TIMEPAC

**Towards Innovative Methods
for Energy Performance Assessment and Certification of Buildings**

Deliverable 6.3

Data Management Plan

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Executive Summary

This document provides a detailed description of TIMEPAC's Data Management Plan (DMP), which covers the life cycle of the management of the data to be collected, processed and generated in the project. The purpose of the procedures included in this plan is to make these data Findable, Accessible, Interoperable and Re-usable (FAIR data principles). These procedures encompass:

- The type and description of the data sets to be collected, processed and generated.
- Their handling during and after the end of the project.
- The methodology and standards applied to carry out their management.
- The way they are shared, exploited and preserved beyond the end of the project.

This is a living document that will evolve during the development of the TIMEPAC project to redefine and include all those issues related to the use of data that must be detailed for their proper management. It is structured as follows:

- **Section 2** includes a list of the type of data that will be generated and / or managed in the context of the development of the TIMEPAC project. For each dada, a description is provided together with other information such as if they will be generated or collected, their origin, the expected size if known, the relationship with the Transversal Deployment Scenarios (TDSs) and the target audience.
- **Section 3** is dedicated to the application of the Findable, Accessible, Interoperable and Reusable (FAIR) principles to the data management of the project.
- **Section 4** deals with the estimation of the costs to make the data FAIR and how these costs will be met.
- **Section 5** addresses the issues related to data recovery, as well as with the secure storage and transfer of confidential data.
- **Section 6** describes how ethical issues will be covered in the context of the Ethics Review, Article 34 of the Grant Agreement and Deliverable 6.4 "Ethics Plan".
- **Section 7** includes other national / funder / sectorial / departmental procedures for data management.
- **Section 8** contains the conclusions.

1   Introduction

This document contains the Data Management Plan (DMP) of the TIMEPAC project. The purpose of the DMP is to provide a framework to ensure compliance with policies on data management and the generation of data by project partners and collaborators. One of the objectives of the DMP is to guarantee the quality and the re-use of the data generated within the project in an effective and efficient way.

The DMP describes how the data will be collected, organized, stored and exchanged throughout the development of the TIMEPAC project in a comprehensive manner through the use of appropriate standards and procedures.

2   Data summary

TIMEPAC is a Coordinated Support Action co-financed by the European Union which aims to contribute to the improvement of existing energy certification processes, by moving from single and static certifications to more holistic and dynamic approaches. A key objective of the project is to ensure the seamless flow of data in all areas of the energy performance certification process, from its generation to storage, analysis and operation, and throughout the entire life cycle of the building, from design to construction and operation. Innovative procedures to foster a holistic and dynamic approach to EPC in practice will be developed in five Transversal Deployment Scenarios (TDSs) and validated in four Demonstration Scenarios (DS) (Table 1), with the participation of partner organizations from six European countries: Austria, Croatia, Cyprus, Italy, Slovenia and Spain.

Table 1. Transversal Deployment Scenarios and Demonstration Scenarios

Transversal Deployment Scenarios		Demonstration Scenarios	
TDS1	Generating enhanced EPCs with BIM data	DS1	Improving certification with enhanced EPCs
TDS2	Enhancing EPC schemas through operational data integration	DS2	EPC exploitation through advanced analysis (SRIs)
TDS3	Creating Building Renovation Passports from data repositories	DS3	Building renovation scenarios from the analysis of enhanced EPC data
TDS4	Integration of Smart Readiness Indicators and sustainability indicators in EPC	DS4	Improving building operation with enhanced EPC
TDS5	Large scale statistical analysis of EPC databases		

To carry out the TDS and DS different data items will be collected and generated. Tables 2-10 contain the main data sources that will be considered in the project:

Table 2. Characteristics of the BIM models to be used in the project

Data	BIM models of existing buildings used for the generation of EPCs
Description	BIM models for five reference buildings will be generated or reused in each country simulating the building transformation over time, using the information stored in the BIM database. Previously developed BIM models will be used to generate the certificates, using a homologated certification tool from CYPE, to simulate the rehabilitation of five selected buildings.
Reused/generated	Reused and generated
Origin	Some of the BIM models will be provided by certifiers and other will be generated by consortium partners
Expected size	30 BIM models, 5 per each of the 6 involved countries
Data utilization	This data source will be used in TDS1, TDS3, DS1 and DS2
Interested on exploiting the data	Building owners, EPC certifiers, energy agencies, public authorities

Table 3. Characteristics of the surveys to be carried out in the project

Data	Surveys
Description	Different surveys will be carried out as part of the tasks of WP1 "Context analysis to support EPC workflow": User perception of the EPC generation, survey to audit EPC databases, EPC data analysis survey, and EPC/BIM knowledge survey.
Reused/generated	Generated
Origin	Completed by consortium partners and other stakeholders (EPC certifiers, building managers, energy experts…)
Expected size	6-100 answers in each survey
Data utilization	This data source will be used in TDS1, TDS2, TDS3, TDS4, TDS5, DS1, DS2, DS3 and DS4
Interested on exploiting the data	Building owners, EPC certifiers, energy agencies, public authorities

Table 4. Characteristics of the EPCs to be used in the project

Data	EPCs of existing buildings
Description	An EPC will be generated for 30 existing buildings, using Energy Performance Certification tools such as CYPETHERM and Edilclima EC 700. In addition, already existing EPCs for pilot buildings will be used to carry out the TDSs.
Reused/generated	Reused and generated
Origin	Pilot partners' EPC databases
Expected size	30 EPCs, 5 per each of the 6 involved countries
Data utilization	This data source will be used in TDS1, TDS2, TDS3, TDS4, TDS5, DS1, DS2, DS3 and DS4
Interested on exploiting the data	Building owners, EPC certifiers, energy agencies, public authorities

Table 5. Characteristics of the energy bills data to be used in the project

Data	Energy bills
Description	Energy bills data will be used, together with other information (e.g., BIM models), to generate 30 EPCs using Energy Performance Certification tools such as CYPETHERM and Edilclima EC 700.
Reused/generated	Reused
Origin	Energy management systems of the buildings
Expected size	Data from 30 buildings, 5 per each of the 6 involved countries.
Data utilization	This data source will be used in TDS2, TDS3, DS1, DS2, DS3 and DS4
Interested on exploiting the data	EPC certifiers, building occupants, building managers, ESCOs

Table 6. Characteristics of the real energy consumption data to be used in the project

Data	Real energy consumption
Description	To improve the accuracy of the input data, real energy consumption data will be collected -among other, via smart meters- from a representative set of the building stock, taking into account use, period of construction and type of thermal system.
Reused/generated	Reused
Origin	Energy management systems of the buildings
Expected size	Data from 30 buildings, 5 per each of the 6 countries.
Data utilization	This data source will be used in TDS2, TDS3, DS1, DS2, DS3 and DS4
Interested on exploiting the data	EPC certifiers, building occupants, building managers, ESCOs

Table 7. Characteristics of the occupancy schedules to be used in the project

Data	Occupancy schedules
Description	To improve the accuracy of EPC data, occupancy information will be collected via questionnaires from a representative set of the building stock, taking into account use, period of construction and type of thermal system.
Reused/generated	Reused
Origin	Questionnaires
Expected size	Data from 30 buildings, 5 per each of the 6 involved countries.
Data utilization	This data source will be used in TDS2, TDS3, DS1, DS2, DS3 and DS4
Interested on exploiting the data	EPC certifiers, building occupants, building managers, ESCOs

Table 8. Characteristics of the qualitative survey to be carried out in the project

Data	Qualitative surveys to propose a sustainability indicator from Level(s) framework.
Description	Sustainability indicators from Level(s) framework (http://ec.europa.eu/environment/eussd/buildings.htm) will be assessed on the basis of qualitative analysis (e.g. surveys) conducted among the main EPC stakeholders (EPC developers, building owners, building managers and national certification body). A list of the most significant indicators that could potentially add value to existing EPC will be created.
Reused/generated	Generated
Origin	Surveys conducted by key EPC stakeholders (EPC certifiers, buildings owners, building managers, and national certification bodies).
Expected size	50-300 answers
Data utilization	This data source will be used in TDS4, DS1, DS2, DS3, and DS4
Interested on exploiting the data	EPC certifiers, building owners, building managers, national certification bodies, administrations issuing technical building codes

Table 9. Characteristics of the sustainable and SRI indicators to be used in the project

Data	Sustainable and Smart Readiness Indicators
Description	A calculation methodology from an ongoing study (https://smartreadinessindicator.eu) will be used to evaluate the data that is needed to automatically calculate a list of SRI indicators.
Reused/generated	Generated
Origin	Calculated from data sources (energy bills, real energy consumption…)
Expected size	Indicators for 35 buildings
Data utilization	This data source will be used in TDS4, DS1, DS2, DS3 and DS4
Interested on exploiting the data	EPC certifiers, building owners, building occupants, building managers, ESCOs

Table 10. Characteristics of the EPC databases to be used in the project

Data	EPC databases
Description	EPC databases contain the data about energy performance certificates in an structured format. The EPC databases will be used to develop a methodology to rank the building stock.
Reused/generated	Reused
Origin	Pilot partners
Expected size	1 database per pilot partner
Data utilization	This data source will be used in TDS1, TDS5, DS1 and DS3
Interested on exploiting the data	National and regional certification bodies, national and regional authorities and energy agencies, public authorities

3 FAIR data

In Horizon 2020, the European Commission promoted the open access and reuse of digital research data generated by Horizon 2020 projects through the Open Research Data Pilot (ORD Pilot), following the FAIR data principles. This means that all the research data must be Findable, Accessible, Interoperable and Reusable (FAIR) to ensure it is soundly managed (European Research Council, 2017). The following sections describe the adequacy of the TIMEPAC project's data management and processing activities with regard to these four principles.

3.1 Making data findable

In order to reuse data, it is first necessary to retrieve it; therefore, both data and metadata must be easy to find for both humans and computers. To this end, data must be described with rich metadata that assigns a unique and persistent universal identifier which must be registered or indexed in a search resource (Wilkinson et al., 2016).

When applicable, Digital Object Identifiers (DOI) will be generated for the project outcomes (e.g., workshop proceedings, datasets) using a public service like Zenodo.org. In addition, the main public outcomes will be published in the project website in a logical way to make them easily findable.

3.2 Making data openly accessible

The consortium will follow the "Guidelines on Open Access to Scientific Publications and Research Data in Horizon 2020" published by the European Commission and, in particular, the Article 29.3 of Grant Agreement, to assure Open Access (free of charge, online access for any user) to all peer-reviewed scientific publications relating to its results.

Most of the deliverables of TIMEPAC are public and will be published on the project website. Some of the data sources listed in Section 2 will be published as a training material in the TIMEPAC training platform.

3.3 Making data interoperable

A TIMEPAC ontology will be created to model the different EPC schemes of the Member States considering the current status of the schemes and the improved ones. The ontology will be based on existing standards (e.g., ISO and CEN) and will reuse existing ontologies to increase the interoperability of the data sources of the project. The TIMEPAC ontology will have mappings to wide-used ontologies in the energy and related domains such as BOT[1], ifcOWL[2] , SSN[3] and SimModel among others.

3.4 Increase data re-use

The license for the research data generated and collected during the TIMEPAC project will be the Creative Commons Attribution License which permits the unrestricted use, distribution and reproduction in any medium provided that the original work is properly attributed. In the case of confidential data (mainly for post-occupancy evaluation), only data that has been anonymised will be available to prevent any reused or reusable data from being traced back to a specific individual. The research data will be available for everyone once it meets the standards of quality and personal

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[1] https://w3c-lbd-cg.github.io/bot/

[2] https://standards.buildingsmart.org/IFC/DEV/IFC4/ADD2/OWL/index.html

[3] https://www.w3.org/2005/Incubator/ssn/ssnx/ssn

data protection applicable in the country of origin. Once the data are published, it will be also available after the end of the project in its website and in public data repositories such as OpenAire, Zenodo, and Mendeley. Other project data will remain reusable as long as the project website is online.

4 Allocation of resources

The costs of making data FAIR are covered by the project funds. The costs of long-term preservation will not be relevant since the data will be stored in free data repositories such as Zenodo and Mendeley. As costs related to open access to research data are eligible as part of the Horizon 2020 grant, complying with the Grant Agreement conditions, a budget of 6,900 EUR for open access publications has been allocated in the budgets of FUNITEC, JSI and POLITO.

5 Data security

In the course of the development of the TIMEPAC project, the data will be collected and managed differently depending on the needs of each task. However, all the procedures that will be implemented for data collection, storage, access, exchange, protection, retention and destruction will be conducted in accordance with the requirements established by European legislation and the national legislation of each partner country. All data collected will be kept securely in accordance with these same legal requirements and in line with EU Directives.

The data related to the different surveys carry out in the development of WP1 will be kept anonymous.

6 Ethical aspects

The TIMEPAC consortium will adhere to good research ethics, taking all the necessary measures to act with the utmost care with sensitive information, and to prevent any situation in which it could be misused. The project activities which could raise some ethical issues are identified and the protocols which need to be followed to prevent them are described in Deliverable 6.4 "Ethics plan".

All data generation and exchange processes will be documented and approved by the Project Coordinator to guarantee maximum security and through the application of the highest data protection standards.

Personal data collected in the context of this research project will only be stored and used anonymously, protecting the identity of individuals. Every person will be fully informed about the intended use of the information in the context of this research project, giving their approval through formal written consent.

The consortium partners will keep all the data, documents or other sensitive material confidential during the development of the TIMEPAC project. Article 36 "Confidentiality" of the Grant Agreement provides the details on data confidentiality, while Article 27 "Protection of results — visibility of EU funding" provides the details on the obligation to protect the results (European Commission, 2017).

The TIMEPAC consortium assumes the legal implications of the proposed research and is committed to respecting the legal regulations and directives defined in Horizon 2020, as well as those reflected in the Charter of Fundamental Rights of the European Union:

- **Convention for the Protection of Individuals with regard to Automatic Processing of Personal Data.** The purpose of this Convention is to ensure in the territory of each Party for each individual, whatever their nationality or residence, respect for their fundamental

rights and freedoms, and in particular their right to privacy, with regard to the automatic processing of personal data related to him.

- **The General Data Protection Regulation (GDPR).** Regulation (EU) 2016/679 on the protection of natural persons with regard to the processing of personal data and on the free circulation of such data. This regulation aims to strengthen the fundamental rights of people in the digital age and facilitate business by clarifying the rules for companies and public bodies in the digital single market.
- **Article 8 - Protection of personal data**[4]**.** The right to data protection is enshrined in the Charter of Fundamental Rights of the EU and the Treaty on the Functioning of the European Union[5], which give effect to people's right to privacy by providing them with control over how information about them is collected and used.

In sum, ethical, social and data protection considerations, to which special attention will be paid, are important aspects for the correct development of the TIMEPAC project.

7 Other issues

TIMEPAC partners will report the use of any other national / funder / sectorial / departmental procedures for data management that are needed during the project development. This information will be included in the updates of this document.

8 Conclusions

This document contains the first version of the Data Management Plan for the TIMEPAC project. Preliminary guidelines are provided for managing project data results, being updated as project development progresses and at the time of its completion. The document will be subject to content reviews and updates as necessary to meet new data management needs and scenarios over the course of the project. Reviews will be formally conducted every six months and upon project completion to ensure FAIR principles are adhered to when publishing data.

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[4] https://fra.europa.eu/en/eu-charter/article/8-protection-personal-data

[5] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A12012E%2FTXT

9 References

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