary

2.1 Introduction

The TwinERGY project aims to develop, configure, and integrate an innovative suite of tools, services and applications for consumers, enabling the increase of (a) awareness and knowledge about consumption patterns, energy behaviours, generation/demand forecasts and (b) local intelligence via properly established digital twin-based and consumer-centric energy management and decision support mechanisms that locally optimize demand response. Through a structured methodology, the project partners will work towards achieving the project objectives, which will be expressed via the formulated use cases and evaluated mainly on the basis of primary data received from four pilot demonstrations, making use of cutting-edge methods and tools. The purpose of the current Data Management Plan (DMP) deliverable is to provide updated information concerning the data that will be collected and used by the project partners and, eventually, be openly accessible.

In the present document, the term 'data' refers to five main categories of information that will be used and/or produced during the project. These are:

1. Datasets, as a result of data collection through the operation of the TwinERGY system modules during pilot testing and/or as analysis results of the procedures that will take place as part of the modules operation.
2. Project deliverables that will be openly accessible to people interested in the project insights (the DMP is considered as a public deliverable).
3. Dissemination material, such as technical reports, workshops, videos, blogs, presentations, posters, and flyers.
4. Software artefacts, such as open-source code, produced by the various components that make up the TwinERGY system and accompanied by the appropriate documentation.
5. Scientific publications referring to the procedures and/or the results of the research conducted.

Note that the aforementioned data may include both personal and non-personal data.

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2.2 Roles and responsibilities

2.2.1 Data management organizational structure

Data management refers to the collection, storage, and use of data in a secure, efficient, and cost-effective manner. Although from the standpoint of the general project management, TwinERGY organization follows a hierarchical structure with the Project Coordinator at the hierarchy top, from the data management/monitoring perspective, it has been deemed appropriate to adopt a network organization structure.

Partner specialization and experience are considered vital in the effort of smooth management of the various data types produced in the project. Therefore, a Data Monitoring Committee (DMC) is established, comprising by members of all affiliated bodies in an organizational structure as shown in Figure 2. Data management responsibilities are distributed among several partners with the roles of Data Protection Officers, Data Protection Coordinator, Ethics Manager, and Project Data Manager, while members of the project management team are included for the facilitation of administrative issues related to DMC work. All raw data produced and considered for public dissemination will be provided by partners running the pilot demonstrations, who will act as Data Controllers, following the project ethics and data protection rules.

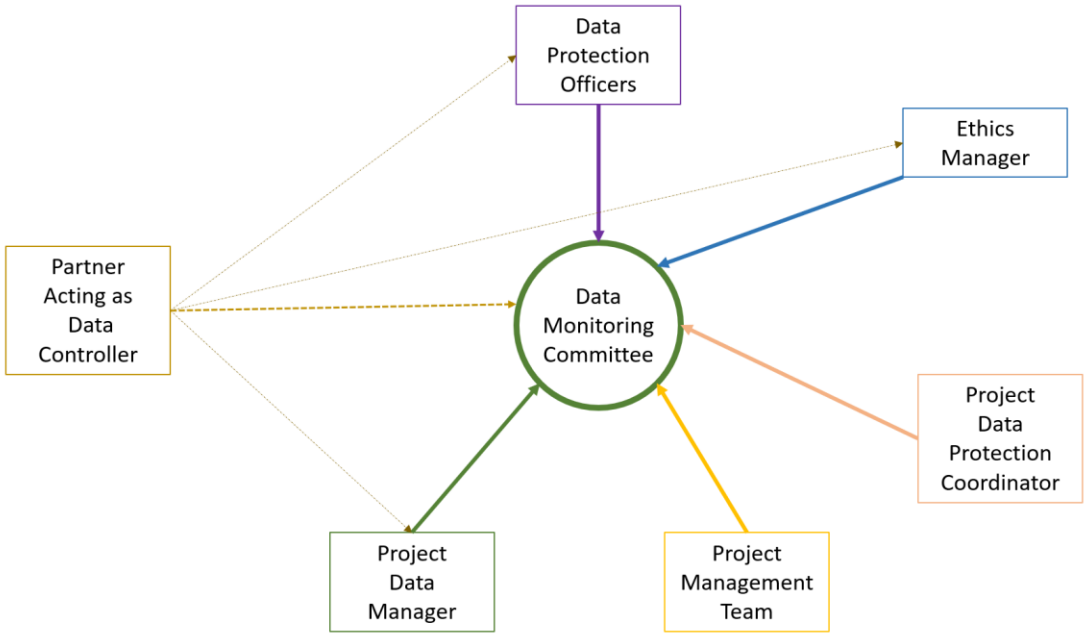

Figure 2. Data Management organizational structure

All partners acting as data controllers need to comply not only with the General Data Protection Regulation (GDPR)[4], but also with all principles set in the project concerning data management. In this context, they are encouraged to contact the appropriate project managers regarding issues that may arise in relation to ethics issues (Ethics Manager), technical issues related to data management (Project Data Manager), or issues related to personal data protection (Data Protection Officers). In this form of data management structure, decentralized and targeted resolutions on data management and information transfer issues will be possible, achieving more effective and comprehensive oversight on this issue.

The responsibilities of the DMC are presented in the following section. Partners belonging to this group come from the ones that are linked with a solid line arrow with the DMC as shown in Figure 2. Despite the fact that these partners have already taken on specific roles in the project, they will have to take on additional responsibilities as required by their participation in the DMC. Such partners represent (a) the Ethics Manager (responsible partner Arthurs Legal with its responsibilities presented in D13.1 'H- Requirement No.1' section 2.2.1 'Appointment of Ethics Manager'), (b) the Data Protection Officers (responsible partners the Pilot leading Partners with their responsibilities presented in D13.2 'POPD - Requirement No. 2' section 4.1 'Data Protection Officer Tasks and Responsibilities'), and (c) the Data Protection Coordinator (responsible partner UoP with its responsibilities presented in D13.2 'POPD - Requirement No. 2' section 4.2 'Role of Data Protection Coordinator').

2.2.2 Data Monitoring Committee

The TwinERGY Data Monitoring Committee is an informal subgroup consisting of partners working in parallel as an advisor to the project Executive Board in regard to Data Management. Its introduction and main purpose is to monitor the data management and handling procedures in all components and processes of the project. As shown in Figure 2, this committee consists of members of the following bodies:

1. Project Data Manager
2. Ethics Manager
3. Data Protection Coordinator
4. Data Protection Officers

[4] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) OJ L 119

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5. Project Management Team (for the purpose of supporting the DMC activities and the communication with the Executive Board).

Regarding data management, the Data Monitoring Committee is responsible for the following actions:

- developing the data management plan and policy in cooperation with the project management team and technical partners,
- monitoring and supervising the data management process,
- inquiring partners for missing information or clarifications related to data produced in the project,
- resolving data management issues,
- functioning as the central hub for data management issues,
- providing data management related information to the Executive Board for decision validation,
- coordinating the development of the DMP deliverable documents (D1.2 - vX.0)

As for data dissemination matters, the Data Monitoring Committee is responsible for the following actions:

- providing assistance in assorting the data for public dissemination,
- providing guidance for developing scientific publications,
- monitoring the dissemination of the project (public) deliverables,
- observing that green access (self-archiving) publications are provided as scheduled via the appropriate publication channels,
- ensuring that publications available in OpenAIRE are properly linked with TwinERGY project,
- reviewing data agreements by applying a specific methodology for assessing the Open Accessibility of the data and examining the possibility for establishing additional data agreements with stakeholders requesting access to their data.

The Project Data Protection Coordinator will act as the Data Monitoring Committee Chair, while the Managers hold a member position with equal responsibility in decision making on the basis of simple majority. Each member has the right to abstain from voting while, in cases of a tie, the vote of the Chair counts as a double vote.

As this is an informal committee, acting as an advisor to the Executive Board, DMC decisions are communicated in the form of recommendations to the Board, which either accepts and validates them as decisions of the project team or reject them

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accordingly. All DMC actions related to administrative issues will be supported by members of the Project Management Team.

2.2.3 Project Data Manager

The Project Data Manager (PDM) is a role that a project partner is called to take on and is introduced in this specific deliverable. The PDM is responsible for the initial screening of external stakeholder requests for access and re-use of raw demo data that are available in the data management platform. The PDM will bring all requests to the attention of the Data Monitoring Committee (DMC), which will have to provide their suggestion to the Executive Board regarding the extent that these requests can be satisfied. Even though it is not very likely that such requests will be realized during the implementation of the project, the PDM will also be responsible for defining the technical specifications for providing access to the data in question and realizing the respective data access policies in the data management platform. The role of the Project Data Manager is assigned to the consortium partner SUITE5, the responsible partner for the Common Data Management Platform, which will be developed as part of the WP5 work.

2.3 Data related actions in TwinERGY project

Data management constitutes an integral part of the work conducted throughout the TwinERGY project lifecycle. The Project Data term refers to all proprietary data generated within the project operations and transactions, e.g., documents, reports and related information, and, more importantly, user data obtained, possessed, and processed in the context of the provided services. Although the actual data acquisition process will be conducted serving the purposes of the project pilot demonstration activities, which lie under Task 9.3 Pilot Demonstrations Implementation', the data management-related work extends far beyond this process. It is in fact closely related to project phases and actions, from the stakeholder requirement analysis to structuring the system architecture and arranging the Intellectual Property Rights, dissemination, and communication activities, as well as developing the project Metadata.

The initial version (v1.0) of the Data Management Plan had a purpose to provide an overview of the general policy and approach to data management in TwinERGY that embodied issues at administrative and technical levels. Based on the project task and deliverable progress up to M6, this version included details regarding ethics and participant recruitment procedures, reference to matters of compliance with local and international data protection regulations, issues regarding data and Metadata

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collection, publication and deposition of open data, which partially rely on the work performed and the conclusions drawn in WP13 'Ethics Requirements' and the corresponding deliverables that had already been submitted.

In addition, the first version provided an introduction to datasets to be used/produced by the project along with a description of the data repository infrastructure, in compliance with the Open Access Infrastructure for Research in Europe provisions (e.g., information sharing via Zenodo and/or GitHub). These are parts of ongoing work associated with WP5 'Data Collection and Communication Platform' and T7.1 'Modules' specifications and system interoperability' of WP7 'Development of TwinERGY System Modules'.

DMP first updated version (v2.0), which was delivered in M10, incorporated the main outcomes of the work performed under WP2 'Stakeholder Requirements, Obstacles to Innovation and Business Models'. The deliverable D2.2 'Stakeholders analysis: KPIs, Scenarios, and Use Case definition' (due in M8), was considered as a first attempt to quantify the Key Performance Indicators (KPIs), deliver the Use Cases (UCs) and scenarios, and set the foundations for the pilot demonstrations. Further, the deliverables D2.4 'Technical obstacles to innovation analysis' (due in M8) and D2.5 'Social, ethical and cultural barriers to innovation' (due in M8) enriched the consortium knowledge base regarding data related elements that may impede the project progress.

An updated version of the DMP (v3.0) was scheduled to be delivered in M16, when the deliverables related to work performed under WP3 and WP4 had been published and the work performed under WP5 'Data Collection and Communication Platform' had furnished a BETA release version of the TwinERGY Integrated Platform. The TwinERGY consortium intends to exploit the experience gained by other projects, which have either been finalized or are currently running at a mature phase and are part of the European Commission's BRIDGE Initiative[5]. This effort is part of the work allocated under WP3 'Cooperation with Projects Supported under LC-SC3-ES-5-2018-2020 and other Selected Projects'. Previous experience was integrated here as know-how and as reported results from similar activities or tools that are to be developed and/or used in TwinERGY project. Synergies with other projects were realized as value-added opportunities and so were any data management related practices and tools that serve the project needs in supporting FAIR data procedures.

[5] https://www.h2020-bridge.eu/

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In fact, a workshop was already planned and carried out on the 1st of February of 2020, with a focus on "Consumer Engagement Approaches and Prosumer Business Models". This workshop was part of the project efforts and work allocated under WP3, towards establishing collaborations with other EU funded projects under the umbrella of the H2020 Programme, which participate in the H2020 Bridge Initiative (more specifically with the projects iFLEX and SENDER). The workshop helped the different project teams working on different elements simultaneously, to explore and focus on the consumer engagement element which lies on the core of the vision of the project, consider the differences in approaches adopted from other project which run different phases of their lifecycle and utilize all the information to carry out beneficial interventions in their work with a highly positive expected impact on the project. Additionally, a 2nd workshop was conducted in M19, with the incorporation of INTERRFACE and OneNet projects addressing Data and Service interoperability, data management process and open architectures. Workshop outcomes will be incorporated into the deliverable D3.2 – 'TwinERGY – European Project Innovation and Cooperation report' (M36).

In WP4 'Methodological Framework and Architecture Design', the consumer behaviour is analysed and a tailor-made conceptual model was developed related to consumer behaviour and engagement. The model was enhanced by the appropriate selection of consumer engagement strategies and Energy Management System (EMS) drivers. The whole effort highly assisted the development of the system architecture, which was mapped based on the European Smart Grid Reference Architecture (SGAM) framework and considered local neighbourhood transactions for energy delivery, storage, demand response, and other energy services. The system architecture presented in D4.4 'System Architecture' (due in M12) embodied important information regarding data usage/production and provided directions for deciding what data types and datasets will be openly shared with the research community.

Work Package WP5 'Data Collection and Communication Platform' constitutes the cornerstone for data management in TwinERGY project. Considering the project data requirements and the specific data needs and required services of the planned use cases in the pilot sites, the envisioned TwinERGY Core Data Management Platform (CDMP) had been developed to provide the necessary interfaces and components/services to assist in the overall energy transition of the pilots through:

- collection of datasets generated at the pilot sites through various data sources and via appropriate communication interfaces in real time (through APIs or as data streams, from stakeholder legacy and operational systems) or at batch level

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(as files extracted by the stakeholder systems) and ensuring that updates are also feasible,

- management of actions for resource orchestration and mapping of the various data formats under a uniform and common language to enable syntactic and semantic interoperability,
- secure storage of the ingested and transformed datasets, enabling access policies and setting up anonymization and encryption methods to safeguard privacy, where required,
- API gateway development to serve the various module needs and the Digital Twin platform.

Potential outcomes or updates deriving from the aforementioned activities up until M28, along with results related to work performed under WP6, WP7 and WP8 are captured under DMP third updated version (v4.0) which is scheduled to be released in M28. The work under WP6 aims at developing a multilevel Digital Twin (DT) at a consumer, building, and community level, based on established expertise in Systems Thinking and Engineering, to develop energy system group model-building practices. Testing of real-world scenarios, based on Digital Twin technology, dictates extensive data usage and production as a result of the processes to be executed. The interconnection of modules to be developed and the interoperability of the TwinERGY system components, resulting from the system integration under WP8 'TwinERGY system integration', will be the milestone for data collection and assessment of pilot demonstration activities under WP9 'Pilots'.

The modules and services that were developed as part of the work under WP7 'Development of TwinERGY System Modules' are the main source of data to be published to the research community, as modules analyse the raw data collected. As all modules were scheduled to be developed by M18, allowing for a clearer view of the available data, a revised list of open access datasets is developed and included in this updated version of the DMP (v4.0). The base was already been set by the results of the work included in deliverable D9.2 'General Pilot Management Plan' (due in M10), which included information about the procedures under each project pilot, the project module content, and the generated data.

Work Package WP11 'Dissemination and Communication' is closely related to the dissemination of results and the communication of the project information to all interested stakeholders and feeds into all Data Management versions with the most recent activities and developments. The TwinERGY partners recognize and embrace the

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need for bidirectional communication with other projects, the research community, institutions, authorities, and the general public. As a result, the above dedicated WP addresses such objectives and activities throughout the project lifecycle. The development of a communication and dissemination plan, under T11.2 'Management of Strategic Communication and Dissemination Activities', ensures effective and inclusive project information dissemination to separable audiences. In addition, the produced materials are designed to adapt to specific audience needs and be disseminated through diverse communication channels following the guidelines set in deliverable D11.1 'Communication guidelines, website, social media'.

2.4 Data generation and collection

The data collection process within TwinERGY project is directly related to people being interviewed as part of the work under WP2 'Stakeholder Requirements, Obstacles to innovation and Business Models' and to the pilot demonstration activities under WP9 'Pilots'. The main motivation of data collection is to facilitate learning and analysis of the current state as well as the assessment of the proposed solutions. The extensive and diverse in content project database holds several levels of confidentiality and data protection needs. Therefore, the consortium has thoroughly discussed and decided to carefully handle datasets in terms of disclosure and public dissemination. This will be done by customizing data types, related to the TwinERGY modules, and applying data minimization principles.

2.4.1 Data origination

The TwinERGY project will produce data of different types (mentioned in section 2.1 of this deliverable) that will be considered for public use. Depending on the data type, there will be different origins and data production methods. In particular:

Datasets with pilot demonstration results will be originated by:

- interviews with pilot participants in each demonstration site,
- analysis results of the collected raw data,
- survey responses and feedback provided during workshops.

Software artefacts available for open publication (e.g., open-source code versions of the system modules) will result from:

- internal code generation as part of the project module development,
- open-source code from code hosting platforms (e.g., GitHub).

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The project deliverables and scientific publications will be the outcome of:

- the scientific and practical work, the software development, and the pilot demonstration documentation that inhere in the project modules,
- the literature study/review based on open access data,
- all kind of data types and results of the project.

Dissemination materials will be produced as part of:

- the procedures for Participant identification and recruitment for the pilot demonstration activities,
- the effort to promote the project goals and make the public aware of them.

2.4.2 Data format and size

A dataset may include different types of formats. TwinERGY will use widely accepted formats for data collection and generation (with the appropriate extensions) as follows:

- Documents/Reports/Publications: .PDF/A, txt, doc/docx
- Spreadsheets: .xls/.xslx
- Databases: .cvs
- Audio files. .mp3, .wav, .wma, .ra
- Pictures: .jpg, .png
- Videos: .avi, .flv, .mov, .mp4, .wmv

The exact data size cannot be pre-determined, although this kind of information will be requested for each developed dataset. The expected size of individual datasets is in the range of a few MB and 20 GB, with a typical value of about 300 MB per file. However, raw datasets can include several files and these data will preferentially be processed offline by individual experts, while the aggregated data will be stored in designated project data (cloud) stores.

2.5 TwinERGY Publication Infrastructure

The TwinERGY publication infrastructure consists of a project database and several web-based publication platforms that have been selected in order to provide long-term open access to all publishable, generated and collected project results. The database will mainly be used to link all publishable material with the project website, with the

domain twinergy.eu[6], and is designed to promote project achievements, facilitate active partner and visitor engagement and participation, and support robust project monitoring, as presented in deliverable D11.2 'Communication and dissemination plan'. In the following sub-sections, the involved web-based platforms are described.

2.5.1 TwinERGY website

The project website, which is mentioned in the TwinERGY Description of Action (DoA) and in deliverable D11.2 'Communication and dissemination plan' section 2.4.4, has already been online from the early stages of the project evolvement. The project website stands as a core element of the TwinERGY communication and dissemination structure and is designed to promote project achievements and to facilitate active partner and visitor engagement and participation as well as robust project monitoring.

Besides including general information about the project (goals, participants, areas of interest, pilots), the website incorporates dynamically updated content of the project deployment (news, events, case studies, results). The news and case studies / stories section is being updated on a regular basis to provide project development information, specific actions held by the pilots and case study impacts. Further, a dedicated section has been established for scientific publications (such as reports and white papers) as well as for project deliverables, providing everyone interested in the project and its outcomes with a point of interaction and the ability of getting access in all available material.

All documents are intended to be published using the portable document format (PDF), while all downloads are enriched by using simple Metadata information, such as the title and the document type. The website overview and management is under the auspices of the dissemination leading partner of the project - the University of Patras - in collaboration with the Ideas For Change (IFC) partner who bears the responsibility for the website development, hosting, and content curation.

2.5.2 OpenAIRE

OpenAIRE[7] is a European infrastructure for project supporting, promoting and providing training on Open Science. It operates as a gateway to publications and data dissemination arising from European research and is built upon a distributed network

[6] H2020 TwinERGY Project website - https://www.twinergy.eu/
[7] https://www.openaire.eu

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of publication and data repositories as well as a human network of national open access desks. OpenAIRE allows European funded projects to be documented in order to link their outputs. The web-based platform is compatible with free repositories that enable researchers to upload their research outputs and directly link them to their funding information. The repository that is mainly suggested by OpenAIRE for linking research outputs is Zenodo, a catch-all repository hosted by CERN.

2.5.3 Zenodo

Zenodo[8] is a general-purpose open-access repository developed under the European OpenAIRE program, operated and hosted by CERN, using one of Europe's most reliable hardware infrastructures. It allows researchers to deposit research papers, datasets, research software, reports, and any other research related digital artefacts. Zenodo supports the publication of any kind of scientific output, such as publications, reports (e.g., deliverables, white papers), data files (e.g., JSON, XML, CSV), software, images (e.g., posters) and videos (e.g., mp4 files).

Zenodo is further integrated with GitHub, thus making code easily citable while supporting open collaboration for source code and versioning of all kinds of data. For each data item submission, a persistent Digital Object Identifier (DOI) is minted, which makes the stored item easily citeable. All Metadata are licensed under CC0 license (Creative Commons No Rights Reserved). An important point of the process is that the property rights or ownership of the data item are not altered when it is uploaded to Zenodo. Zenodo is a place where all public results generated or collected during the project lifetime can be uploaded for long-term storage and open access. Zenodo also allows for uploaded results to be linked to a project via OpenAIRE, thus, the results uploaded are easily searchable and structured in a fine-grained way in the dedicated OpenAIRE project webpage.

2.5.4 Research Gate

Along with the project website establishment and its profiling in Zenodo, the project ResearchGate[9] channel will be established to promote the dissemination of scientific project publications. All downloads will be enriched by using simple Metadata information like the title, a short description, and the document type. The TwinERGY

[8] https://zenodo.org
[9] https://www.researchgate.net/

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ResearchGate channel will be managed by the Project Management Team, following the instruction by the Data Monitoring Committee.

2.5.5 GitHub

GitHub[10] is a source code hosting platform providing services in which developers and programmers can upload the code they have created and work collaboratively on its improvement. GitHub enables world-wide collaboration between developers and provides facilities to work on documentation and track issues. Many open-source projects use GitHub to share their results free of charge. The platform uses Metadata, such as contributor nicknames, keywords, time, and data file types to structure the projects and their results. The terms of service state that no intellectual property rights are claimed by the GitHub Inc. over provided material. Source code components that are implemented during TwinERGY project are anticipated to become publicly available via this platform.

2.5.6 Social media

As stated in deliverable D11.2 'Communication and Dissemination Plan' section 2.4.5, the TwinERGY project will encompass diverse social media channels to publish news, announce events, and present results during the project implementation. More specifically, social networks like Twitter, LinkedIn, and YouTube will be used for such purposes, with their corresponding "share" buttons embedded in the project website. All partners are expected to use these channels to post news or share information of project-related dissemination activities. The network utilization is considered of high importance as a result of their large penetration to diverse audiences, among which people potentially interested in the project results but not previously aware of the project.

[10] https://github.com

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3. TwinERGY Data Management Framework

3.1 FAIR principles in TwinERGY

Data collection and generation in TwinERGY will be governed by the FAIR principles, as described in the EC guidelines on FAIR Data Management for H2020 programme[11]. The project partners' joint pursuit is to maximize access to research data, project results, and any scientific publications. An additional aim is to support the wide re-use of the generated research data and the project results. In these directions, this section focuses on the findability, accessibility, interoperability, and reuse of the identified datasets. The data that will be publicly disseminated have to comply with the provisions described below.

The part of the data that are considered as confidential will be securely used by the project partners only for the purposes of the project. Some data of this class might need to be shared with third parties; however, this will be realized only after signing an appropriate and binding data use agreement. In particular, the agreement will set the responsibilities and the permissible actions, following the recommendations of the Data Monitoring Committee and the consent of the Executive Board.

Regarding data handling and management in general, the following general principles will be in effect.

3.2 Data Findability

In TwinERGY project, standardized naming and identification mechanisms are used to allow effective differentiation of the produced datasets. As a general rule for data naming, the title of each data packet should provide information about:

- a unique chronological number of the project datasets (dataset unique ID number),
- the project acronym,
- the dataset title,
- the data type (e.g., data, deliverable, scientific article),

[11] https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-data-mgt_en.pdf

- a version number that will be updated following new dataset versions or revisions (starting from v0.1).

The final naming form for the datasets is currently consolidated as part of the work under WP5 'Data Collection and Communication Platform'. In the event of introduced changes, the current section will be updated accordingly.

3.2.1 Naming conventions and keywords

It is expected that throughout the TwinERGY project, numerous datasets will be collected/generated. In order that they are easily identifiable and distinguished between each other, they should be appropriately named. As such, a naming scheme will be utilized based on a simple hierarchical structure consisting of:

- the pilot site where the dataset was collected followed by the city name, the district and the building block, as required,
- the acronym of the partner responsible for creating/collecting and managing the dataset,
- a title,
- a numerical dataset sub-index (starting from 1) to identify datasets created /collected at different times with individual Metadata.

The proposed format to be followed for naming the datasets and a naming example is shown below:

TwinERGY_[Pilot_Country]_[Responsible_Partner]_[Title]_[Data_set_Index.Data_set_sub_Index]

Example: TwinERGY_Germany_Steinheim_CO_2 Emissions_1.0

The proposed naming convention will enable dataset identification when published as Open Data in various open data portals.

3.2.2 Standard identification mechanism and Metadata

TwinERGY intends to utilize the Zenodo repository as the main tool for making research result data findable, in accordance with the H2020 Open Access Mandate, and the project website as the main tool for publishing the public deliverables. Following a dataset uploading to an online data repository, a Digital Object Identifier (DOI) will be assigned to it for the purpose of effective and persistent citation. A Digital Object Identifier (DOI) is a unique alphanumeric string that is assigned by a registration agency

(the International DOI foundation in this case) in order to identify the content and provide a persistent link to its location in the web. All project related publications will be indicated with a unique DOI so that the end users are able to identify and link them.

In addition, all project datasets are intended to be described with Metadata. Metadata comprise a set of data that provides context or additional information about other data. Metadata provides researchers the ability to find data in an online repository and this increases the dataset reusability potential. As for Zenodo, all uploads will be enriched with standard Zenodo Metadata, including the grant agreement number and the project acronym. Zenodo also provides version control and assigns DOIs to all uploaded elements.

The provision of rich and detailed Metadata allows researchers to efficiently determine whether the corresponding dataset is relevant to their research. Besides data ingestion and reusability purposes, the Metadata further provide a concrete view of the data being used in the project independently from accessibility restrictions.

As already specified within the General Agreement Article 29.2(c)[12], regarding open access to scientific publications, the bibliographic Metadata must be in a standard format and include all of the following:

- the terms "European Union (EU)" and "Horizon 2020",
- the name of the action, acronym, and grant number,
- the publication date and length of embargo period, if applicable,
- a persistent identifier.

In addition, each dataset published in Zenodo or other publication means will have by default the following associated Metadata:

- project name,
- Digital Object Identifier,
- version number,
- bibliographic information,
- keywords,
- grant information,
- access and licensing information,
- writing language,

[12] H2020 TwinERGY Project Grant Agreement No. 957736

- abstract/description,
- associated publications and reports,
- associated projects and communities.

3.2.3 Data versioning

This part of the DMP aims to address issues regarding:

- how the data could be discovered (including Metadata provisions),
- how the data could be identified and referred to standard identification mechanisms,
- the naming conventions to be used,
- the method towards keyword search,
- the method for versioning control,
- the standards for Metadata generation.

When datasets are to be updated, the partner that possesses the data has the responsibility of versioning control. In case of publicly available data, the partner has to ensure that only the latest version is published. The mechanism for capturing and storing information should further be described. Metadata information can be used to identify the description and location of datasets stored in a database and link to each data item. Among the various Metadata standards, the following best practices and guidelines for dealing with Open Data are considered:

- **Open Data Foundation**[13] : focuses on global Metadata standards and the development of open-source solutions promoting the use of statistical data.
- **Open Knowledge Foundation**[14] : aims to improve access to key information and the ability to use this information.

3.3 Data Accessibility

The H2020 Open Access Mandate[15] aims to make research data generated by H2020 projects accessible to the public while minimizing restrictions and accepting protection of personal or sensitive data due to privacy concerns and/or commercial or security reasons. In general, the TwinERGY consortium focuses on ensuring open access of

[13] http://www.opendatafoundation.org/
[14] https://okfn.org/about/
[15] https://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/open-access-data-management/open-access_en.htm

research data. However, because of the sensitive nature of some data parts, in certain cases these parts may remain confidential and not be accessible to third parties. The data status in this regard is going to be indicated by each individual partner responsible for collecting and/or producing the data, with the support of the Data Management Committee and the supervision of the Executive Board.

TwinERGY consortium will generally ensure open access to any peer-reviewed scientific publications coming out of its results, as described in deliverable D11.2 'Communication and Dissemination plan'. The decision, though, on whether to publish through open access has to consider the potential requirements for protection of sensitive data. There are cases where raw data cannot be shared either within the consortium (e.g., data coming from the pilot case in United Kingdom, which will be considered as a third country from July 2021) or publicly, due to internal regulation constrains or until proper agreements are prepared and established. All such cases will be considered and analysed by the TwinERGY consortium for making rational publication decisions. Various Protection of Personal Data (PoPD) techniques, such as anonymization and sampling, will be applied in an effort to maximize open access to the TwinERGY data as mention in deliverable D13.2 'POPD – Requirement No. 2'. By the current time, all consortium members have expressed the intention to opt-in the open data pilot implementation. In case of change, appropriate modifications will be made to the Consortium Agreement and the DMP will be updated accordingly.

3.3.1 Means of publication

Based on the data types available for publication, diverse suitable channels will be utilized for providing access to the TwinERGY Open Data. The potential means of publication of the various data types are presented in Table 2. Among all publication means, the project website and its social media accounts (Twitter, LinkedIn, and YouTube) as well as the Zenodo and ResearchGate platforms have been utilized up to this point. Other channels will be activated when appropriate material for publication through them is available.

Table 2. Means of publication

Data type	Means of publication
Datasets	Project Website, Zenodo, OpenAIRE

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Deliverables	Project Website, Zenodo, ResearchGate, OpenAIRE
Dissemination material	Project Website, Social Media, OpenAIRE, Zenodo
Software	Zenodo, GitHub
Scientific publications	Project Website, ResearchGate, Zenodo, open access journals, research oriented social media

All datasets, scientific publications, and deliverables will be uploaded to ResearchGate and/or Zenodo and be openly and freely available unless stated otherwise (i.e CDMP datasets). Furthermore, confidential deliverables will not be publicly accessible. Research data used to validate the scientific publication results will be deposited in a data repository at the time of publication and be accessible to interested people. Publications and datasets will be linked through the use of identifiers (DOI versioning). Datasets with dissemination level tag "confidential" (non-anonymous datasets and/or business sensitive information) will not be shared due to privacy concerns and trade secrets. Instead, they will be archived in a secure repository with controlled access to authorized consortium members only.

3.3.2 Open Access methods and tools for information dissemination

This section of the DMP addresses the issues regarding the Open Access methods and tools for publication or research data dissemination. Open Access refers to the practice of providing online access to scientific information, such as peer-reviewed scientific research articles published in scholarly journals or research data underlying publications (e.g., statistics, experimental results, measurements, raw or curated data), that is free of charge to the end-user and reusable.

There are two questions to be answered when dealing with open access information dissemination:

- Define Open Access (OA) type of data and, if the data are to be kept confidential or of limited access, explain the reasons for it;
- Decide on the type of open access to be granted to a publication.

Open Access to scientific publications can be achieved via two routes:

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1. **Self-archiving / "Green" open access**: the published article or the final peer-reviewed manuscript is archived in an online, freely accessible repository before, at the time, or after publication for a period of up to 12 months. In certain cases, open access is granted only after an embargo period has elapsed (usually 6 months).

2. **Open access publishing / "Gold" open access**: the published article is immediately accessed in open access mode. The publication costs in this case are not borne by subscribing readers; instead, the funding entity of the research (university, institute, etc.) undertakes the cost. In other cases, the open access publishing costs are covered by subsidies or other funding models.

Within the context of TwinERGY project, "Green" open access to the data will be primarily adopted. The journal has to grant the researchers the permission to self-archive the final peer-reviewed manuscript for a period of 12 months after publication. As more information becomes available for the data to be collected, the "Gold" Open Access model for specific publications could also be adopted, in case that the authors wish to cover the publication costs. Figure 3 presents the strategy to be followed towards defining Open Access for publication and research data dissemination. Following the methodology of the Open Access strategy towards defining which data are to be made openly accessible, a structural approach with simple though important questions and answers are introduced in Table 3 to assist in classifying the various datasets.

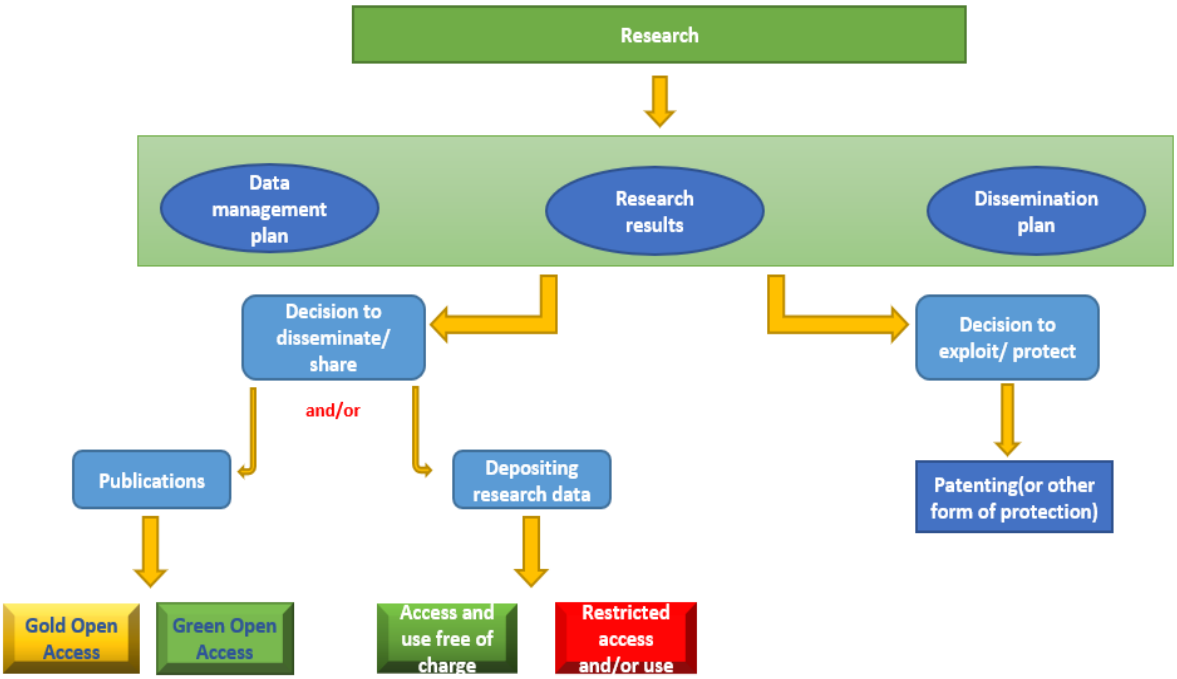

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Figure 3. Open Access strategy for publication and research data dissemination

Table 3. Dataset classification questions and answers

Question	Answer
1. Does a result provide significant value to others or is it necessary to support a scientific conclusion?	If **Yes**, the result is classified as public (i.e., granted for open access).
	If **No**, the result is classified as non-public (e.g., a code part that is very specific to a platform), it is usually of no scientific interest to others, and it does not add any significant contribution.
2. Does a result include personal information besides the author name?	If **Yes**, the result is classified as non-public. Any personal information other than the name must be removed in order to be publishable, according to the ethics management plan of the project.
3. Does a result allow the identification of individuals even without a name indication?	If **Yes**, the result is classified as non-public. This case is also covered by the TwinERGY ethics management plan towards anonymizing user identities (e.g., employing abstraction, dummy users, or non-intersecting features).
4. Can a result be abused for a purpose that is undesired by the society in general or contradict with societal norms and the project ethics?	If **Yes**, the result is classified as non-public. This case is managed by the project ethics management plan.
5. Does a result include business or trade secrets of one or more project partners?	If **Yes**, the result is classified as non-public. Any business or trade secrets need to be removed in accordance to partner requirements prior to being published.
6. Does a result name a technology of an ongoing, project-related patent application?	If **Yes**, the result is classified as non-public. The result can be published once a patent has been filed.

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7. Does a result break security interests for any project partner?	If **Yes**, the result is classified as non-public.

Upon classification of the different datasets that are generated or collected by each individual partner, the following courses of action should also be performed towards disseminating the project outcomes:

- Define how data will be made available.
- Define the methods or software required to access such data; determine whether documentation is necessary about the software and, if possible, include the relevant open-source code.
- Define the data depository and the associated Metadata, documentation, and code.
- Make data that are considered safe in terms of privacy and useful for release available for download under the Open Data Commons Open Database License (ODbL).
- Define how access will be provided in case that there are dissemination restrictions.
- Define if and to which registry Open Data will be added.

As a minimum, datasets will be made available in the TwinERGY partner own servers. At the end of the project, they may be uploaded to a public repository and submitted to the registry of open data repositories at https://www.re3data.org/.

3.4 Data Interoperability

This aspect of the DMP focuses on the assessment of data interoperability and defines the data and Metadata vocabularies, standards or methodologies that need to be followed to enable interoperability. In addition, it defines whether standard vocabulary will be used for each data type to allow inter-disciplinary interoperability. Within the context of TwinERGY, the following guidelines are to be followed for the various types of data towards ensuring interoperability:

- If the data are part of a domain with well-known open formats that are in common use, these formats should be selected.
- If the data do not fall in the previous category, an open and easily machine-readable format should be selected.

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3.5 Data Re-use

The TwinERGY consortium aims to provide third parties with the opportunity to access, exploit, reproduce, and disseminate all public datasets. This process will be regulated by using Creative Commons Licences (CC). Creative Commons licenses will provide us with a standardized way to grant the public permission to use TwinERGY creative work under copyright law. As the process of decision making related to Data Use licences is currently in progress, as part of the work allocated under WP 12 'Ethics, Legislation and standardization' and D12.5 'Data Use License template' with a due date in M12, additional information will be available in the updated DMP version.

3.6 Participation in the EC Pilot on Open Research Data

TwinERGY partners have decided to participate in the Pilot on Open Research Data, launched by the European Commission along with the Horizon2020 programme. This action demonstrates in practice the consortium support in the concept of open science and its potential benefits. In this direction, public deliverables, data produced, and open source software developed by the project will be generally published in open form, following though specific decisions for each data type, modules or system components and taking into account the fundamental principles under which project research is conducted. These principles are presented here and are directly linked with the work allocated under WP13 'Ethics Requirements' and task T12.1 'Identification of Legal & Ethics Requirements' of WP12 'Ethics, Legislation and Standardization'.

The chapter provides a brief overview on the ethical and security related aspects, in accordance with the previously mentioned applicable Guidelines on Fair Data Management in Horizon 2020[16]. Based on these Guidelines and given that the ethics related aspects have been already extensively addressed under dedicated project deliverables, section 3.4.1 merely summarizes the key points.

3.6.1 Ethics related aspects

As identified in the context of WP13 the Ethics related aspects in TwinERGY primarily concern two issues: (a) the involvement of individuals in the piloting activities and (b) the processing of personal data related to the individuals participating in these activities. These interrelated issues were respectively addressed in detail under

[16]H2020 Programme Guidelines on FAIR Data Management in Horizon 2020 available at: https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-data-mgt_en.pdf#page=10

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deliverables D13.1 'H - Requirement No.1' and D13.2 'POPD - Requirement No. 2' that have been finalized and submitted in January 2021. Furthermore, D12.1 "Legal & Ethical Compliance Guide'[17] submitted in July 2021 expanded the work performed under WP13 on Ethics Requirements, going beyond the area of personal data protection and addressing to an extent issues, such as equity, diversity and inclusion that also relate to the recruitment, involvement and active participation of individuals in the piloting activities.

The TwinERGY project involves human participation, mainly in the activities related to the pilot demonstrations, which are to be conducted in real buildings of different uses. During these activities, it might be necessary to collect basic personal data (e.g., name, background, contact details). The collection and processing of personal data will be performed in accordance with the applicable principles of the European Data Protection Law, including the data minimization principle. National regulations applicable to the piloting activities (demonstrated in UK, Germany, Greece and Italy) will be also considered to the necessary extent, as further explained in Chapter 4 of deliverable D13.1 'H - Requirement No. 1' and Chapter 5 of deliverable D13.2 'POPD - Requirement No. 2'. In this context, all data directly related to human participants will be strictly collected on the basis of a previously obtained consent. The participants will be fully informed in accordance with the requirements of the applicable legal framework, as described in Chapters 3 and 4 of deliverable D13.1 'H - Requirement No. 1'. The ethical aspects underlying the engagement strategy of the project have been further elaborated under task T2.1 'Citizen Engagement and Co-design: framework and guidance' and, in particular, under D2.1 'Best practice guidelines for engaging citizens in the pilots and metrics for diversity and inclusion', submitted in June 2021.

Based on the GDPR, project partners leading piloting activities are considered legally responsible (data controllers) for any processing of personal data involved in the respective activities. Each of these partners appoints a Data Protection Officer (DPO) within its organization. In addition to the DPO appointment per partner leading piloting activities, the TwinERGY project has made a provision for an Ethics Manager (EM) and a Data Protection Coordinator (DPC) at a project level. Such an appointment further supports the effective protection of personal data, while raising awareness on personal data related matters and procedures within the consortium.

[17] Note that as far as the legal requirements are concerned, the deliverable discusses the most relevant for TwinERGY regulations identified systemized into four categories: the human-centric, the system-centric, the data-centric and the market-centric regulations. In the context of this approach, the GDPR relevant from an ethics viewpoint as well, was considered, for instance, as an example of a human-centric regulation.

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Raw data coming out of the pilot cases and possibly including personal data are not considered for sharing at this point. If personal data is considered for sharing at a later project stage, this will be performed following the instructions of the pilot case DPO (and the EM and DPC, if necessary). In any case, all necessary organizational and technical measures will be implemented for digitizing any manually collected data and storing both, manually and automatically collected data, in the TwinERGY central Database. Based on the project Methodology, the operating partner of the Core Data Management Platform is technically responsible for the collection, security, storage, and handling of the related data.

3.6.2 Security related aspects

The TwinERGY Data Management Platform provides for technological and organizational measures to safeguard processing of personal data against access of unauthorized persons, loss, damage, or destruction. In particular, the following procedures and actions are foreseen:

- **Information security:** SSL (Secure Socket Layer) certificates are applied. To ensure the appropriate level of security, the account password will appear in the platform only in an encrypted form.
- **Options for reading data:** the platform offers the possibility to make data available in a read-only or in downloadable format, thus, mitigating the risk of access to information by unauthorized users.
- **Back-up policy:** complete and redundant back-ups are created frequently. Moreover, every time a modification is done, the older version is archived.
- **Accidental deletion or modifications:** in case of a catastrophic event that implies the partial or complete deletion of the data sets, the data from the most recent back up will be automatically restored (back-up will not be older than 60 minutes). In case of accidental deletion or modification, only the most recent document will be restored, and the information will be recovered.
- **Deletion or modification of data by users:** only administrators have the rights to delete or modify the information included in the datasets.
- **Terms and conditions of use acceptance:** the TwinERGY Data Management Platform terms and conditions of use have to be accepted by every platform user.

The above stated measures and procedures provided by the TwinERGY Data Management Platform stem from the currently applicable regulations at EU level that set the related baseline requirements. For instance, although, the GDPR does not

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dictate the implementation of the aforementioned SSL as such, it does dictate the implementation of appropriate technical and organizational measures and, in certain cases, the periodic review of those measures through the performance of a data protection impact assessment (DPIA). Taking into account the role of cybersecurity for effective personal data protection, in addition to the data protection related aspects, D12.1 'Legal & Ethical Compliance Guide' mentioned above does elaborate as well on cybersecurity related aspects and how these are addressed under the currently applicable and proposed EU regulations.

3.7 TwinERGY Common Information Model (CIM)

TwinERGY project will produce data of different types (mentioned in section 2.1 of this deliverable), generated from various sources (e.g., pilot demonstration activities), while several algorithms are being developed and will run as part of the several modules operations, indicating that depending on the data type, there will be different origins and data production methods. Based on the work plan of the project, in the context of the work for the preparation of the deliverable D5.1 "TwinERGY Common Information Model"[18], a proper data landscaping of pilot's available data as well as module's data needs has been carried out with priority, to shape the Common Information Model of the project, which data management procedures will be governed by.

More specifically, there project responsible working group, which was led by the partner SUITE5 laid out a methodology, that consisted of 5 stages, which included the analysis of review of several data standards in order to select the most appropriate characteristics that the TwinERGY CIM will acquire, that will support the data related functionalities of the project services under development. Based on the analysis, the data need and actors involved for the different use cases were mapped (table 1 of D5.1) along with the data needs of the modules.

The methodology resulted at the Initial version of the TwinERGY CIM, that, due to the fact that additional data needs of types might be considered at later stages of the project, it is foreseen to be a continuously evolving model, with the ability for any stakeholder who will be granted access to be able to suggest potential additions to the existing concepts. In addition, it is highlighted that the CIM is built in accordance with the previously mentioned FAIR principles dictating, among other, how to render, for

[18] Selection of D5.1 TwinERGY Common Information Model at https://www.twinergy.eu/deliverables

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instance, project data findable and accessible, while aiming to safeguard the operation of the TwinERGY Core Data Management Platform (CDMP).

3.8 TwinERGY Core Data Management Platform (CDMP)

The TwinERGY Core Data Management platform (CDMP), as described in the D5.5 'Data Collection, Security, Storage & Management Services Bundles – Release 1.00' is an interoperable modular big data management enabling tool that has been developed as part of the project workplan to work as the data collection, management, and communication enabler throughout the project lifecycle. The CDMP will work based on the TwinERGY CIM standards that have been introduced as a result of the extensive research on data handling and management for the energy sector, which will ensure semantic integration communication and operation on top of the systems and devices to be utilized.

The TwinERGY CDMP provides for significant data related services such as data collection, data security, data storage and platform management service. For the purposes related to the project data management plan, all services will be utilized mainly based on their following functionalities:

- The Data Collection service provides for the data ingestion process in the TwinERGY Core Data Management Platform.
- The Data Security Service provides for addressing the platform users' data security and privacy concerns regarding the data that are ingested in the TwinERGY CDMP.
- The Data Storage Service provides for addressing the demand of the platform users for reliable data storage and indexing.
- The Platform Management Service provides for establishing the methods and processes for users to register securely and reliably on the platform.

The utilization of the aforementioned services will ensure that the data, that consist part of the project work, will be handled based on the FAIR and all related principles that were presented in section 2 of this report. The TwinERGY CDMP stands as the enabler of the project team both to reassure the smooth operation of the data related processes of the project and to keep up with the decision to opt in for the European Commission Open Research Data Pilot (ORDP).

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4. TwinERGY Open Data Catalogues

4.1 Introduction

As previously stated, it rests upon the Executive Board to decide on whether or not datasets and/or other material produced during the project lifecycle will be publicly open, following the conditions of the DoA and relevant suggestions of the Data Monitoring Committee. Besides the publication status of the project deliverables, which have already been determined on the basis of the DoA, all other work derivatives will be subject to scrutiny before they are publicly released. The process will be facilitated via the TwinERGY dissemination infrastructure and all available and appropriate channels.

The types and categories of data considered for public dissemination are initially listed in this section of the document. Proper updates will be formulated and presented within the next document versions.

4.2 TwinERGY public deliverable catalogue

By the time of the present DMP submission (M28), there have been produced and reported 49 deliverables by the project partners, in accordance with the DoA. Among them, 47 deliverables have been designated as public ones and are to be disseminated to the public. For the time being, 41 deliverables have been already approved by the EC after the 1st official report (M18) and thus are available for public dissemination with the exception of deliverables D13.-" H-Requirement No. 1" and D13.2-" POPD – Requirement No. 2" which are considered confidential. However, it has been advised by the Project Officer to proceed with publishing the submitted to the EC deliverable versions, even if they are not approved yet, through the project publication infrastructure, which will be later replaced by the approved versions. Therefore, the dissemination status is marked with the indication "published" in the following catalogue that presents the public deliverables developed so far (Table 4).

Based on the DoA, almost all TwinERGY deliverables have been classified as public and will be presented in the project website, in which the dissemination leading partner (UoP) and the website curating partner (IFC) have already developed a dedicated "deliverables section". All deliverables are also considered for dissemination in TwinERGY Zenodo profile (already activated), while other channels may be utilized in order to enhance result dissemination and attract the scientific community attention.

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Table 4. List of public deliverables until 28th of February 2023

No	Deliverable Title	Due Date (month)	Deliverable Type	Dissemination Channels	Dissemination Status
1	D1.1 Project Management Handbook	6	Report	W	Published
2	D1.2 Data Management Plan (v3.0)	16	ORDP	W	Published
3	D1.3 Quality Assurance Plan	6	Report	W	Published
4	D1.5 Project Management Plan	2	Report	W	Published
5	D1.6 Project Mangement Plan - revision 1	18	Report	W	Published
6	D2.1 Best practice guidelines for engaging citizens in the pilots and metrics for diversity and inclusion	8	Report	W	Published
7	D2.2 Stakeholders' analysis: KPIs, Scenarios and Use Case definition	8	Report	W	Published
8	D2.3 Business Models & Incentive Schema Definition	8	Report	W	Published
9	D2.4 Technical obstacles to innovation analysis	8	Report	W	Published
10	D2.5 Social, ethical, and cultural barriers to innovation	8	Report	W	Published
11	D3.1 TwinERGY – European Projects Innovation and Cooperation roadmap	8	Report	W	Published
12	D4.1 Consumers Behavioural Analysis	10	Report	W	Published
13	D4.2 Consumer Engagement plan	11	Report	W	Published
14	D4.3 Methodological Framework	10	Report	W	Published

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15	D4.4 System's architecture	12	Report	W	Published
16	D5.1 TwinERGY Common Information Model	10	Report	W	Published
17	D5.2 Data Collection, Security, Storage & Management Services Bundles – Beta Release	14	Other	W	Published
18	D5.3 TwinERGY Integrated Data Management Platform – Alpha, Mock-ups Release	14	Other	W	Published
19	D5.4 TwinERGY Integrated Platform– Beta Release	16	Other	W	Published
20	D5.5 Data Collection, Security, Storage & Management Services Bundles – Release 1.00	20	Other	W	Published
21	D5.6 TwinERGY Integrated Data Management Platform– Release 1.00	24	Demonstrator	W	Published
22	D5.7 TwinERGY Integrated Data Management Platform– Release 2.00	28	Demonstrator	W	Published
23	D6.1 System dynamics models	15	Other	W	Published
24	D6.2 Demand flexibility Models	16	Other	W	Published
25	D6.3 Customer digital twin	18	Other	W	Published
26	D6.4 Digital Twin Interconnected Platform (Intermediate Report)	12	Report	W	Published
27	D7.1 Modules' Interoperability	8	Report	W	Published
28	D7.2 Consumer well-being module	18	Demonstrator	W	Published
29	D7.3 Home & Tertiary realtime	18	Other	W	Published

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	Energy Monitoring Module				
30	D7.4 Consumer and Neighborhood demand flexibility profiling Module	18	Other	W	Published
31	D7.5 RES integration and DER management Module	18	Other	W	Published
32	D7.6 Electric Mobility as a Service Module	18	Other	W	Published
33	D7.7 Transactive Energy Module	18	Other	W	Published
34	D7.8 Customer Deployment and Social Engagement Module	18	Other	W	Published
35	D7.9 Risk Management and event handling Module	18	Other	W	Published
36	D8.1 TwinERGY connectors to distributed smart grid assets and respective APIs	18	Demonstrator	W	Published
37	D8.2 TwinERGY Pre-trial validation testing scenarios and results	24	Report	W	Published
38	D8.3 TwinERGY integrated solution	26	Demonstrator	W	Published
39	D9.1 Pilot Quality assurance Guide	10	Report	W	Published
40	D9.2 General Pilot Management Plan	10	Report	W	Published
41	D10.1 Business analysis / Exploitation plans	27	Report	W	Published
42	D11.2 Communication and Dissemination Plan	3	Report	W	Published
43	D11.3 1st European Workshop with stakeholders	25	Report	W	Published
44	D12.1 Legal & Ethical Compliance Guide	9	Report	W	Published

45	D12.2 1st Legal & Ethical Compliance report	24	Report	W	Published
46	D12.5 Data Use License template	15	Report	W	Published
*	D1.2 Data Management Plan (v4.0)	16	ORDP	W	To be published

W: website, Z: Zenodo, SM: Social Media, ORDP: Open Research Data Pilot

* The updated versions of D1.2 'Data Management Plan' deliverable fall within a single deliverable presented in the DOA. Any updated version, though, is (re)submitted as a normal deliverable.

4.3 TwinERGY data catalogues

The TwinERGY partners do not foresee (up until the deliverable submission) that raw pilot data will be publicly disseminated during the project lifecycle, mainly because of the data sensitivity and the anticipated lack of interest by the scientific community in this part of the data. In case that such need arises, these data will be made available only after signing a data agreement that will be developed for this purpose, under the supervision of the DMC and the approval of the Executive Board. Therefore, in cases of such suggestions, completed data information templates, like the one presented in the following section, will be gathered and used by the DMC for data dissemination suggestions.

By now, there is no provision for raw datasets to be open to third parties based on the results of the work related to the development of TwinERGY Common Information Model (D5.1). However, the data publicity status may change in the future, as the data evolve through pilot activities and analyses of the project work. Any change in relation to the data publicity status will be documented in the final version of the Data Management Plan.

4.3.1 Data template

The information list related to the available data and accessibility level includes various pieces of information (ranging from their ID and a brief description up to the data asset rights) that will assist in deciding for the accessibility status. This list constitutes the first input to be reviewed by the DMC in order to make a suggestion regarding the

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dissemination status of each dataset. Table 5 presents a template with the basic information associated with the dataset characterization.

Table 5. Raw dataset information template

Basic Information	**Dataset ID**	*[Unique identifier following the convention "Country_Partner#no"]*	XX_XXX_1
	Demo Case-relation or Demo Case ID	*[Unique identifier following the convention "DA_Country_Partner_DC#no"]*	DA_XX_XXX_DC1
	Data Asset Title	*The title of the data asset*	Energy imported from the Grid (kWh)
	Description	*A brief description of the data asset - At least 2-3 lines to give an overview of the data*	smart metering on residential/commercial prosumers' (customers) installations
Data Asset Features	**Volume**	*[X GBs / records / transactions per hour / day / month]*	1 record per hour
	Variety	*[Structured / Unstructured / Semi-structured]*	Structured
	Type	*[Text / Image / Video / Audio / Other]*	text
	Format	*[csv, xml, json, other]*	csv
	Velocity	*[Real-time, Near Real-time, Batch]*	Batch
	Historical Data Availability	*[Y/N]*	N
	Temporal Coverage	*[From ... To...]*	[1-1-2020 - today]
	Spatial Coverage	*[Locations]*	XXX
	Language	*[e.g. English, Italian, German, Greek, ...]*	English
	Relevant Standards	*[List the international standards to which a data asset complies]*	n/a
	Veracity	*[Raw, Pre-processed, Processed Data asset]*	Raw
	Temporal Resolution	*[The temporal "granularity" of the data, e.g., per minute / hour / day / month]*	per hour
	Spatial Resolution	*[The spatial "granularity" of the data, e.g., at district / zone / building / area level]*	building
	Dependency / Linking to Other Sources	*[Y/N, If Y, list the other sources or codelists]*	N
Data Asset Availability	**Data Asset Owner**	*The name of the data asset owner*	XXX
	Data Asset Available from 3rd Party	*[Y/N]*	N
	Data Asset Provider	*The name of the data asset provider in TwinERGY*	XXX
	Accessibility Method	*[Through API, As downloadable file, As database extract, Other]*	As downloadable file
	Frequency of Updates	*[Real-time, Every X minutes / hours, Daily, Weekly, Monthly, Yearly, other]*	Monthly
	Update Strategy	*[Append new data / Replace existing data / other]*	New file for each period
	Documentation	*The documentation of the API or data*	N/A

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		sample (incl. the location and the name of the file in the TwinERGY repository]	
Data Asset Rights	**Privacy**	*[Confidential (not to be shared at all) / Proprietary (to be shared with appropriate licensing with the demonstrator partners) / Private (to be shared with appropriate licensing within the demonstrator & potentially to be traded with other stakeholders in TwinERGY) / Public (available to all)]*	Private
	License	*[Exact Licence that is currently applied, e.g., CC Attribution / NonCommercial-ShareAlike (CC BY-NC-SA) / Case-by-Case Bilateral Agreement]*	Case by case Bilateral Agreements
	Sharing Mode	*[Encrypted Data Sharing / Unencrypted Data Sharing / Secure Multi-party Computations (with data always on-premise at providers' side) / Encrypted Intelligence Sharing / Unencrypted Intelligence Sharing]*	Encrypted Data Sharing (encrypted data to be uploaded in the TwinERGY core platform)
	Data Asset Consumer(s)	*The list of consumers (in the demonstrator) that are interested in the specific data asset*	all
	Other Stakeholders Potentially Interested in Data Asset Use/Purchase	*[List categories of stakeholders beyond TwinERGY that are potentially interested in the specific data asset]*	DSOs, Aggregators, Retailers, ESCOs, Research Institutes
	Pricing	*[Per Transaction / Subscription / PAYG / N.A.]*	payg
	Need for Anonymization	*[Y/N depending on whether the data asset contains sensitive or personal data]*	Y
Data Analysis	**Types of analysis currently conducted on data**	*[e.g. Correlation analysis for..., Predictive analytics for...]*	N/A
Data Asset Assessment	**Accuracy**	*[Measure of correctness and precision, e.g., whether the dataset is error-free, Ranked 1 (Low) - 5 (High)]*	5
	Completeness	*[Degree to which a data asset is sufficient in scope, depth, Ranked 1 (Low) - 5 (High)]*	4
	Timeliness	*[How long a data asset remains up-to-date]*	always
	Relevance to specific demonstrator	*[How relevant a data asset is for the specific demonstrator, Ranked 1 (Low) - 5 (High)]*	5
	Relevance to other TwinERGY demonstrators / demo cases	*[How relevant a data asset is for other demonstrators, Ranked 1 (Low) - 5 (High), following the convention "D#no_DC#no_Rank X", e.g. D1_DC1_Rank 5 for a very relevant data asset for demo case 1 under demonstrator 1]*	D1_DC1_Rank 5
	Importance	*[How critical a data asset is for the demonstrator, Ranked 1 (Low) - 5 (High)]*	4
	Rationale	*[Explain the reasons for importance ranking]*	

Comments	

4.3.2 TwinERGY Publications catalogue

The TwinERGY consortium has set as one of its goals to develop content that will raise awareness and inform the public about the energy issues. By continuously presenting and providing information about the project activities, as well as information about the partners involved, it aims to attract the public attention to follow its course. In fact, various publication ways have been identified (such as newsletters of the project activities, informative videos and articles) which will be promoted through appropriate communication channels (YouTube channel, project website of social media accounts etc.), based on the project communication strategy. In the list below (Table 6), all currently available publication material is listed in order to provide an overview of the effort to reach a greater audience of people, participants for pilot activities, and potential users of the solutions proposed.

Table 6. List of TwinERGY publications until 28th of February 2023

Type of Publication	Title	Description	Means of Publication	Release date	Format	Link
Videos	Steinheim pilot videos	19 videos about the Steinheim pilot activities	TwinERGY YouTube channel	02-08-21	Video	link here
	H2020 TwinERGY project video	Video about the objectives and activities of the TwinERGY project	TwinERGY Youtube channel	7-09-22	Video	Link Here
	Greek Pilot video - PAN EU Workshop	Video about the demo-site in Athens	TwinERGY Youtube channel	29-09-22	Video	Link here
	Bristol Pilot video - PAN EU Workshop	Video about the demo-site in Bristol	TwinERGY Youtube channel	29-09-22	Video	Link here

	German Pilot video - PAN EU Workshop	Video about the demo-site in Steinheim	TwinERGY Youtube channel	29-09-22	Video	link here
	Driving Autotutorial e-mobility TwinERGY pilot Steinheim	Tutorial on how to drive the e-vehicles deployed as part of TwinERGY pilot in Germany	TwinERGY Youtube channel	10-11-22	Video	Link here
	Entertainment Autotutorial e-mobility TwinERGY pilot Steinheim	Tutorial on how to use entertainment assets in the e-vehicles deployed as part of TwinERGY pilot in Germany	TwinERGY Youtube channel	10-11-22	Video	link here
	Climate Autotutorial e-mobility TwinERGY pilot Steinheim	Tutorial on how to use air conditioning in the e-vehicles deployed as part of TwinERGY pilot in Germany	TwinERGY Youtube channel	10-11-22	Video	link here
	Energy Future Video Series 2 - Citizen Capacities and Engagement Approach	Video about the citizen engagement strategy implemented in TwinERGY and the workshop with citizens from Benetutti during the first PAN EU Workshop	TwinERGY Youtube channel	20-12-22	Video	link here
Newsletter	Let's revolutionise the energy ecosystem!	Presentation of the initiative and insights on the TwinERGY project, the latest steps of the pilots and the	Mailchimp, SM channels (TwinERGY Twitter and Linkedin)	28-05-21	newsletter	Link here

		presentation at the #BRIDGE_GA2021				
	Energetic news for summer time	Last news and updates of TwinERGY:	Mailchimp, SM channels (TwinERGY Twitter and Linkedin)	28-07-21	newsletter	Link here
	Energy community: let's meet at Enlit Europe! 🌐	Announcing the participation at the Enlit Europe event in Milan, and share the article about the 3 TwinERGY digital twin models	Mailchimp, SM channels (TwinERGY Twitter and Linkedin)	14-10-21	newsletter	Link here
	Best wishes from TwinERGY!❄	Overview of actions and relevant milestones achieves by TwinERGY in 2021	Mailchimp, SM channels (TwinERGY Twitter and Linkedin)	23-12-21	newsletter	Link here
	Joining forces to kick off the year	Collaboration with sister projects and Proofing Future (interviews publication)	Mailchimp, SM channels (TwinERGY Twitter and Linkedin)	01-03-22	newsletter	link here
	Summer is here, and so is our fresh TwinERGY news	Save The Date PAN EU Workshop in Benetutti, latest articles and activities	Mailchimp, SM channels (TwinERGY Twitter and Linkedin)	29-07-22	newsletter	link here
	Invitation to the PAN EU Workshop	Invitation to the workshop online and overview of the agenda	Mailchimp, SM channels (TwinERGY Twitter and Linkedin)	15-09-22	newsletter	link here
	All you need to know about our meeting in Benetutti	Chronicle of the event	Mailchimp, SM channels (TwinERGY Twitter and	27-10-22	newsletter	link here

			Linkedin)			
	TwinERGY's gift for this holiday season	Energy Future video 2 and latest articles	Mailchimp, SM channels (TwinERGY Twitter and Linkedin)	20-12-22	newsletter	link here
Articles	TwinERGY is on air!	Announcement of the project launch, and explanation of the main action lines.	TwinERGY website	23-06-21	website article	Link here
	Talking about TwinERGY at the Filwood Market	Explanation of the KWMC's participation at the Filwood market where they introduced the Twinergy project amd plants to the attendees	TwinERGY website	19-07-21	website article	Link here
	How to engage citizens in energy efficiency programs? An overview of TwinERGY's engagement framework	Explains how TwinERGY's partners Knowle West Media Center and Ideas for Change have led the co-design of an ad-hoc citizen engagement framework to ensure that consumers are placed at the centre of the innovation process.	TwinERGY website	27-07-21	website article	Link here
	Digital twins, automation and a guide for energy	Presentation of the TwinERGY technological framework, the	TwinERGY website	23-09-21	website article	Link here

	communities so is the TwinERGY framework	three digital twins and the data and automation strategy.				
	At TwinERGY we're going to celebrate our one year kick off anniversary in style!	News about TwinERGY's participation at the Enlit event organised in Milano.	TwinERGY website	30-11-21	website article	Link here
	Wrapping up the first year: what we have done and what's coming in TwinERGY	Overview of actions and relevant milestones achieved by TwinERGY in 2021	TwinERGY website	23-12-21	website article	Link here
	Great conversation with partner energy projects: getting to know each other through our engagement strategies	Sum up of the consumer engagement workshop with sister projects.	TwinERGY website	15-02-22	website article	Link here
	TwinERGY enables citizens at the heart of the energy market - an interview	First publication of Proofing Future talking with Dr. Stylianos Karatzas, Dr. Athanasios Chassiakos and Vasiliki Lazari.	TwinERGY website and Proofing Future platform	02-03-22	website interview	link here
	Energy communities in the EU and UK: challenges and opportunities	Overview of the energy community scenario in a dedicated workshop with sister projects under the Bridge umbrella.	TwinERGY website	21-03-22	website article	link here

	The Bristol Approach for citizen engagement in the energy market - an interview	Second publication of Proofing Future talking Lorraine Hudson, Anna Higueras and Lucía Errandonea.	TwinERGY website and Proofing Future platform	05-04-22	website interview	link here
	Bringing together solutions for a more integrated energy system	Chronicle of the workshop with sister projects on Data and Service Interoperability and Open Architectures	TwinERGY website	12-07-22	website article	link here
	Get ready for TwinERGY's event in Benetutti: the agenda uncovered	Overview of the first PAN EU Workshop and agenda	TwinERGY website	15-09-22	website article	link here
	Benetutti diary: the PAN EU Workshop and meeting a powerful energy community	Chronicle of the event, the Benetutti pilot and citizen engagement workshop	TwinERGY website	27-10-22	website article	link here
	TwinERGY Pilot Series: An overview on the Bristol, Athens, Steinheim and Benetutti demo-sites	Article about the keys of each demo-site	TwinERGY website	22-11-22	website article	link here
Press releases	TwinERGY takes off: citizens from four European regions will test a first of its	Announcement of the project launch, explanation of the main goals and actions and how TwinERGY is going	Media Outlets	27-05-21	Press release	

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	kind digital system for energy consumption efficiency	to impact the energy community.				
	TwinERGY takes off: citizens from four European regions will test a first of its kind digital system for energy consumption efficiency	Announcement of the project launch, explanation of the main goals and actions and how TwinERGY is going to impact the energy community with a specialised piece for the Enlit's event.	Media Outlets // Enlit's database	21-10-21	Press release	
Scientific publications	Smart Tool Development for Customized Charging Services to EV Users	This paper focuses on the design of the TwinEV module, that offers high-value services to electric vehicles (EV) users	TwinERGY website, Zenodo	03-08-22	Scientific article	link here
	Local Energy Market-Consumer Digital Twin Coordination for Optimal Energy Price Discovery under Thermal Comfort Constraints	In this paper, it is shown how Local Energy Markets (LEM) act as a catalyst by providing a digital platform where the prosumers' energy needs and offerings can be efficiently settled locally while minimizing the grid interaction.	TwinERGY website, Zenodo	30-01-23	Scientific article	link here
	Causal Loop Mapping of Emerging Energy Systems	This paper outlines project TwinERGY's suggested	TwinERGY website, Zenodo	June 2022	Scientific article	link here

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	in Project TwinERGY: Towards Consumer Engagement with Group Model Building	approach to collaborative mapping of emerging energy systems with relevant stakeholders, including in particular participant consumers.				
	A multi-level Digital Twin for optimising demand response at the local level without compromising the well-being of consumers	The aim of this research work is to demonstrate the development of this new, interrelated, multi-level Digital Twins that can be used as a decision-making tool, helping to determine optimal scenarios simultaneously at consumer, building and community level, while enhancing and successfully supporting the community's management plan implementation.	TwinERGY website, Zenodo	July 2022	Scientific article	link here
	Determining occupant's Thermal Comfort and Well-Being towards facilitating	The scope of this work is to provide unobtrusive means to accurately depict the thermal comfort and well-	TwinERGY website, Zenodo	June 2022	Scientific article	link here

	energy demand management utilizing a low-cost wearable device	being level of the occupants making them predictable energy wise and allow pertinent personalized feedback notications or actions towards energy demand management while preserving their corresponding preferences.				
	Design and Evaluation of a Micro-Grid Energy Management Scheme Focusing on the Integration of Electric Vehicles	The present study considers key parameters leading to Electric Vehicle adoption, utilizing background data from countries where Electric Vehicles have already been introduced and adopted in everyday living. The study also presents a case study of an energy management scheme in Greece, where the penetration rate is still low.	TwinERGY website, Zenodo	June 2022	Scientific article	link here
	Development of a Multi-Asset Risk	This paper presents a multi asset risk	TwinERGY website, Zenodo	03-02-23	Scientific article	link here

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	Assessment Algorithm in the Context of Home Energy Management	assessment algorithm, which is part of a risk management application developed for residential buildings within the framework of energy communities and digital energy markets. It describes the logic, principles, and operation of the algorithm, as well as the functionalities related to risk analysis and result visualization.				

4.4 Interview procedures

During the initial phase of the project, interviews have been planned and scheduled aiming at better understanding consumer behaviour and getting deeper insights on how to engage consumers in the solutions developed in the project. By the time this deliverable is submitted, the interview process has been finalised with all material needed already arranged. Based on the procedures related to recruiting participants, which are described in WP13 and deliverable D13.1 'Ethics Requirements', a dedicated consent form including all information related to the process allowing for both the voluntary participation in the interview and the respective processing of personal information has been prepared by partner UNL and is included in this deliverable annex. The related results derived from the conducted interviews have been included in the deliverable D4.1 for public dissemination.

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5. Concluding remarks and next actions

The present version of the TwinERGY Data Management Plan has been structured upon the information and data of the available procedures, infrastructure, and datasets resulting from the work conducted up to the current state of the project (M28). The document emphasizes on updating the information related to the general structure and the data related services that are designed to be provided as part of the project plan. Based on the conclusions of D5.2 'Data Collection, Security, Storage & Management Services Bundles – Beta Release' and D5.3 'TwinERGY Integrated Data Management Platform – Alpha, Mock-ups Release', D5.4 'TwinERGY Integrated Platform– Beta Release, D5.5 'Data Collection, Security, Storage & Management', D5.6 'TwinERGY Integrated Data Management Platform– Release 1.00' and D5.7 ' Data Collection, Security, Storage & Management Services Bundles – Release 2.00' there is a structure already created to handle the data that will be gathered as part of the pilot activities of the project and the internal processes of the modules that will run as part of the TwinERGY framework to be introduced. Up to the current state of the project, none of the CDMP datasets are designated as publicly available, though this may be altered during the lifecycle of the project, due to the dynamic nature of the pilot activities. This issue will be re-evaluated in the final version of the deliverable.

The next actions will focus on semantics and further clarification of procedures, identification of areas that need special attention and updating open data catalogues. Activities regarding the Data Management Portal are also subject to possible modifications related to the means and procedures to be followed across different types of datasets. Potential amendments, resulting from the comprehensive studies at pilot sites, which are being conducted in parallel with the development of this deliverable, will help into providing useful information towards finalizing the portal.

A lesson learned from the current state of work is that nearly all project partners involved in pilot demonstrations will be considered as owners or/and producers of data. The multiplicity of data sources along with potential privacy and security concerns emphasize the need for a Common Data Management Platform. This platform will allow specific access to each project partner with the access/editing rights to be accordingly managed.

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The next deliverable update is scheduled for M36 capturing the latest developments until the end of the project. By the time of the fourth update, new and diverse material will be available, such as videos, reports, and scientific publications. The final DMP version (v5.0) will provide the finalized catalogues of the pilot data, as the respective pilot activities will have been completed, and will include information about data handling after the TwinERGY lifecycle.

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Annexes

Annex A – Interview informed consent form (prepared by partner UNL)

TwinERGY Interview Participation / Consent Form

This consent form relates to the participation in interviews and related content by certain participants, being either a consumer or an expert in energy solutions ('Participant').

This consent form governs the participation, privacy and related matters when participating in an interview by TwinERGY and how a Participant can exercise its rights regarding its Personal Data, in accordance with the General Data Protection Regulation ('GDPR') and other related laws and regulations.

TwinERGY Research Project background:

TwinERGY is a research project, which is run by a consortium of project partners and funded under the European Union Horizon 2020 research and innovation program under the grant agreement No. 957736 ('TwinERGY') that will develop, configure and integrate an innovative suite of tools, services and applications for energy consumers in order to:

1. empower citizens to track their energy use and actively participate in the energy market;
2. raise awareness and knowledge about consumption patterns and energy behaviours;
3. increase community participation in the energy market and engagement of consumers via the Digital Twin technology;
4. encourage a green ecosystem, more sustainable and accessible to all ('Research Project').

The Research Project will introduce a first of a kind demand response framework, which allows electricity retailers and local energy communities to introduce themselves in energy markets under the roles of an aggregator or a prosumer, facilitating consumer representation in the energy sector. Please find more details on the website: https://www.twinergy.eu/.

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Interview Participation:

TwinERGY will conduct interviews with stakeholders, both consumers and experts, in order to identify relevant dimensions that can help in explaining the consumer behaviour towards the adoption and continuous use of energy solutions, and validate other solutions already identified in the literature.

You are kindly invited to participate in this Research Project to advance the general knowledge on energy solutions and Participants have the right to decline participation when not interested in this Research Project.

The interviewer will ask the Participant to answer honestly and in the best way, no wrong answer can be given or skip any question, at Participant's choice. Please note that participation in the interviews will be on a voluntary basis and Participants will have the right to withdraw their consent regarding participation to the interview and processing their Personal Data, at any time.

All interviews will take place in March and April 2021. The interviews will be performed by certain authorized researchers of the NOVA Information Management School, which is one of the consortium partners of the Research Project of TwinERGY.

The interview will take approximately 30 minutes of Participant's time. The interview will be held online and might be recorded. If a participant gives his/her consent to record the interview, the record will solely be used to transcript the interview. After transcription of the interview, the recording will be deleted. However, Participant will have the choice to do the interview without recording.

The interviews result will help the researchers to understand the consumers intention to adopt and continue using the energy solutions developed during the Research Project. This will provide relevant information to TwinERGY and its project partners, especially for the consumer engagement in the current energy solutions and the ones developed during this Research Project, and to the extent applicable exclusively for the benefit of TwinERGY.

Data Collection and Protection:

TwinERGY solely collects and processes Personal Participants' Data when a Participant provides his/her consent when a participant is interested to participate in the interview with regard to the Research Project. In such case TwinERGY needs to collect the following Personal Data: name, surname, e-mail address, and organization (if applicable) in order to contact the Participant and to perform such interview. All Personal Data will be kept strictly confidential and to the extent applicable exclusively

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for the benefit of the Research Project of TwinERGY. However, when participating in the interview, TwinERGY does not further collect and process any Personal Data of the Participants without their consent and Personal Data will be requested and provided at the choice of the Participant when participating in the interview, under the conditions as set forth in this consent form.

When a Participant participates in the interview, TwinERGY may retain those communications, responses, output and results in order to process the interview. Information and responses that Participants provide in the interview will solely be used by TwinERGY in an anonymized way for further processing, use, modifications, storage, publications, and analyzations resulting in certain outputs and results with regard to the related TwinERGY Research Project, as described above.

Any Personal Data will be processed in a proper, careful and safe manner by taking technical and organizational security measures according to the GDPR, and in accordance with the applicable laws. All Personal Data collected during the interviews shall remain within the European Union and will be stored in a password protected statistical file on the password-protected computer at the Nova Information Management School, or on the Principal Investigator's password-protected personal laptop during the COVID-19 pandemic. All Personal Data will be retained for as long as the TwinERGY Research Project runs, and deleted after completion of the Research Project. Personal Data will be shared with the TwinERGY consortium partners in order to perform and execute the Research Project under the grant agreement. Further, TwinERGY is obliged to share and disclose Personal Data with the European Commission in order to comply with the grant agreement and audit obligations thereto.

Consent:

Please tick the box if you either would like to participate or not want to participate in an interview regarding the TwinERGY Research Project.

- I hereby give consent to TwinERGY to participate in the interview, to contact me by the provided contact details (name, email address, organization), and that the data and results of the interview will be stored, collected and used for the purpose of the TwinERGY Research Project.
- I do not give consent to TwinERGY to participate in the interview and to contact me.

Please add below your contact information for the TwinERGY interviews:

Your Full Name:

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Your E-mail:
Your organization (if applicable):

Thank you very much! You will help the TwinERGY Research Project to develop sustainable energy solutions.

Questions, Comments or Suggestions:

If you may have any questions, comments or concerns about the Research Project, the protection of your Personal Data or any queries regarding this consent form, you can contact the following researchers:

Tiago Oliveira: toliveira@novaims.unl.pt

Catarina Neves: cneves@novaims.unl.pt

When a Participant as Data Subject under the GDPR wishes to withdraw its consent, request for access to inspection, correction or deletion of its Personal Data or other Personal Data rights request or may have any other comments or concerns that Participant would like to discuss, please call the NOVA IMS Ethics Committee +351 912 885 311. Alternately, you can write to: NOVA Information Management School (NOVA IMS), Campus de Campolide, 1070-312, Lisboa.

This consent form is governed by EU law and supplemented by the laws of Belgium if necessary. Any and all disputes that may arise with respect to this consent form will be referred exclusively to the competent court in Brussels, Belgium. In addition, a Participant has the right to file a complaint at the national Data Protection Authority.