D1.4: Data Management Plan

WP1 - Project Management, Coordination and Administration

ENCHANT
Energy Efficiency through behaviour Change Transition Strategies

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AUTHORS NAMES
Alim Nayum, Christian A. Klöckner with input from all consortium partners

Norwegian University of Science and Technology, Norway

ENCHANT Report

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Alim Nayum (NTNU), Christian A. Klöckner (NTNU) with input from all consortium partners

Quality assurance: All project partners

ABSTRACT

The Data Management Plan (DMP) provides an effective framework to ensure comprehensive collection and handling of primary and secondary data during the lifetime of ENCHANT. It describes what kind of data will be collected, processed, and synthesised, and which methodology and standards will be applied during the data collection and handling processes. It elaborates the procedures for sharing and open access to the data, as well as for curation and preservation of the data. Furthermore, it defines the procedure that the exchange of data in ENCHANT will be in full compliance with EU and national legislation, as well as with the participating user partners' internal data protection strategies.

DOCUMENT HISTORY:

VERSION	DATE	VERSION DESCRIPTION
1	15.02.2021	First version for a quality check sent to partners
2	31.03.2021	The final version sent to the European Commission

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1. Introduction and Overview

1.1 General overview of data collection activities in ENCHANT

ENCHANT is a multimethod project where established science-based behavioural intervention techniques are implemented to increase energy efficiency behaviour among millions of European citizens through a contextual and multi-disciplinary approach. Its key methodological strength comes from combining both qualitative and quantitative methodologies with a multi-disciplinary theoretical foundation from the perspectives of behavioural sciences, sociology, social anthropology, human geography, and economics. This excellent theoretical and methodological competence allows not only successful design and implementation of the large-scale interventions, but also answering the question of which (the combination of) intervention tools are most effective implemented by which societal actor in which cultural context. Through a systematic evaluation of data gathered from implementing these interventions, in combination with re-analysing already existing data, ENCHANT will design an empirically informed, web-based decision tool for impactful campaign design targeting energy-efficiency, relevant for a number of public and private actors (e.g., policymakers). The work in the project is delivered in different work packages, which have their own methodological approaches.

1.2 Purpose and scope of this document

This Data Management Plan (DMP) aims to describe the procedure for data collection, consent procedure, storage, protection, retention, and destruction of data in ENCHANT, and confirmation that they comply with national and EU legislation. It also defines access to data within the open data pilot of the EU. The DMP provides an effective framework to ensure comprehensive collection and handling of the primary and secondary data used in the project. It needs to be noted that a DMP is a dynamic document, which will evolve during the lifetime of the project. In that respect, the DMP describes ENCHANT's data management at the point in time it is delivered to the European Commission. The document is written with reference to the Guidelines to FAIR data management in Horizon 2020 (http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-data-mgt_en.pdf) and the GDPR (Regulation (EU) 2016/679). The DMP will comply with the open access strategy of H2020 while also ensuring the protection of the involved households' and individuals' data, information, and privacy rights; thereby contributing with Open Research Data wherever possible. Furthermore, the project will comply with each user partner's internal data protection strategy.

1.3 Future revisions of this document

The DMP is a dynamic document, which will be constantly adjusted and adapted during the project. Though, a formal revision of this DMP will be provided in month 14 and month 28 of ENCHANT, which means in November 2021 and January 2023.

2. Data Collections

ENCHANT is a mixed-methods project and its methodological strength comes from combining qualitative and quantitative techniques with an interdisciplinary approach. This allows us to integrate multi-disciplinary knowledge, which is essential for the successful design and implementation of the large-scale interventions targeting millions of European citizens using a Randomised Control Trial (RCT) approach and for monitoring the effects of the interventions on different levels. By a systematic evaluation of the data gathered from implementing these interventions, supplemented with re-analysing already existing (secondary) data, ENCHANT will test the effects of the intervention tools in real-life settings with the objective to unlock an energy efficiency potential among the general public through behavioural change.

The RCT will aim to single out the marginal or joint effects of the selections of independent parameters on the dependent parameters. The selection of different choices of dependent and independent variables, number of trials, and sample and sample size choice are components of the experiment design. Rather than a full-factorial experiment design (including all possible combinations of factors), the project will construct and test scenarios, where each test scenario corresponds to the specification of which parameter(s) are selected as dependent variable(s) and which parameters are selected as the independent variable(s). The scenario approach is chosen for several reasons. First, not all combinations of the parameter selections are feasible or applicable, e.g., non-governmental organisations cannot select bills as the means of communication, since they do not issue them. Even considering all feasible combinations of parameters, efficient use of resources requires that the most relevant experiments are carried out based on the project goals. Moreover, the parameters are not necessarily independent and may involve dependencies which are not easy to single out a priori. Second, the project results need to be replicable and scalable. Therefore, the RCTs will be designed in a way to select the intervention packages and other parameters that will enhance higher replicability and scalability. This aspect of the experimental design also relates to the design of the empirically informed decision support tool for impactful energy efficiency campaign design. The design of this tool requires the identification of patterns and rules to be used in the underlying algorithm for the decision support tool. The selection of the experiments is also geared towards identifying as many generalizable patterns and rules as possible. The experiments are designed based on their desired impacts. Hence, the experimental design and selection also rely on the intervention packages' assessed impacts.

Results of the intervention packages using RCTs will be captured through several mechanisms regarding the pre-and post-intervention situation, depending on the targeted behavioural change by the intervention package, as well as data availability and accessibility. The selection of the data to be collected and the means of data collection represents another dimension of the experiment design. The resulting behavioural change may be observed in terms of energy consumption, energy savings, and energy conservation behaviour that can be reflected by energy investment behaviours, maintenance behaviours, or adjustment of everyday behaviour. The data to be collected and analysed in WP5, with close collaboration with WP4, is either measured directly: by digital data tracking or by collecting consumption data obtained from

utility companies; or indirectly: from the consumers self-reporting through mobile or web-based apps, from focus groups, from surveys conducted by external companies, or through netnography based on consumer social media use. In the indirect category, also data on (changes in) well-being of the recipients of interventions will be recorded. A fundamental purpose of the project is to observe the behavioural change of a large number of people as much as possible with the effects of the interventions applied. In order to ensure representativeness, the project will employ a diverse large sample. There are multiple challenges in reaching a high number of people, including challenges regarding collecting data, implementing pre-and post-test experiment design on the same groups of people in different countries, and measuring the impact of the interventions. Moreover, for the post-test design, reaching the same target group contacted in pre-testing constitutes a barrier for the data gathering process which also requires implementing careful tracking systems in line with GDPR.

The ENCHANT project prioritises data gathering methods such as directly or indirectly measuring energy consumption data and digital data tracking but supplements these techniques with additional methods to validate and extend the findings. Data tracking is mostly associated with digital information that characterizes consumer behaviour. In this sense, how many times a link has been clicked, or how many times a digital pamphlet has been read, provides insight into the interaction between energy information and behavioural change. An important obstacle with consumption data and data tracking is that energy consumption data on resolution of hours, weeks or even months only provides information about a concrete consumption level without any insight into the consumers' level of awareness. Digital real-time tracking provides information through smartphones and relevant applications. In this sense, the individuals who do not have any access to smart systems and applications will be unable to provide sufficient data through this channel. ENCHANT will through method triangulation focus on assessing the bias effects each data collection method has.

As stated above, energy consumption data provides a single-dimensional data flow, which means other factors such as the level of awareness and underlying reasons behind such a consumption habit are ignored. ENCHANT's strategy of combining energy consumption data with surveys will therefore obtain more insightful results. In a research experiment design, it is crucial to reach as many and as diverse respondents and participants as possible to ensure and increase representativeness, reliability, and validity. Since reaching such a large number of people requires established reliable data collection structures, an intermediary actor in the form of a survey company will function as a facilitator to overcome this problem. A survey company can also easily overcome challenges associated with pre-test and post-test experiments by re-contacting their fixed sample of respondents. The ENCHANT project will use survey companies so that a larger number of individuals can participate in the data collection process.

ENCHANT will also use self-reporting as a method to get responses from consumers, through mobile or web-based apps. The major challenge of this method is the bias in the responses, which implies the individuals' tendency to provide self-assessed measures of the relevant

phenomenon[1]. The bias challenge will be overcome by relying on a wide range of data collection methods, including focus group interviews, which allows triangulating results. Focus groups have a number of qualities, providing elaboration into complex situations and behaviours[2]. ENCHANT aims to use this method during the pre-testing period when testing and controlling the validity and reliability of the intervention pilots, interviewing one group in the pre-test and then again post-test to look for changes in the consumers' energy behaviour. Further, ENCHANT uses netnography, which is an online ethnographic method, coined by Kozinets[3], focusing on social interaction and internet behaviour to collect relevant data. The method analyses the digital traces people leave when participating in social activities on the net, such as contributions to discussion forums, Facebook or Instagram entries, or tweets. Netnography will study how some of the interventions make use of ENCHANT's user partners existing social media channels to reach their targeted audiences (costumers/citizens/members), and how energy attitudes and behaviours might be affected.

ENCHANT includes data collection and handling activities in most of the WPs, which strongly depend on each other. This complexity demands strict coordination between the different tasks and WPs as they depend on one another, and input from preceding tasks is not only required within the same WP but also in other WPs. Furthermore, ENCHANT is a project that also depends on already existing (secondary) data provided by the case cluster cities partners and other sources. This makes it necessary to define procedures for how data access rights for secondary data are achieved and how that data is used and matched with primary data.
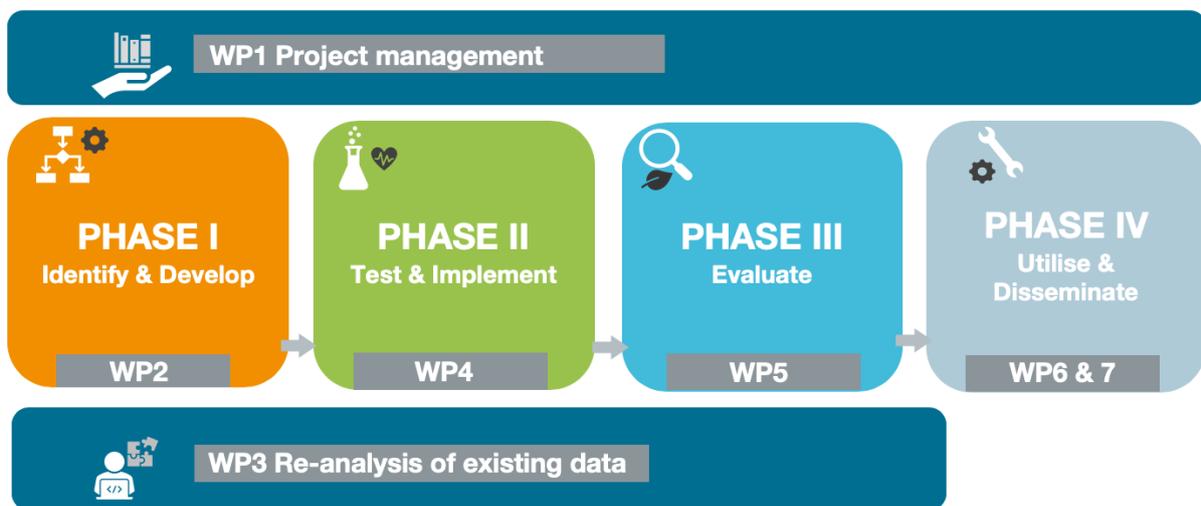
Figure 1 *Methodological approach of ENCHANT*

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[1] Rosenman, R., Tennekoon, V. and Hill, L.G., 2011. Measuring bias in self-reported data. *International Journal of Behavioural and Healthcare Research*, *2*(4), pp.320-332.

[2] George, M., 2013. Teaching focus group interviewing: Benefits and challenges. *Teaching Sociology*, *41*(3), pp.257-270.

[3] Kozinets, R.V., 2010. *Netnography: Doing ethnographic research online*. Sage publications.

ENCHANT's methods are organized to most effectively 1) identify and develop, 2) test and implement and 3) evaluate the ENCHANT interventions (WPs 2, 4 and 5), as shown in Figure 1. The other work packages are designed to provide the right input at the right time (WP3), to utilise the results at the right time (WP6 and 7) and finally to provide support and to ensure that all activity is carried out effectively in accordance with all relevant legislation in addition to the project's own principles (WP1).

Table 1 presents an overview of the various data collection methods (see the first column) used in the different WPs of ENCHANT (see the first column) and indicates which WP(s) participate in each data collection or data handling. For example, one of the data collection methods is "Document study", and WP2, WP3 and WP5 utilize this data collection activity.

Table 1 Data collection methods used in different WPs

Method / WP	WP1	WP2	WP3	WP4	WP5	WP6	WP7
Literature search		✓	✓		✓		
Document study		✓	✓		✓		
Meta-analysis		✓	✓				
Re-analysis of existing data			✓			✓	
Surveys					✓	✓	
Quantitative experiments				✓		✓	
Online data tracking					✓		
Energy use data					✓		
Interviews					✓		
Focus group					✓		
Netnography			✓				
Workshop		✓		✓	✓		
Decision-making architecture						✓	

2.1.   Research data and personal information for non-research purposes

We define data as all research data obtained from respondents directly or indirectly, through various research methods, for the project research purposes. We distinguish data, as defined, from personal information used for external communication and dissemination purposes in WP7 (for example quotes from experts or interviewees for project videos, blogs, etc. meant for communication). Such personal information will be published only after the informed written consent[4] of the involved individuals have been received. In this latter instance, personal information used for communication will not be anonymised, encrypted or pseudonymised.

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[4] The consent form is under development, and will be included as part of Annex II in the updated DMP

2.2. Data types

Table 2 presents the key characteristics of each data collection in ENCHANT. The first column indicates the type of data collection, the second column indicates where the data come from for each data collection method, the third column indicates how the data are collected, the fourth column indicates whether data, from a given data collection type, will be published in an open access mode at the end of the project, the next column lists the tasks and/or WPs that contribute to a given data collection type, and finally the last column names all partners involved in a given data collection type. Note that the same data collection type may be used in several independent data collections in different WPs.

Table 2 *Details of data collection*

Type of data collection	Source of data	How data is collected	Open access	WP/task	Partners (lead partners underlined)
Literature search	Published studies, reviews, meta-analyses from both user-partners and previous projects	Relevant bodies of literature are identified by conducting a comprehensive review of existing behavioural interventions through published studies, reviews, and meta-analytical syntheses. Search engines (e.g., Google Scholar) and databases (e.g., the European Commission's document database, Web of Science, Scopus) will be used to identify the relevant literature. Furthermore, user partners are asked for available internal reports.	Y [if no restrictions by the owners of the document/data are made]	WP2 / T2.1 WP3 / T3.1 WP5 / T5.1	ROMA3, UBB, EI-JKU, NTNU, IUE, SIN, NSR
Document study	Documents published by relevant stakeholders, such as policymakers and regulators, NGOs, and professional organizations	Relevant bodies of documents and data from previous studies and research projects about interventions, intervention evaluations/ assessments, plans of action and periodical reports implemented in interventions, and other relevant documents in previous interventions are located through direct contact with the user partners and search engines (e.g., Google Scholar) and databases (e.g., European Commission's document database, Web of Science, Scopus).	Y [if no restrictions by the owners of the document/data are made]	WP2 WP3 WP5	ROMA3, UBB, EI-JKU, NTNU, IUE, SIN, NSR

Meta-analysis	Published studies, reviews, and meta-analytical syntheses on existing behavioural interventions. Data from both user-partners and previous projects on energy efficiency and consumer behaviour	The relevant body of literature on existing behavioural interventions are identified through a literature search. Data on the topic of energy efficiency and consumer behaviour from user-partners and previous projects are collected through a chain referral method, based on enquiries of experts at the national and European level. Input to the meta-analyses will be extracted from the identified documents or if the documentation there is incomplete by an inquiry from the authors of the documents.	Y [if no restrictions by the owners of the document/data are made; ENCHANT accepts restrictions by the owners]	WP2 / T2.1 WP3 / T3.3	ROMA3, UBB, NTNU, IUE, EI-JKU, SIN, NSR
Re-analysis of existing data	Existing data sets, and studies on the topic of energy efficiency and consumer behaviour The consolidated data set of previous projects, open-access datasets	An inventory of all relevant data sets is made, and a data review is conducted to integrate and process the disparate empirical sources	Y [if no restrictions by the owners of the document/data are made]	WP3 / T3.1, T3.3, T3.4 WP6 / T6.1	UBB, SIN, NTNU, ROMA3, IUE, EI-JKU, NSR
Surveys	Responses of participants in the pre-post surveys	In order to reach as many and as diverse respondents and participants as possible to ensure and increase representativeness, reliability and validity of responses, an intermediary actor in the form of a survey company will be used to overcome challenges associated with pre-test and post-test experiments by re-contacting their fixed sample of respondents.	Y [after anonymisation; respondents will be informed prior to data collection]	WP5 / T5.2 WP6 / T6.4	EI-JKU, SIN, NTNU, ROMA3, IUE, UBB, NSR

Quantitative experiments	Responses of experimental participants	ENCHANT tests and experiments 7 types of interventions using a Randomised Control Trial (RCT) approach and collects detailed information on the hypothesized personal and contextual moderators in a pre-experimental survey.	Y [after anonymisation; respondents will be informed prior to data collection]	WP4 / T4.2 WP6 / T6.4	IUE, SIN, NTNU, ROMA3, UBB, SIN, NSR
Online data tracking	Digital information through smartphones and relevant applications, which shape consumer behaviour.	ENCHANT will apply automized digital data-tracking, where the technical channels used to allow for it, as a means of verification intervention impact. This might be in the form of keeping track of the overall number of clicks or visualizations on a specific web link, or responses in apps, social media, homepages or similar. This will be done only when express consent is given by the user and the owner of the digital platform.	Y [after anonymisation; only when express consent is given by the user and the owner of the digital platform]	WP5 / T5.2	EI-JKU, NTNU, ROMA3, IUE, UBB, SIN, NSR
Energy use data	Energy use estimates from energy providers	Before and after the interventions, energy use estimates will be obtained with consent by the participants from collaborating energy providers wherever possible and adjusted for seasonal variation.	Y [after anonymisation; only when consent is given by the user and the owner of the energy providers]	WP5 / T5.2	EI-JKU, NTNU, ROMA3, IUE, UBB, SIN, NSR

Interviews	Responses of key informants/ citizens in individual interviews	In-depth interviews with the strategically selected informants/ citizens, who are involved in interventions, will be conducted pre and post-intervention as part of WP5. Interviewees will be selected by taking into account the features of each intervention. Express consent will be obtained before.	N [interview raw data cannot be published in line with GDPR. However, anonymised summaries of the data are included in the project deliverables]	WP5 / T5.2	EI-JKU, NTNU, ROMA3, IUE, UBB, SIN, NSR
Focus group	Responses of key informants/ citizens in focus group discussions	Focus group interviews with the strategically selected informants/ citizens, who are involved in interventions, will be conducted pre and post-intervention as part of WP5. Individuals belonging to each group will be selected by taking into account the features of each case intervention.	N [interview raw data cannot be published in line with GDPR. However, summaries of the data are included in the project deliverables]	WP5 / T5.2	EI-JKU, NTNU, ROMA3, IUE, UBB, SIN, NSR
Netnography	Consumer social media use and the social dynamics triggered by the intervention campaigns	By focusing on social interaction and internet behaviour, ENCHANT analyses the digital traces people leave when participating in social activities on the net (e.g., contributions to discussion forums, Facebook or Instagram entries, or tweets). The analyses reveal how some of the interventions make use of	Y [after anonymisation; only data publicly accessible is used]	WP3 / T3.1 & T3.4	UBB, NTNU, ROMA3, IUE, EI-JKU, SIN, NSR

		ENCHANT's user partners existing social media channels to reach the targeted audiences (costumers/citizens/members) and how energy attitudes and behaviours might be affected.			
Workshop	Responses of workshop participants	Views of relevant experts, user-partners and stakeholders during workshops with academic and non-academic partners will be feed into the design of the intervention package.	Y [in the form of brief reports]	WP2 / T2.3 WP4 / T4.1 WP5 / T5.4	NTNU, IUE, EI-JKU, NSR, ROMA3, UBB, SIN,
Decision making architecture	Historical and primary data sources, i.e., data from the pilots provided by ENCHANT's WP5 and data from secondary sources provided by ENCHANT's WP3, and other relevant data from ENCHANT's WP2 and WP4	Relevant data sources from ENCHANT's WP2, WP3, WP4, and WP5 are transformed to be suitable for designing the high-level architecture of the decision-making tool. This includes a normalization process and checking data quality to be able to better utilise, exploit the data for the resulting AI algorithm, and identifying the relationships among the interventions and users.	Y	WP6 / T6.2	SIN, NTNU, ROMA3, IUE, EI-JKU, UBB, NSR

3. Partner Responsibilities

The data collections and data processing each WP is responsible for are described in this section. For a complete overview of data collection responsibilities, see Annex I (constantly updated during the project). WP1 is not directly included in any data collection or processing but defines the overarching procedures, which is why it is mentioned in the following paragraph.

3.1   WP1 (NTNU)

In the ENCHANT project, informing all other WPs on an overarching level, NTNU (WP1 lead beneficiary) is responsible for ensuring that the project is methodologically and ethically sound. ENCHANT will use a large amount of existing data and data collected specifically for the project. This data needs to be integrated, monitored, securely stored, and made available for analysis within and beyond the project. Even though data collection, curation, analyses, and exploitation will be conducted in WPs 2 – 6, WP1 will have the overall responsibility to secure the compliance of the data collection and handling with data protection laws (national and GDPR) and the open data pilot regulations.

Amongst other things, WP1 takes charge of a data management plan (DMP), with the contribution from all other project partners. All procedures for the data collection methodology and standards, data coding, referencing, and processing, exploitation of the data during the project and beyond, data protection regulations, and open access to data are included in the DMP. The elaboration of a DMP according to scientific standards and the principles of accuracy, correctness, currency, completeness, and relevance is, therefore, part of the methodological approach of WP1. The DMP will also assure that the gender dimension and the perspective on vulnerable energy consumers are correctly built into surveys and data collection in general, paying specific attention to aspects such as income inequality, time use and preferences/values, which are areas one can expect to find the major differences related to gender. The DMP will be updated in M14 and M28.

3.2   WP2 (ROMA3)

Methodologically, the first phase of the ENCHANT is concerned with identifying and developing the intervention packages, for which ROMA3 (WP2 lead beneficiary) has the main responsibility. WP2 will identify key factors affecting the impact of interventions on energy behaviour, design the intervention packages, and define the main independent variables for the experimental design. It will further define the protocols for standardized interventions for behavioural change, to make the interventions replicable and suitable for upscaling and comparability. To do so, WP 2 uses a range of methodological approaches producing the data that is used in WP2, including conducting a comprehensive review of existing behavioural interventions, through published studies, reviews, and meta-analytical synthesising the relevant body of literature. In the process, WP2 will further identify good and bad practices affecting interventions, as well as major contextual boundary conditions for more successful

and for less successful practices (i.e., Task 2.1). WP2 will also define a set of standardized procedures and protocols to conduct effective behavioural interventions (i.e., Task 2.2). WP2 will arrange a series of participatory co-construction workshops to select and define the ENCHANT intervention matrix together with WP4. These workshops will be addressing various types of user-partners to discuss and identify practical implications, main infrastructures and existing or potential policy schemes (i.e., Task 2.3). In this first part of the project, the RCT procedure, as well as research protocols for intervention evaluation (WP5), will be defined, alongside the definition of outcome indicators assessing the success of the interventions (i.e., Task 2.4).

3.3 WP3 (UBB)

The first phase of the ENCHANT – identifying and developing the intervention packages – is also informed by work in WP3, which is led by UBB. WP3 will make an inventory of all relevant data sets and conduct a data review in order to inform the development of the intervention packages and their implementation. There are several challenges regarding existing datasets on citizens' energy consumption patterns. The main concerns are to which extent the data is reliable, accurate, statistically significant, replicable, etc. Methodological concerns are raised by the fact that large-scale data collection is usually done by non-academic parties (e.g., energy providers and NGOs), at various levels, and for a variety of purposes. The collection methodology is largely informed by the initial goal of the data collection, which might make it hard to use large data sets for comparative analytical purposes. Moreover, the data collection level varies greatly; in some countries, it is systematically collected at the national level, while in other countries it is only collected through local smaller-scale research projects. Finally, behavioural analysis is only conducted in some countries, while such data is unavailable in the majority of EU member states. This data heterogeneity makes structured comparison difficult, and thus limits our potential for inference, and necessitates the ENCHANT comparative assessment.

To address these issues, WP3 will not only collect relevant data on the topic of energy efficiency and consumer behaviour from user-partners and previous projects but will also allow for triangulation of data using datasets generated the ENCHANT project and through this, better usage of ENCHANT's datasets making data relevant for ENCHANT topics. Based on the consolidated data set of previous projects, the re-analysis of the existing data will necessitate efforts to integrate and process the disparate empirical sources, and then to deploy a descriptive and inferential statistical analysis. To this end, it will build upon and feed into the literature review performed by WP2. The curation procedures of the data sets will follow two main steps: first, the data repository from previous studies and projects will be catalogued and processed to be operational and accessible (i.e., Task 3.1). Second, the descriptive and inferential analysis will inform a data review of energy consumption behaviour to date presented as a meta-analysis report (i.e., Task 3.3). In order to achieve a consolidated dataset from ENCHANT's interventions, data collection within the consortium, data sorting and processing, and data analysis will be performed (Task 3.4).

3.4 WP4 (IUE)

As of the central part of ENCHANT, i.e., the second phase, IUE coordinates and implements the intervention packages (i.e., Task 4.2), which are developed in WPs 2–3 based on experimental design and the guidelines / operational plan developed in Task 4.1, using RCT. The intervention packages will be developed and tested during the project to unlock an energy efficiency potential. As the efficiency and impact of a particular intervention depend on a multitude of factors, which types of interventions will be grouped in intervention packages is one of the main determinants.

In this process, the intervention packages are fine-tuned with the development of operational plans and the establishment of monitoring mechanisms for impact assessment. The operational plan for implementation will be based on a matching of the intervention packages with the user-partners and the associated communication channels. The development of guidelines will consider technical compatibility, geographical fit, and the likelihood of attaining the expected impact. The operational implementation plan will also consider adopting and improving the intervention packages in order to ensure sufficient variety, which may enhance the replicability and reproducibility of interventions during the project, and beyond the project lifetime. The monitoring and follow-up mechanisms will rely on the key performance indicators (i.e., KPIs that are established in WP5 Task 5.1) developed for the preparation, pilot, and post-implementation stages of the interventions, along with targets for the developed KPIs. Potential setbacks and problems identified during the implementations will be handled through coordination with project partners through workshops.

3.5 WP5 (EI-JKU)

The third phase of the project, i.e., evaluating the interventions implemented in WP4, is led by EI-JKU. For each ENCHANT' intervention, Task 5.1 of WP5 will establish key performance indicators (KPIs) related to the impact categories. Quantitative and qualitative KPIs, with which the outcomes of the interventions will be evaluated, are defined ex-ante in Task 5.1 to provide a set of (measurable) performance indicators for the project's overall efficacy in achieving its objectives. These KPIs in terms of energy efficiency enhancement, energy (and monetary) savings, greenhouse gases emissions reduction, and well-being impact etc., will not only be used for external evaluation but also serve as an internal reference throughout the project. The elicitation of these success indicators, including those addressing the effectiveness of the respective interventions, follows a hierarchical process: first, indicators are formulated verbally, in order to identify the necessary measurements without the need of a mathematical background (so that discussions are not hampered by algorithmic complication). In the next step, the hitherto formulated indicators are then translated into mathematical formulae by scientific partners. For each of the indicators, the thresholds are defined for the category's success, promising, and missed the target and displayed separately in accordance with the indicators using a traffic light methodology for ease of interpretation. Using these KPIs, the impact of the interventions is calculated (i.e., Task 5.2). The related data collection process will also allow the thorough assessment of their replicability and up-scalability as well as the

limitations and barriers encountered (i.e., Task 5.3). Finally and in close cooperation with all other WPs, WP5 will provide a guidebook on how to transfer the best practice interventions identified and will develop a policy instrument matrix (matching the intervention matrix) for standardised interventions towards behavioural change (i.e., Task 5.4).

3.6   WP6 (SIN)

Building on the work from WPs 2–5, WP6 will design a decision-making tool for policymakers, energy providers, NGOs, and municipalities. It will also implement this tool as a web-based, easy-access interface. In doing so, it will transfer the data from WPs 2–5 (i.e., Task 6.1), and supplement the quantitative analyses in WPs 3 and 5, for the purpose of designing a recommender system (i.e., Task 6.2). The system will use an algorithm that will be developed and trained in WP6 (i.e., Tasks 6.3). The tool will be adjusted, with strong involvement from user-partners, to meet the needs of the specific user groups, and validated by tests in the pilot environment (i.e., Task 6.4).

The decision-making tool's basis is an adaptation of a recommender system, which is a technology-based on machine learning that identifies patterns within large data sets and matches desired states (in ENCHANT, it is substantial changes in energy efficiency) with behavioural or demographic patterns in the population. The structure of the recommender system envisioned for ENCHANT is illustrated in Figure 2.
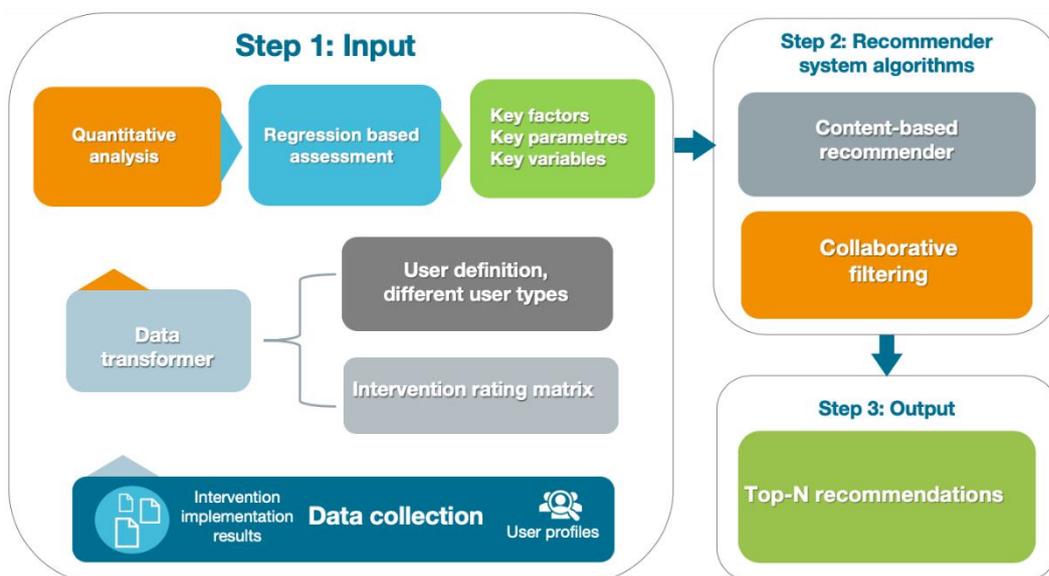
Figure 2 *Framework of the ENCHANT recommender system*

A machine learning system like the recommender system needs substantial data input to provide reliable and useful output. Therefore, the main purpose of _Step 1_, depicted in Figure 2, is to prepare the necessary data sources and information for the learning stage. Data from WP2, WP3, WP4 and WP5 will be harvested and transformed to fit the requirements of the following steps 2 and 3. Analyses conducted in WP3 and WP5 will be complemented with additional analyses of primary and secondary data tailored to feed into the recommender system process to figure out the key factors and their relations. Clustering techniques will be

used to define homogenous user groups. A regression-based methodology will be used to match user profiles, intervention profiles, and intervention effects.

The main task of *Step 2* is to implement and train the recommender systems. Two recommender systems – a content-based recommender and a collaborative filtering recommender – will be the starting point in this step. The content-based recommender aims to suggest the intervention packages that are similar to the ones that yielded the best results in terms of energy efficiency improvements and user well-being in the past for specific user-groups. The similarity of the interventions is determined depending on the similarity of profiles of the compared interventions for the user group. For instance, if a user from a specific user group has responded well to an intervention in the past which is including a discount of energy-efficient household appliances, the program can learn to suggest other interventions from this category for this user. A Collaborative Filtering recommender is a popular technique for a recommender system that bases its recommendations on the ratings of *other users* in the system. This system learns to use the past ratings of users to predict or recommend a new intervention that an individual user will like, based on the similarity of the user profiles and intervention packages. The similarity between users or between interventions is expressed as a function of agreement between past ratings or preferences. Four parameters will be analysed and used as measuring factors to provide the recommendations:

- User similarities: Determine user similarities based on clustering in rating patterns in the survey and energy use patterns within the target user group. Then use this information to estimate predictions and recommendation for similar user groups.
- Intervention similarities: Analyse the clustering among the interventions and produce predictions based on conclusions made from related intervention techniques.
- Cosine similarities: Identify the similarity between two interventions that are considered as vectors in the user group space. This means that similarity of interventions is assessed based on the response patterns they create across different user-groups, thus being a higher-order assessment of similarity as compared to the similarity measures described in the first two bullet points.
- Pearson or Spearman correlations: Assess the relationship between two user responses, two intervention profiles or between (degrees of) interventions and user response ratings through correlational analysis. The stronger the correlation, the more closely related the two concepts are.

Step 3 is based on the results obtained from Step 2. The trained algorithm will be able to provide the most relevant recommendations of interventions for specific given target groups to energy decision-makers. The recommendations will be a set of interventions or intervention packages, which provides different options to the decision-makers to choose the best strategy to implement according to the customers/companies' situation. In this final step, the decision-making tool will be implemented as a web-based dialogue system, where the decision-maker will be able to define the target groups for the intervention and will be provided with the recommended list of most likely successful interventions. The more information the user of this web-tool can provide, the more accurate this recommendation process will work. However,

well-trained recommender systems have been shown to work relatively well already with limited input.

The design of the recommender system in ENCHANT will be closely coordinated with the user-partners so that it will be adjusted in terms of user feedback. Issues about data privacy related to the data handled in the recommender system will be addressed in WP1 before the data handing in Step 1. The maintenance of this tool after the project is part of the business plans developed in the exploitation strategy in WP7.

3.7   WP7 (NSR)

WP7 will derive a multimedia platform for presenting ENCHANT throughout the project period, and beyond. It will also derive a strategy for effective dissemination and exploitation of the ENCHANT results to all relevant users of the web-based tool. WP7 is essential for raising the project's impact on policy, business, and citizen initiatives in promoting energy efficiency. It has to guarantee that the valuable knowledge and new data on individual and collective engagement in the energy field are transferred to those actors who can convert it into tangible actions and new projects in the field of energy efficiency. WP7 relies on the results to be delivered by WP 2-5 for its execution, plus their interpretation with regard to policy relevance in WP5. Methodologies to be applied are limited to a sound dissemination and communication plan, with clear target audiences and effective ways of reaching them. Furthermore, it proposes a lean methodology for elaborating business plans for those outputs of the project, for which commercial and non-commercial exploitation is possible, not the least the web-tool which will require a maintenance concept for the time after the project.

The dissemination activities will consider the perspective of gender in accordance with the European Council (EC) strategy on gender equality in research and innovation. During ENCHANT's dissemination activities, WP7 will consider the perspective of gender in the following ways: during the visual design of the dissemination material, web page and other components of the dissemination activities, a positive relationship between female characters and energy will be established; a gender-neutral language will be sought; gender-relevant findings of the project will be tagged as such on the project website and in press releases and other communications.

4. Data Management

This chapter describes the procedures applied in ENCHANT for the different steps of data collection, management, storage, and publication in detail.

4.1   Formal ethical approval

The compliance with national and European regulations is embedded in the concept and activities of ENCHANT. Ethical and societal dimensions as well as national and international regulations will be considered at all stages of the ENCHANT project. All proposed ENCHANT tasks are permissible under the applicable laws and regulations, given proper observance of requirements. All project beneficiaries have existing and operational policies regarding potential ethics issues. Table 3 identifies the data protection officer or national agency responsible for the approval of every data collection activity or inquiry for secondary data of the partners. Their opinion will be guiding for how ENCHANT handles the different types of data. The necessary actions will be taken by the project management and all beneficiaries to ensure compliance with applicable European and national regulations and professional codes of conduct relating to personal data protection. This will include, in particular, Directive 95/46/EC regarding data collection and processing, the General Data Protection Regulation (GDPR, 2016/679) that entered into effect in May 2018, and respective national requirements, ensuring legal and regulatory compliance.

NTNU confirms that the Data Protection Officer (DPO) has been appointed and the contact details of the DPO will be made available to all data subjects involved in the research. For beneficiaries not required to appoint a DPO under the GDPR, a detailed data protection policy for the project will be kept on file and submitted to the EC services upon request. Each beneficiary will submit a confirmation within this respect to the coordinator.

In order to fully comply with the research ethics requirements, the following sections address ethical aspects relevant for ENCHANT's planned research activities, which involve human participants, personal data collection and processing, and involvement of non-EU countries.

4.1.1 Involvement of human participants

ENCHANT will involve the voluntary participation of adult participants within WP4 and WP5 activities. Dedicated surveys, interviews, and questionnaires will be implemented within tasks 4.3 and 5.1. With respect to mandatory ethical requirements, the consortium will implement the following steps concerning these activities:

- Submit procedures and criteria described below that will be used to identify potential research participants, also as a separate deliverable (D1.7).
- Deliver the informed consent procedures that will be implemented for the participation of humans described below, also as a separate deliverable (D1.7).

- Prepare templates of the Informed Consent Forms and Information Sheets, in national languages whenever necessary, covering the voluntary participation and data protection issues in terms intelligible to the participants. The templates will be submitted to the EC services upon their request.

Table 3 *Data protection officer or national agency per partner*

Name of partners	Short name	Data protection officer / National agency (responsible for the approval of data collection/use/inquiry)
Norges teknisk-naturvitenskapelige universitet	NTNU	Norwegian Centre for Research Data (NSD)
Universita degli studi Roma Tre	ROMA3	Ing. Alessandro Masci
Izmir Ekonomi Universitesi	IUE	Prof. Dr. Murat Aşkar (Rector)
Universitatea Babes Bolyai	UBB	Dr. Raul-Ciprian Dăncuță
Energieinstitut an der Johannes Kepler Universitat Linz Verein	EI-JKU	Marie Holzleitner
Smart Innovation Norway AS	SIN	Norwegian Centre for Research Data (NSD)
NTNU Samfunnsforskning AS	NSR	Ragnhild B. Overland
Izmir Buyuksehir Belediyesi	IBB	Güler Sağıt (Head of the Department of Information Technologies in IBB)
Gediz Elektrik Perakende Satis AS	GDZ	Gülin Sontuna
Energie Kompass GmbH	EKG	Michael Niederkofler
Norges Naturvernforbund	NNF	Sahar Arazi
Viken fylkeskommune	Viken	Guro Hegna Svendsen
Fondazione Roffredo Caetani onlus	FONDA	To be identified
Energia Positiva Società Cooperativa	ENPOS	To be identified
Electrica Furnizare SA	EFSA	Ionut Claudiu Anghel
Municipul Cluj-Napoca	MCN	Alina Nițulescu (Law department – Cluj Napoca City Hall)
Asociatia Centrul pentru Studiul Democratiei	ACSD	Melania Lese
Badenova AG & CO KG	BDNV	Stefan Beyer

The consortium will ensure that all necessary procedures are followed, particularly with regard to the signing and collation of all necessary Informed Consent Forms prior to the collection of any data and storing the forms after the data collection. These Informed Consent Forms will apply also for anonymous/online data collection, e.g., questionnaires where consent is given by clicking "start" in the online survey. All involved stakeholders and users will be informed in detail about measures and the consortium will obtain free and fully informed consent. Details of recruitment, inclusion, and exclusion criteria, and informed consent procedures will be prepared ahead of the start of any proposed measures.

4.1.1.1 Details on the criteria and procedures used to identify/recruit research participants

Following will NOT be involved in the project activities of ENCHANT:
- Children and/or adults unable to give informed consent.
- Vulnerable groups/individuals.

Participants to the primary quantitative data surveys will be recruited from already registered members/customers/citizens of the user partners, members of national or local web-panels, or they will be specifically recruited by the subcontracted survey companies or the user partners. Only survey companies complying with the regulations formulated in this DMP will be subcontracted. The participants will be sampled to be representative for each user case where possible. Participants should be 18 years or older and must be able to give informed consent (see point 4.1.1.3 below for consent/information sheet templates). They will be informed about the aim of the study, the collected data, if relevant the aim of connecting the survey data with secondary datasets (such for example energy consumption data) via a pseudonymised key table. The participants will also be informed about data handling, storage and pseudonymisation and anonymisation procedures as well as the publication of the anonymised data and its inclusion in the Open Data Pilot. This will be done, in accordance with GDPR, in simple language, easy to understand for the participants. In cases the data collection will be conducted online, by following the link to participate, they explicitly give their consent to participate. If participants are recruited from existing survey panels, they will likely earn points in the point system of their panel operator as a reward for their participation. If they are recruited specifically for this study, they may participate in a lottery of rewards for their participation. Participants are also informed that they can withdraw their consent until the data is anonymised, without any disadvantages and without having to give a reason. A contact (telephone and e-mail) will be provided where they can request to be informed about all data that is stored about them in the project. From the point of anonymising the data is no longer personal information.

For the other empirical studies, such as in-depth personal interviews, focus groups and workshops, information is presented in written form when participants are recruited. It will be repeated immediately before the data collections are started and the consent form is signed by the participant before the interview, focus group or workshop. Participants are also informed that they can withdraw their consent until the data is anonymised without any disadvantages and without having to give a reason. A contact (telephone and e-mail) will be provided where they can request to be informed about all data that is stored about them in the project. From the point of anonymisation, the data is no longer personal information. Participants of this part of the empirical work will be recruited locally from the general population of customers/citizens/members of the user partners, who are older than 18 years and able to give informed consent. Participants will be recruited through personal contact by the user case representatives, mailing lists, newspaper advertisement, snowball systems, posters, or the like. Expenses that they have for participating will be reimbursed. Participants are also informed that they can withdraw their consent, until the data is anonymised, without any disadvantages

and without having to give a reason. For the netnography, content in public fora is considered public information that can be analysed in an anonymised form.

4.1.1.2 Informed consent procedures

Before participation in an online survey, participants will be invited to the survey via e-mail through the survey panel provider or the user partner who has access to the mail addresses. E-mail addresses will not be shared within or outside the consortium. In the e-mail, the information from the informed consent form will be presented and a link to the survey will be included. The participants will be instructed that by clicking the link they consent to participate in the study as described in the information included in the e-mail. A contact (telephone and e-mail) will be provided where they can request to be informed about all data that is stored about them in the project. From the point of anonymisation, the data no longer includes personal information.

To the extent that interviews are conducted by project researchers, respondents will be informed before being interviewed and are asked for their consent. The principles of written informed consent will be applied. Their participation in research activities (e.g., interviews, focus groups, workshops) is entirely voluntary. They may give notice of their withdrawal from research activities at any time. Participants are also informed that they can withdraw their consent until the data is anonymised without any disadvantages and without having to give a reason.

When applying automized digital data-tracking (e.g., in the form of keeping track of the overall number of clicks or visualizations on a specific web link, or responses in apps, social media, homepages or similar) as means of verifying intervention impact, both the user and the owner of the digital platform will be informed beforehand and their consent will be sought.

4.1.1.3 Informed consent forms and information sheet

The information sheets and consent forms will be based on the standard form provided by the Norwegian Centre for Research Data (NSD – Norwegian organization acting as Data Protection Officer concerning GDPR for social science research organizations) and will be in line with national regulations. Annex II documents all consent forms used until the point in time this report is submitted. Future updates of the DMP will include documentation of all local consent forms/information sheets used in ENCHANT.

4.1.2 Data collection and processing

Three significant steps must be followed related to Data Collection and Processing:

- Copies of opinion or confirmation by the competent Institutional Data Protection Officer and/or authorization or notification by the National Data Protection Authority (whichever applies according to the GDPR and the national law) must be submitted from the partner collecting the data to the coordinator for archiving.

- If the position of a Data Protection Officer is established, their opinion/confirmation that all data collection and processing will be carried according to EU and national legislation should be submitted from the partner collecting the data to the coordinator for archiving.
- Detailed information must be provided from the partner collecting the data to the coordinator for archiving on the procedures that will be implemented for data collection, storage, protection, retention, and destruction, and confirmation that they comply with national and EU legislation.

4.1.2.1 Copies of opinion/confirmation by the Institutional Data Protection Officer/Authority

All partners of the consortium that collect and process data agree that they will do so according to the GDPR and the national law. All confirmations by the institutional or national data protection officers regarding the conduction of data collections in ENCHANT in accordance with EU and national legislation will be collected in Annex III of the DMP as they are received. They will be provided from the partner collecting the data to the coordinator for archiving at the earliest possible time point prior to starting the data collections.

4.1.2.2 Information on the procedures for data collection, storage, protection, retention, and destruction

This DMP provides information on the procedures that will be implemented for data collection, storage, protection, retention, and destruction in ENCHANT (see 4.2 – 4.8 below). All procedures are in accordance with the principles of the "Guidelines on Data Management in Horizon 2020".

4.1.3 Involvement of non-EU countries

ENCHANT has the coordinator not situated in the European Union but Norway. There are also partners from Turkey involved. Due to the ENCHANT project nature and its activities, the data might be transferred from a non-EU country to the EU and vice versa to allow for joined analyses and storage of all data in the common database. With regards to this, the consortium confirms that such transfers comply with the laws of the country in which the data was collected, and such transfers are in accordance with Chapter V of the General Data Protection Regulation 2016/679. All data transferred between project partners (within or outside the EU) will be restricted to pseudonymised or anonymised data and the transfer will only be made in encrypted form via secured channels.

4.2 Data collection procedures

In order to achieve quality assurance, quality control, and consistency throughout the project, specific data collection procedures will be added to the DMP as they are developed by the

involved partners ahead of the different data collections. All procedures will be developed to meet general scientific quality criteria for data collections as indicated in the following:

- <u>Accuracy</u>:
  Is the data collected correct and complete?
  Are the data entry procedures reliable?
- <u>Efficiency</u>:
  Are the resources used to collect data the most economical available to achieve those objectives?
- <u>Effectiveness</u>:
  Have the objectives been achieved?
  Have the specific results planned been achieved?
- <u>Feasibility and timeliness</u>:
  Can data be collected and analysed cost-effectively?
  Can it provide current information in a timely manner?
- <u>Relevance</u>:
  What is the relevance of the data/information/evidence for primary stakeholders?
  Is data collection compatible with other efforts? Does it complement, duplicate, or compete?
- <u>Security</u>:
  Is the confidentiality/privacy and protection of the data ensured?
- <u>Utility</u>:
  Does data provide the right information to answer the questions posed?

4.2.1 Literature search

Literature search and study procedure will be developed ahead of the data collection and documented in an updated DMP. The first steps in this respect are identifying the relevant literature.

4.2.2 Document study

The document and record (data) study procedure will be developed ahead of the data collection and documented in an updated DMP. The first steps in this respect are identifying the need for data and the availability of secondary data.

4.2.3 Meta-analysis

Meta-analysis procedures will be developed ahead of the data collection and documented in an updated DMP. The first steps in this respect are identifying relevant empirical studies.

4.2.4 Re-analysis of existing data

Re-analysis of existing data procedures will be developed ahead of the data collection and documented in an updated DMP in case data will be analysed that is not anonymised. Likely, the reanalysis of existing data will be restricted to anonymised datasets, in which case the data

does not fall under the GDPR. The first steps in this respect are identifying relevant existing data.

4.2.5 Surveys

The questionnaire survey procedures will be developed ahead of the data collection and documented in an updated DMP.

4.2.6 Quantitative experiments

Quantitative experiments procedure will be developed ahead of the data collection and documented in an updated DMP.

4.2.7 Online data tracking

Online data tracking and data collection procedure will be developed ahead of the data collection and documented in an updated DMP.

4.2.8 Energy use data

Energy use data collection procedure will be developed ahead of the data collection and documented in an updated DMP.

4.2.9 Interviews

Individual in-depth interview data collection procedure will be developed ahead of the data collection and documented in an updated DMP.

4.2.10 Focus Group

Focus group data collection procedure will be developed ahead of the data collection and documented in an updated DMP.

4.2.11 Netnography

Netnography procedure will be developed ahead of the data collection and documented in an updated DMP.

4.2.12 Workshop

The workshop data collection procedure will be developed ahead of the data collection and documented in an updated DMP.

4.2.13 Decision making architecture

Decision-making architecture will be developed ahead of the data collection and documented in an updated DMP.

4.3   Data documentation

All collected data shall include a metafile when stored on ENCHANT's secure storage solution and/or ENCHANT's SharePoint server accessible through the TEAMS frontend. The file will later be made available for external users of the data. This metafile shall include metadata concerning the kind of data included, involved personnel, date and duration of the data collection, variable names/labels, recruiting procedures, response rates, whether or not it is anonymised, related WPs and tasks, and finally a summary. Annexe IV provides two templates for such metafiles for qualitative and quantitative data sets that will be adapted during ENCHANT.

4.4   Data storage and curation

All personal data will be stored and protected on ENCHANT's encrypted server space for secure data storage, as described in 4.4.1. WP1 (NTNU) and WP3 (UBB) are responsible for the curation of all data collected in ENCHANT and its safe storage. The storage solutions for personal raw-data and anonymised data include daily backup routines to prevent data loss. The underlying (aggregated) data will be made available as supplemental information, in a thematic repository or on the Zenodo platform, and will be mentioned in the main text of the publication.

4.4.1 Protection of personal data

The ENCHANT consortium agrees that any Background, Results, Confidential Information and/or all data and/or information that is provided, disclosed or otherwise made available between the beneficiaries during the implementation of the Action and/or for any Exploitation activities ("Shared Information"), shall not include Personal Data as defined by the General Data Protection Regulation 2016/679 hereinafter referred to as the Data Protection Legislation. By exception to the principle described above, the beneficiaries may share Personal Data of individuals involved in the project to execute the Consortium Agreement or the Grant Agreement including but not limited to; names, job titles, e-mail addresses, and other related tele-contact information ("Business Contact Information"). The beneficiaries agree that the Business Contact Information will be only processed to the limited extent required to manage the business relationship between the members. Each beneficiary, its affiliated entities, and its contractors may, wherever they do business, store and otherwise process such Business Contact Information. Where notice to or consent by the individuals is required for such processing, each beneficiary, as applicable, will provide notice or obtain such consent as applicable.

The ENCHANT project implies collecting different personal data from numerous individuals (i.e., personal data of the third parties) during the project's implementation. The ENCHANT consortium will pay dedicated attention to whether and how well the processes and procedures have been applied when processing different personal data to the project data sets.

The non-anonymised raw-data and the key tables for anonymised data will be stored on secure server solutions, such as the one hosted and operated by the University of Oslo (UiO) and their Services for Sensitive Data (TSD) or NTNU's own solution NICE-1, which comply with the Norwegian regulation regarding individual privacy. Each contact partner (including user partner and scientific partners) for the data collection tasks is responsible for storing these data and anonymising the datasets for the work in ENCHANT on storage locations with the following security standards. These server spaces will be established as soon as the first data is produced. ENCHANT's server solutions will comply with the regulations set by the TSD. Backup is performed through a regular backup system with the addition of encryption. The encryption key is only available on the dedicated terminal server with a copy stored in safes on two separate locations. Data transfers (import/export) to and from the services is handled by a special purpose file staging service and the project administrator controls access rights for all project members. By default, all project members are able to transfer data in, but only the project administrator can do a data transfer out. For security reasons the infrastructure is accessible only with a 2-factor login, i.e., the username, password and electronically generated secure code (like in internet banking applications). Connecting to the system is first done by accessing a login server via an encrypted SSH tunnel. From the login server, users will connect to project VMs via PCoIP (Windows)/ThinLinc (Linux). The login procedure requires a one-time password that is received through a smartphone/Yubikey.

The project has engaged beneficiaries from Norway and Turkey. Therefore, the personal data might be transferred from a non-EU country to the EU and vice versa. With regards to this, the ENCHANT consortium confirms that such transfers will comply with the laws of the country in which the data was collected, and such transfers are in accordance with Chapter V of the General Data Protection Regulation 2016/679. In accordance with Section 5.1.2 Humans, the templates of the informed consent forms and information sheets (in language and terms intelligible to the participants) will be submitted to the EC services upon their request.

4.4.2 Data anonymisation

All data collection and processing that will be done during ENCHANT will be carried out according to national legislation and the EU General Data Protection Regulation (Regulation (EU) 2016/679). The ENCHANT project will respect the privacy of all stakeholders and users and will seek free and fully informed consent where personally identifiable data is collected and processed, implementing suitable data handling procedures and protocols to avoid potential identification of individuals by anonymising and aggregating data. This will include participants' data in activities that use techniques such as questionnaires, interviews, workshops, or data tracking. Where necessary, the data will be anonymised at the earliest possible point in time. The mapping of the anonymised ID and the person will be safeguarded

and will not be available to persons other than the ones working with the data. Results may be used in anonymised or aggregated forms of analysis and may subsequently be published in project reports and scientific papers. All beneficiaries will handle all material with strict care for confidentiality and privacy in accordance with the legal and regulatory requirements, without any harm to participants, stakeholders, or any unknown third parties. At the end of the project, all data will be anonymised, and the key tables for the mapping of the anonymised ID and the person will be deleted.

Anonymised data will be stored at the ENCHANT's SharePoint solution in an encrypted and password-protected form (see Section 4.4.4). ENCHANT partners have access to this solution through personal logins provided by NTNU. The overall folder structure is based on the ENCHANT WP and case cluster cities structure; each WP folder includes a data subfolder, and these will include folders for the specific kinds of data produced.

4.4.3 Data minimisation

All collected data are relevant to the ENCHANT project and will be exclusively limited to the purposes of the successful implementation of the action. The type of data to be collected and data collection processes are in accordance with the 'data minimisation principle. The data collection and processing will be done to serve the closely engaged stakeholders' interests and society overall.

4.4.4 Technical and organizational measures (TOMs)

The technical and organisational measures (TOMs) that will be implemented to safeguard the rights and freedoms of the data subjects/research participants and a description of the security measures that are recommended to be implemented by the beneficiaries to prevent unauthorised access to personal data or the equipment used for processing are described in Annex V.

The following measures will notably be implemented:

- clear definition of roles and responsibilities regarding data processing operations (including collection, storage, access, sharing, protection, destruction), as part of the data management process.
- clear definition of the purposes of the processing and no further processing without specific new consent of data subjects or their legal representatives.
- notification of the data processing to relevant national protection authorities, if applicable.
- security of data and their processing (hardware, networks and physical businesses security, confidentiality agreements with employees through which authorised persons will notably commit to using the data for the strict purpose of the project, access control and log records).

- clear separation, each time it will be possible, between the different categories of data according to their degree of accuracy or reliability, particularly between data based on facts and data based on personal or technological assessments.
- enhanced protection of personal data.
- mechanisms ensuring data deletion when they are not anymore necessary to the purposes for which they were processed.
- no transfer of personal data to another party without a specific consent given by data subjects and their legal representatives; no transfer to third parties that do not ensure the same level of personal data protection.
- set up of procedures to ensure the efficiency of data subjects' rights, including their right of access, communication, rectification, erasure and to object.

4.4.4 Use of secondary data

ENCHANT will not only collect new data but also reanalyse existing data sources, such as datasets provided by the user partners. All these secondary data sources contain already anonymised datasets or will be anonymised by the user partners before analysis, which will not allow identifying individuals directly or indirectly as a default. In cases where past energy use data will be accessed on a personal level, the respective households need to give consent to that. Data will then be pseudonymised for matching with primary data recorded in the project.

4.4.5 Tracking and observations

ENCHANT will apply automized digital data-tracking as means of verifying intervention impact. This might be in the form of keeping track of the overall number of clicks or visualizations on a specific web link, or responses in apps, social media, homepages or similar. This will be done only when consent is given by the user and the owner of the digital platform.

All collection and handling of personal data through tracking and observations will be done following Directive 95/46/EC regarding data collection and processing, the General Data Protection Regulation (GDPR, 2016/679), and respective national requirements, ensuring legal and regulatory compliance. Data will be anonymised (see 4.4.2 Data anonymisation).

4.4.6 Encryption standards and procedures

All data files will be transferred via secure connections and in an encrypted and password-protected form (for example with the open-source 7-zip tool providing full AES-256 encryption: http://www.7-zip.org/ or the encryption options implemented in MS Windows). Passwords will not be exchanged via e-mail but in personal communication between the partners. The encryption solutions will be chosen in accordance with the ENCHANT partners' IT supports departments.

4.4.7 Filename standards

The filename shall always consist of document number, document title and issue (in this order). Underscore shall be used between document number, issue number and document title. There

Table 4 *Name standards of ENCHANT*

XXX	XXX explanation	YYY	ZZZ
D	Deliverable	Report	1, 2, 3, etc.
MAN	Management	1.1, 1.2, 2.1, 2.2 etc.	1, 2, 3, etc.
DAT	Data files	1.1, 1.2, 2.1, 2.2 etc.	1, 2, 3, etc.
DOC	Data documentation file	1.1, 1.2, 2.1, 2.2 etc.	1, 2, 3, etc.
NOT	Notes	1.1, 1.2, 2.1, 2.2 etc.	1, 2, 3, etc.
MOM	Minutes of meeting	1.1, 1.2, 2.1, 2.2 etc.	1, 2, 3, etc.
PRE	Presentations	1.1, 1.2, 2.1, 2.2 etc.	1, 2, 3, etc.
PAP	Journal paper manuscript	1.1, 1.2, 2.1, 2.2 etc.	1, 2, 3, etc.

* XXX: Identifies which main category the document belongs to. In order to always easily identify the files, the project name ENCHANT - shall be included as a prefix to all document categories. YYY: Will always be a number assigned subsequently for each new doc in the XXX category and WP. ZZZ: Issue number.

shall be no open spaces in the document title. Logical short versions of words can be used in the document title part of the filename to shorten the filename. If the document is a draft version, this is indicated by "DR" after Issue# and underscore. For example, in the Data Management Plan document, the first issue will be named ENCHANT-D1.4_DMP_1.

To ensure that data files as well as any other file in ENCHANT have a clear name identifying the content, the following file name standards are used. All documents shall be numbered by their type of document, and the assigned subsequent numbering within each WP (first deliverable of WP1: D1.1, first deliverable of WP 2: D2.1).

The type of deliverable should be indicated using one of the following codes:

- R   Document, report
- DEM   Demonstrator, pilot, prototype
- DEC   Websites, patent fillings, videos, etc.
- ETHICS   Ethics requirement
- ORDP   Open Research Data Pilot
- DATA   data sets, microdata, etc.
- OTHER

4.5   Open access to ENCHANT's data

Data based on the empirical results (e.g., data and information collected via a web-based survey(s), workshops, and site visits etc.) from this project will be stored in an open-access database (e.g., Zenodo or EUDAT platforms). This database will be used to grant access to anonymised quantitative data after the project is ended. Qualitative raw data (e.g., recordings

of interviews), however, will not be made open access because even after anonymisation identification might be possible through an in-depth analysis of speech patterns. The researchers have a duty of transparency to fully inform how the data will be used and to what purpose the data collected is for. Thus, the ethically compliant data collection will be guided by proportionality and follow the legal safeguards (described in WP1 and WP3) to minimise any risks related to the unauthorised release of personal and private information. The empirical work of WP4 and WP5 will be coordinated (for data management issues) by WP1 and then transferred into the database created by WP3, which is responsible for the collection of existing data and curation of ENCHANT data sets. Furthermore, ENCHANT will, in WP6, provide a decision-making support tool utilizing the data curated and collected in the project. Secondary data will only be made available to open access if the licensing with the owners of the data allows for that.

4.6   Deletion of data

Identifying personal data and key tables will be retained for a maximum of 1 year after collection completion to allow for thorough quality control. All such data will thus be deleted by April 2024 at the latest. At this point, all data will be anonymised. Anonymised data will not be deleted but stored and made available for future use through the Open Data Pilot.

4.7   Open data pilot

Wherever possible, ENCHANT thoroughly complies with the Open Research Data Pilot of the European Commission regarding research data generated by Horizon 2020 projects (see https://www.openaire.eu/what-is-the-open-research-data-pilot). ENCHANT beneficiaries will also check that the metadata of the publications is adequate for interoperability/reusability. The underlying (aggregated) data, where publication of the data does not collide with copyrights of the initial data providers, will be made available as supplemental information, in a thematic repository or on the Zenodo platform, and mentioned in the main text of the publication using ENCHANT data. ENCHANT provides access to all quantitative primary data (after anonymisation) collected (qualitative data will not be made available open access for GDPR reasons). Data will be made available as soon as ENCHANT primary research and publication interests are fulfilled. No embargo period is implemented once the ENCHANT publications are finished and no restrictions are foreseen to be put on the re-use of the data at this point. WP1 and WP3 are responsible for providing open access to the data.

4.7.1 General principles

All data in ENCHANT shall be open access if no other important principles stand against it (such as restrictions on secondary data or GDPR restrictions). In this respect, the Grant Agreement is binding, especially ARTICLE 25 — ACCESS RIGHTS TO BACKGROUND and ARTICLE 31 — ACCESS RIGHTS TO RESULTS are relevant for determining the potential need for access restriction to ENCHANT data.

4.7.2 Size of the data

The size of the data files is not determined at this point of the ENCHANT project yet. Given that ENCHANT will test evidence-based intervention packages using RCT approach combined with a participatory approach involving stakeholders and user partners of millions of European consumers, the data, which is collected through various data collection methods ranging from energy use data to self-report data, is expected to be large for conventional storage media such as portable hard drives. Therefore, this section will be updated as soon as interventions are implemented, and more information is available.

4.7.3 Target group for the data use

The data provided in ENCHANT will be of interest to policymakers, businesses in the energy sector, stakeholder groups in the energy market and communities, and other researchers. They will be documented and presented in a way that makes them as easily accessible as possible.

4.7.4 Access procedures

The data made available through the open data pilot will be fully accessible without any restrictions (if exploitation benefits do not require an embargo period).

4.7.5 Documentation procedures

All data files provided by ENCHANT include metadata on the content of the data file and the context in which the data was collected. It is important to ensure the usefulness of the data for researchers and analyst not foreseen in the data collection. The documentation procedures will be constantly updated during the ENCHANT project.

4.7.6 Securing interoperability

For social science data, it is essential to document the use and source of theoretical concepts leading to data collections to ensure interoperability across different user groups. Sources for theoretical concepts and variables measures will be documented to ensure comparability with previous and future use. For quantitative data, the psychometric performance of the variables will be documented. The use of theoretical concepts will be standardized within ENCHANT and with previous use of the variables and concepts wherever possible.

4.7.7 Search keywords and data identification

Each data set will be assigned a unique and persistent Digital Object Identifier (DOI) to make it identifiable when stored in a data repository. Each file will be tagged with keywords for search purposes: ENCHANT is always a keyword, furthermore, keywords describing the type of the data (e.g., "energy use data", "focus group", etc.), the participants (e.g., "energy consumer", "stakeholder", etc.), the type of topics included (e.g., "energy use", "feedback", etc.).

4.7.8 File types

Each data file in ENCHANT will be made available with accompanying documentation of its content. Quantitative data will be made available in standard data formats for popular statistical program packages to make reuse as easy as possible (e.g., csv, sav, or R with popular character encoding such as ASCII or UTF-8 without BOM). Qualitative data such as interview transcripts will be made available internally in its entirety in the form of text documents (e.g., in .pdf, .txt, .rtf or .docx format) in their original language. Besides, excerpts of transcripts and other qualitative data will be made available in English.

ANNEXES

Annex I: Complete summary of all data collections and responsibilities

The following table presents a complete summary of all data collections in ENCHANT with the responsibilities indicated. The table will be constantly updated during the project as soon as data collections are started.

Data Collection	Source	Data	When	Format	Data Flow	Responsible for Data Production & Monitoring	Responsible for Data Preparation (transcription, data cleaning)	Responsible for Storage / Anonymisation	Responsible for Transfer to Long-term Storage	Data to Be Used by
Literature search	Published studies, reviews, meta-analysis	Relevant body of literature on behavioural interventions	M1-M10	Text files	WP2 collects publications on previous cases of intervention implementations; WP3 identifies other datasets; WP5 collects literature on KPIs	WP2, WP3, WP5	WP2, WP3, WP5	WP2, WP3, WP5 (no anonymisation necessary)	WP2, WP3, WP5, WP1	WP4, WP5, WP6, WP7
Document study	Documents published by relevant stakeholders	Existing data and records from previous studies and research projects about interventions	M1-M10	Text files	WP2 collects publications on previous cases of intervention implementations; WP3 identifies other datasets; WP5 collects literature on KPIs	WP2, WP3, WP5	WP2, WP3, WP5	WP2, WP3, WP5 (no anonymisation necessary)	WP2, WP3, WP5, WP1	WP4, WP5, WP6, WP7
Meta-analysis	Published studies, reviews, and meta-analytical syntheses on existing behavioural interventions	Data from both user-partners and previous projects on energy efficiency and consumer behaviour	M6-M13	Effect size data from other studies (extracted from papers or reports or requested from authors of these papers where not published)	Based on the input from the literature search and the document study, meta-analyses will be conducted	WP2, WP3	WP2, WP3	WP2, WP3	WP2. WP3, WP1	WP4. WP5, WP6, WP7
Re-analysis of existing data	Existing data sets, and studies on the topic of	The consolidated data set of	M3-M13	Secondary data from published or unpublished studies	Data will be collected and curated for the analyses in	WP3	WP3	WP3	WP3, WP1	WP4, WP5, WP7

	energy efficiency and consumer behaviour	previous projects		(scientific or user partner)	ENCHANT and new analyses will be conducted on these data.					
Surveys	Questionnaire	Participants' responses to questionnaire(s)	M10-M24	Primary data collections with quantitative surveys on participants in the pilots	The survey data will be collected pre and post-intervention and then analysed in WP5 and WP6	WP5, WP6	WP5, WP6	WP5, WP6, WP3	WP5, WP6, WP3, WP1	WP5, WP6, WP7
Quantitative experiments	Experiments	Responses of experimental participants	M10-M19	WP4 implements RCT based experiments and collects indicators in alignment with WP5 and WP6	The data collected will feed into the analyses in WP5 and WP6	WP4, WP6	WP4, WP6	WP4, WP6, WP3	WP4, WP6, WP3, WP1	WP5, WP6, WP7
Online data tracking	Digital information	Digital track of energy consumers	M10-M24	Use data of the implemented internet platforms/apps will be collected	The user data will be used in WP5 to evaluate the range of the used communication strategies	WP5	WP5	WP5, WP3	WP5, WP3, WP1	WP5, WP7
Energy use data	Energy providers	Energy use estimates of consumers	M10-M24	Energy use data will be obtained from energy providers or assessed based on self-reports	The energy use data feeds into the evaluation activities in WP5 and the tool development in WP6	WP5	WP5	WP5, WP3	WP5, WP3, WP1	WP5, WP6, WP7
Interviews	Stakeholders interviews	Responses of key informants and stakeholders	M8-M24	Personal interviews with selected participants will be conducted especially early in the implementation phase of the interventions to assess barriers and facilitators	The data from the interviews will be used to adjust the implementation of the interventions in WP4 and feed into the evaluation activities in WP5 and the tool construction in WP6	WP5	WP5	WP5, WP3	WP5, WP3, WP1	WP5, WP6, WP7
Focus group	Focus group discussions	Responses of focus group participants	M8-M24	Focus group interviews with selected participants	The data from the focus groups will be used to adjust	WP5	WP5	WP5, WP3	WP5, WP3, WP1	WP5, WP6, WP7

				will be conducted especially early in the implementation phase of the interventions to assess barriers and facilitators	the implementation of the interventions in WP4 and feed into the evaluation activities in WP5 and the tool construction in WP6					
Netnography	Social media	Information on consumers' social media use and social dynamics	M6-M24	Expressions of energy users in publicly accessible internet fora will be analysed (post, tweets, comments, etc.)	The data will contribute to assessing the effects of the interventions. In WP5 and the tool development in WP6	WP3	WP3	WP3	WP3, WP1	WP5, WP6, WP7
Workshops	Workshop discussions	Responses of workshop participants	M2-M21	Co-creation workshops with the user partners will be conducted to design and adjust the intervention packages	A series of national and joint workshops develop a common understanding of the intervention techniques and their adjustment to real-world conditions	WP2, WP4	WP2, WP4	WP2, WP4	WP2, WP4, WP3	WP4, WP7
Decision-making architecture	The historical and primary data sources	Data from secondary sources and data from ENCHANT	M17-M28	The AI analyses will build on primary and secondary quantitative data collected in ENCHANT	The AI algorithms will analyse primary and secondary quantitative data to define the decision support tool. The tool will be a major part of the exploitation plan.	WP6	WP6	WP6	WP6	WP6, WP7

Annex II: Documentation of consent forms

This Annex collects all Consent Forms and Information Sheets used in ENCHANT.

The first included document is the template for ENCHANT information sheets based on the general template provided by the Norwegian Centre for Research Data (NSD).

Copies of Information Sheets and declaration of Consent Forms from the partners will be included in the updated DMP.

NSD Template

This is a template for informed consent when processing personal data in research projects.
It can be used for surveys, observation, interviews, sound recordings, etc.

Please delete the text in italics and insert your own text

NB! The information must be concise and easily understandable for the reader.
Use clear and simple language, headings, and bullet points, active (not passive) language, avoid foreign words.

Are you interested in taking part in the research project *"(insert title of the project)"*?

This is an inquiry about participation in a research project where the main purpose is to *[Insert a brief description of the project purpose]*. In this letter, we will give you information about the purpose of the project and what your participation will involve.

Purpose of the project
Describe the purpose of the project in more detail and indicate the scope of the project.
Briefly outline the project's objectives/research questions
Indicate whether it is a research project, a doctoral thesis, a bachelor's/master's thesis, other student projects etc.

If you or others will use the collected personal data for other purposes (e.g., teaching or other research projects), describe these other purposes.

Who is responsible for the research project?
[Insert name of the institution(s)] is the institution responsible for the project.

If applicable, provide names and describe the cooperation with other institutions, external entities etc.

Why are you being asked to participate?
Describe how the sample has been selected (population, selection criteria and how many people have been asked to participate) so that it is clear why the person is receiving this inquiry

If applicable, indicate whether you have received the person's contact details from another (and indicate any approval/permission obtained in order to do this), or whether another has sent out this information letter on your behalf.

What does participation involve for you?

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Describe the methods (online/paper-based survey, interview, observation, etc.), the scope, what type of information will be collected and how the information will be recorded (electronically, on paper, sound/video recording), e.g.,

- *« If you chose to take part in the project, this will involve that you fill in an online survey. It will take approx. 45 minutes. The survey includes questions about (describe the most important questions/topics). Your answers will be recorded electronically»*

If applicable, indicate that you also will collect information about the participant from other sources – such as registers, records/journals, educational records, other project participants, etc., e.g.:

- *«I will also ask your teacher to provide information about you in an interview. It will be information about (describe the most important questions/topics). I will record the interview and will take notes»*

If children will participate, provide information that parents/guardians may on request see the survey/interview guide etc. in advance.

If there are multiple groups of participants, be clear about what participation will involve for each group or give a separate information letter to each group.

Participation is voluntary

Participation in the project is voluntary. If you chose to participate, you can withdraw your consent at any time without giving a reason. All information about you will then be made anonymous. There will be no negative consequences for you if you chose not to participate or later decide to withdraw.

Expand on this if the person being asked to participate is in a situation where they are dependent on the person asking. E.g., «It will not affect your treatment at the hospital / your relationship with your school/teacher, place of work/employer etc.(..)»

Your personal privacy – how we will store and use your personal data

We will only use your personal data for the purpose(s) specified in this information letter. We will process your personal data confidentially and in accordance with data protection legislation (the General Data Protection Regulation and Personal Data Act).

- *Describe who, in connection with the institution responsible for the project, will have access to the personal data (e.g., the project group, student and supervisor, etc.)*
- *Describe which measures you will take to ensure that no unauthorized persons are able to access the personal data, e.g., «I will replace your name and contact details with a code. The list of names, contact details and respective codes will be stored separately from the rest of the collected data», you will store the data on a research server, locked away/encrypted, etc.*

If applicable, indicate:

- *the name of the data processor that will collect/work with/store data, e.g., online survey provider or transcription service*

- *that persons from other institutions will be given access to the personal data, name the institutions, indicate the number of people and what type of information they will have access to (e.g., whether they will have access to data that can be directly linked to individual participants, or to collect data that has been de-identified)*
- *that personal data will be processed outside the EU (e.g., fieldwork, analysis, cloud computing, conferences), name the institution and country, describe security measures.*

Describe whether participants will be recognizable in publications or not, and to what extent. If applicable, indicate what type of personal information will be published (e.g., name, age, occupation etc.).

What will happen to your personal data at the end of the research project?
The project is scheduled to end *[insert date]. Describe what will happen to the personal data, including any digital recordings, at the end of the project.*

If the collected data will not be anonymised at the end of the project: indicate the purpose of further storage/use of personal data (e.g., verification, follow-up studies, archiving for future research), indicate where the personal data will be stored, who will have access to it, and the date for anonymisation (or, if applicable, specify that the personal data will be stored indefinitely and give a reason for this).

Your rights
So long as you can be identified in the collected data, you have the right to:
- access the personal data that is being processed about you
- request that your personal data is deleted
- request that incorrect personal data about you is corrected/rectified
- receive a copy of your personal data (data portability), and
- send a complaint to the Data Protection Officer or The Norwegian Data Protection Authority regarding the processing of your personal data

What gives us the right to process your personal data?
We will process your personal data based on your consent.

Based on an agreement with *[insert name of the institution responsible for the project]*, NSD – The Norwegian Centre for Research Data AS has assessed that the processing of personal data in this project is in accordance with data protection legislation.

Where can I find out more?
If you have questions about the project or want to exercise your rights, contact:
- *[Insert name of the institution responsible for the project]* via *[insert name of the project leader]. For student projects, you must include contact details for the supervisor/the person responsible for the project, not just the student.*
- Our Data Protection Officer: *[insert name of the data protection officer at the institution responsible for the project]*

- NSD – The Norwegian Centre for Research Data AS, by email: (personverntjenester@nsd.no) or by telephone: +47 55 58 21 17.

Yours sincerely,

Project Leader   Student (if applicable)
(Researcher/supervisor)

Consent form

Consent can be given in writing (including electronically) or orally. NB! You must be able to document/demonstrate that you have given information and gained consent from project participants i.e., from the people whose personal data you will be processing (data subjects). As a rule, we recommend written information and written consent.
- *For written consent on paper, you can use this template*
- *For written consent, which is collected electronically, you must choose a procedure that will allow you to demonstrate that you have gained explicit consent (read more on our website)*
- *If the context dictates that you should give oral information and gain oral consent (e.g., for research in oral cultures or with people who are illiterate) we recommend that you make a sound recording of the information and consent.*

If a parent/guardian will give consent on behalf of their child or someone without the capacity to consent, you must adjust this information accordingly. Remember that the name of the participant must be included.

Adjust the checkboxes in accordance with participation in your project. It is possible to use bullet points instead of checkboxes. However, if you intend to process special categories of personal data (sensitive personal data) and/or one of the last four points in the list below is applicable to your project, we recommend that you use checkboxes. This because of the requirement of explicit consent.

I have received and understood information about the project *[insert project title]* and have been given the opportunity to ask questions. I give consent:
- ☐ to participate in *(insert method, e.g., an interview)*
- ☐ to participate in *(insert other methods, e.g., an online survey) – if applicable*
- ☐ *for my/my child's teacher to give information about me/my child to this project (include the type of information)– if applicable*
- ☐ *for my personal data to be processed outside the EU – if applicable*

☐ *for information about me/myself to be published in a way that I can be recognised (describe in more detail)– if applicable*

☐ *for my personal data to be stored after the end of the project for (insert purpose of storage e.g., follow-up studies) – if applicable*

I give consent for my personal data to be processed until the end date of the project, approx. *[insert date]*

(Signed by participant, date)

Annexe III: Confirmations by Data Protection Officers

All confirmations regarding the conduction of data collection in accordance with national and international law, especially the General Data Protection Regulation (Regulation (EU) 2016/679) will be collected in this Annex as soon as they are available. Copies of declarations from the ethical committees and data protection officers or authorities will be included in the updated DMP.

Annex IV: Data documentation templates

The following two templates shall be used to document the necessary background of the data files for internal and external use in ENCHANT.

1) Data documentation template for qualitative data in ENCHANT
2) Data documentation template for quantitative data in ENCHANT

1) Data documentation template for qualitative data in ENCHANT

Name of the data set: _____   Date the data set was finalized: _____

Date/time period the data was collected: _____ to _____.

Responsible partner for the collection of the data:

_____ (name) _____(institution)

Data produced in WP: _____   Task: _____

Data anonymised on (date): _____ by _____

Information about the participants:

Number: _____   Age: _____ Sex: _____

Participants' background: _____

Recruitment procedure: _____

Original language of the material: _____

Data collected by (interviewer): _____

Transcribed by: _____

Transcription rules: _____

Translated to English by: _____

Ethically cleared by: _____ on (date): _____

Interview guidelines (or the like): _____

Size of the data (e.g., number of words): _____

Short summary: _____

2) Data documentation template for quantitative data in ENCHANT

Name of the data set: _____   Date the data set was finalized: _____

Date/time period the data was collected: _____ to _____.

Responsible partner for the collection of the data:

_____ (name) _____(institution)

Data produced in WP: _____   Task: _____

Data anonymised on (date): _____ by _____

Information about the participants:

Number: _____   Age: _____ Sex: _____

Participants' representative for which population: _____

Recruitment procedure: _____

Response rate: _____

Original language of the material: _____

Translated to English by: _____

Ethically cleared by: _____ on (date): _____

Variables in the dataset:

Variable name	Variable type	Variable label	Answering format/value labels	Comments

Variable types:
- T = text
- D = date / time
- B = binary / dichotomous
- C = categorical
- O = ordered categorical / ordinal
- I = interval / ratio / Likert scales with 5 or more categories

Short summary: _____

Annex V: Recommended technical and organizational measures (TOMs)

1. General

☒ Employees have demonstrably been trained in data protection law and data security.
☒ All employees are demonstrably obliged to maintain data secrecy and, if applicable, telecommunications secrecy.

2. Confidentiality (Article, 32 paragraph 1, point (b) GDPR)

2.1 Physical access control

Technical measures	Organisational measures
(Manual) locking system	Visitors in company are accompanied by an employee
☒ Safety lock	Reception
	Management of locking system
	Care in the selection of cleaning staff

2.2 Data access control

Technical measures	Organisational measures
Auto-lock for display	general data protection and/or security policy
Anti-virus-software	Creation of user profiles
VPN for remote access	"Secure password" policy
Firewall	
Management of user accesses and permission	
Login with username + password	
Mobile Device Management	
Encryption of notebooks/tablets	

2.3 Data usage control

Technical measures	Organisational measures
Document shredder (in accordance with ISO/IEC 21964-1)	The minimum necessary number of persons with administrative access
External shredder (in accordance with ISO/IEC 21964-1)	User rights/user profiles
	Proper destruction of data carriers
	Administration of user rights by administrators

3. Integrity (Article 32, paragraph 1, point (b) GDPR)

3.1 Input control

Technical measures	**Organisational measures**
Manual or automated control of the logs (depending on the application)	Traceability of input, change and deletion of data through individual usernames (not user groups) (depending on the application)
Technical logging of the input, change and deletion of data (depending on the application)	

3.2 Transfer control

Technical measures	**Organisational measures**
Data provision via encrypted connections Use of VPN	Personal handover with protocol Care in the selection of transport personnel and vehicles
Optional Email encryption Establishment of leased lines or VPN tunnels Firewall: state-of-the-art firewall technologies have been implemented and are kept up to date	

4. Availability and resilience (Article 32, paragraph 1, point (b) GDPR)

Availability Control

Technical measures	**Organisational measures**
RAID system / hard disk mirroring	Keeping of backup media in a safe place outside server room à Off-site-Backup
uninterrupted power supply (UPS) server room monitoring (temp./humidity)	Formulated backup & recovery concept Separate partitions for operating system and data storage No sanitary connections in or above the server room Periodic data recovery testing and recording of results

5. Regular review, assessment and evaluation procedures (Article 32, paragraph 1, point (d) GDPR)

5.1 Data Protection Management

Organisational measures

Assigned data protection officer

Employees trained and committed to confidentiality

Regular awareness-raising of employees (at least annually)

The data protection impact assessment (DPIA) is carried out if necessary

The organization complies with the information requirements according to Article 13 and 14 GDPR

Formalized process for processing information requests from those affected

5.2 Incident-Response-Management

Technical measures

Use of firewall and regular update

Use of virus scanners and regular updates

Order control

Organisational measures

Selection of the contractor based on due diligence (with regard to data protection and data security)

Conclusion of the necessary agreement for order processing or EU standard contractual clauses

In the case of long-term cooperation: an ongoing review of the contractor's level of protection

Control of the execution of the contract

Regulation on maintenance (especially remote maintenance)

Written instructions to the contractor

Agreement on effective control rights towards the contractor

The obligation of the contractor's employees to maintain data secrecy

Existing agreements for order processing

Prior examination of the security measures taken by the contractor and their documentation