

## D4.1 Guidelines and Operational Intervention Plan

**The guidelines, application principles, and an operational implementation plan for the pilots**

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# ENCHANT Report

Guidelines and Operational Intervention Plan  
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## ABSTRACT

The overarching objective of the ENCHANT project is to stimulate a shift towards more sustainable energy behaviours in European households in general. Thus, the implementation of the interventions using the RCT (Randomized Control Trials) design is a crucial component of the ENCHANT methodology. In order to achieve the desired objectives, the interventions should be appropriately designed, implemented, and monitored, in coordination with the involved partners. Also central to the success of the interventions is planning for the data requirements and data collection processes. This deliverable provides comprehensive guidelines and an operational plan for the ENCHANT interventions, covering the following three stages: intervention planning and design, intervention implementation, and analysis and reporting. In addition to the operational aspects, the guidelines and operational plan also specify the planning requirements pertaining to the supporting administrative structure, assignment of staff roles and responsibilities, and potential issues and barriers arising during implementation, with recommendations for overcoming these, and for dealing with ethical issues that need to be addressed.

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## EXECUTIVE SUMMARY

Interventions are central in the methodology of the ENCHANT project. The interventions will be implemented using the RCT (Randomized Control Trials) research design, in coordination with the user-partners, scientific partners, and other relevant stakeholders.

Given the multitude of factors to be considered regarding the design, implementation, monitoring, and reporting phases, the need to implement the interventions over specified timelines, data collection requirements, and the necessity of establishing coordination mechanisms, it is necessary to describe the general rules and guidelines for the interventions, ensuring comparability and high data quality across all implementations. To this end, this deliverable provides a comprehensive documentation of the guidelines and the operational plan, which will also serve as a hands-on guidebook for the intervention implementations.

The systematic structure in the deliverable analyses the intervention process in three stages: i) intervention design and planning, ii) intervention implementation, iii) analysis and reporting. The intervention design and planning stage addresses the planning requirements for the definition, design, and pre-implementation preparation steps. The implementation stage involves the steps of recruitment, randomization, setting the timeline, communication, coordination, intervention kick-off, monitoring and implementation, and intervention completion. Planning requirements for the analysis and reporting stage cover the analysis, reporting, and data management and storage steps.

In order to establish adherence to the guidelines and operational plan, enhance coordination, monitor the intervention progress, and implement corrective actions in case of deviation from the plans, six milestones for the interventions are defined. These are Recruitment, Pre-intervention data collection, Intervention kick-off, Monitoring, Intervention closure, and Post-implementation data collection. Each milestone is tracked by periodic checks and reporting throughout the intervention, on the target dates, status, and possible or actual deviations from the timeline.

Along with the operational planning requirements, it is also important to address the administrative structure, assign roles and responsibilities of the staff, user-partners and scientific partners for the interventions, and monitor them. To this end, the guidelines and operational plan also involves the planning requirements for the administrative structure with a detailed definition for the key roles and responsibilities for recruitment, implementation and monitoring, data collection, and data protection officer.

Ethics requirements need to be considered in every phase of the interventions. Considering the recruitment processes, data collection requirements and other interactions with stakeholders, ethics concerns become especially important for the ENCHANT interventions. Acknowledging this fact, the guidelines and operational plan defines the planning requirements for the ethics issues that may arise during the design and implementation of the interventions as well as the data processing and reporting phases (ENCHANT, 2021b). The main points addressed are the recruitment process,



informing and consent procedures, data collection, required anonymization of data, and data storage.

The last section of the guidelines and operational planning is devoted to a comprehensive framework for intervention reporting. The framework is built on a structure that involves problem definition, intervention strategy, intervention design, objectives, methodology, data requirements, and analysis and discussion of the intervention.



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# 1. Introduction and Background

The ENCHANT project aims to realize the energy efficiency potential in the general public by means of behavioural change. To this end, the project targets millions of European citizens, utilizing a Randomized Control Trial (RCT) approach. The behavioural change potential will be tested through interventions to be implemented through existing communication channels used by energy providers, municipalities, and environmental NGOs. This allows the impacts of these interventions to be tested in real life settings.

This deliverable outlining guidelines and the operational intervention plan for the interventions of ENCHANT has been prepared as a part of WP4, integrating a number of systematic frameworks (Sundnes, 2014a; Sundnes, 2014b; Sundnes, 2014c; Hales et al., 2016). This section provides insights regarding the overall framework of ENCHANT and outlines the current progress.

In recent years, the European Commission has put great emphasis on decarbonizing European lifestyles and economies. Accordingly, the European Climate Pact sets ambitious goals for reducing the carbon emissions resulting from energy production and increasing energy demand (EC, 2021). Hence, the concept of energy transition gains significance, focusing on energy efficiency as a key pillar. Energy efficiency implementations and improvements at the household level are substantial targets to accelerate the energy transition. To this end, ENCHANT designs and implements interventions aimed at improving household energy efficiency. The interventions will be implemented under controlled conditions in an unprecedented large-scale effort, targeting millions of European citizens, using a Randomized Control Trial (RCT) approach. The expected outcome is behavioural change in energy consumption habits.

Overall, ENCHANT has three fundamental objectives. The first and overarching objective is to influence the European households' energy behaviour in a more sustainable direction under real-life conditions, particularly encouraging energy efficiency, thereby supporting international, national, regional, and local policies on the way towards global sustainability transition. Secondly, ENCHANT also aims to review and systematize existing theoretical models, empirical data and best practices regarding the implementation of psychological interventions, steering human behaviours towards more sustainable energy choices. This approach seeks to address a knowledge gap concerning which of the various interventions are most successful in changing different types of behaviour, and under which conditions which type of sender, through which kind of communication channels, can most effectively implement these behaviour patterns. The final main objective of ENCHANT is to identify existing knowledge about psychological, social and contextual drivers of energy choices and sustainable energy lifestyles in European society through a multi-disciplinary approach. Accordingly, the ENCHANT project will highlight how these factors can be more effectively addressed in practical interventions, and how



they might be implemented, replicated and upscaled at the level of European, national and local institutions.

With this framework of objectives, ENCHANT has set a target of reaching 8.4 million European households in six countries, covering the cultural variability of Europe. In so doing, the project will consider different sets of intervention types, user-partners' categories, targeted behaviours, and communication channels. Thus, the interventions are central in the methodology of ENCHANT.

The design of the ENCHANT interventions utilizes seven typologies of behavioural interventions, proven scientifically to have an effect on behaviour (ENCHANT, 2021c):

- a) **Feedback** on own consumption involves providing feedback to participants on their past and current behaviour, specifically their electricity consumption. The intervention aims to inform individuals about their consumption patterns, change their energy behaviour, based on the received feedback.
- b) **Social norms** are based on providing participants with information about the behaviour of relevant others and about the socially acceptable standards of behaviour. In this way, the main objective of the intervention is to provide individuals with information about behaviour pertaining to the amount of energy that other households consume and eliciting their approval or disapproval of specific behaviours which could lead to a behavioural change.
- c) **Information** including **simplification** aims to provide people with targeted information. Information strategies are based on the principle that greater accessibility of information about the environmental impact of own activities will encourage people to adopt energy conservation behaviour.
- d) **Monetary incentives** as an intervention type are prominent to understand the degree to which saving money is a motivation for energy-related behaviours since incentives and costs delineate and constrain people's decisions.
- e) **Commitment** is a type of intervention in which participants are asked to commit to a specific behaviour to consume less energy. Commitment strategies are particularly useful to energy-related and other sustainable behaviours.
- f) **Competition** creates a context in which participants with the best performance are rewarded. Competition campaigns aim to engage people not only in energy conservation behaviour but also in increasing awareness, understanding and knowledge of the connection between behaviour change and energy use.
- g) **Collective vs. individual framing** concerns whether sustainable initiatives are presented as a collective or an individual phenomenon, and how these alternatives affect people's behaviour. In fact, framing may influence the individual choice between a series of given alternatives and may thus lead individuals to engage in different behaviours with different impacts on the environment.



The interventions to be tested in ENCHANT will be implemented in various geographical, cultural and organizational contexts in Europe. For this purpose, three main typologies of formalized actors focusing on different groups and categories of target populations will take a key. The three categories of user-partners are:

- a) **Energy providers and/or producers** (electricity, gas) take an active role for supplying large customer databases, providing an opportunity to test interventions that are aiming to use strategies based on consumption feedback, information, and social norms in relation to individual's and households' energy consumption.
- b) **Municipalities and governmental energy agencies** (centralized or local) will run information campaigns reaching large numbers of citizens, with the aim of developing and testing interventions based on strategies such as information, commitment or competitions, to promote greater sustainability in energy behaviours among the larger public.
- c) **NGOs in the energy and sustainability sector** will take the opportunity to involve specific stakeholders or organized groups in the civil society and the public, in order to develop and test interventions based on strategies such as commitment, information, or social norms for the promotion of a sustainable energy transition and sustainable lifestyles.

The user-partners of ENCHANT along with their categories are depicted in Table 1 below:

*Table 1. User-partners in ENCHANT*

User-partner	Category	Country
Energie Kompass	Consultancy	Austria
Badenova <i>(with City of Freiburg, and KPO)</i>	Energy provider <i>(Local government/Municipality, NGO in energy and sustainability sector)</i>	Germany
Energia Positiva	Energy provider	Italy
FONDAZIONE ROFFREDO CAETANI <i>(Fondazione)</i>	NGO in the energy and sustainability sector	Italy
Naturvernforbundet	NGO in the energy and sustainability sector	Norway
Viken County	Local government/Municipality	Norway
Asociatia Centrul pentru Studiul Democratiei	NGO in the energy and sustainability sector	Romania



(ACSD)		
Cluj-Napoca Municipality	Local government/Municipality	Romania
Electrica Furnizare	Energy provider	Romania
Gediz Energy Company (GDZ)	Energy provider (electricity)	Turkey
Izmir Metropolitan Municipality	Local government/Municipality	Turkey

The user-partners will implement intervention packages defined by scientific partners on the basis of a systematic RCT approach. In this way, ENCHANT will aim to replace a broad range of energy-related behaviours with those with high energy saving potentials, through behavioural change. These behaviours include:

- a. **Investment behaviour** encourages people to invest in energy efficient technology, building upgrades and/or transport (e.g., house renovations, replacing electric appliances with more energy efficient ones)).
- b. **Maintenance behaviour with relation to energy efficiency** promotes household equipment that maintains high energy efficiency (e.g., maintenance of heaters, cars, tires, water heaters, etc. relevant to high energy efficiency).
- c. **Everyday energy saving behaviour** encourages people to adopt high impact energy behaviour at home and more sustainable mobility behaviour (e.g., reducing heating, cooling, and consumption of hot water; changing transport mode including trip chaining, co-driving, increased use of public transport, e-biking, biking, etc.).

The user-partners will utilize their existing and prospective communication channels to reach out to the target populations and implement interventions designed to create changes in energy-related behaviours. These communication channels include press, advertising, applications, SMS messages, smart phone apps, and web portals.

Meetings between scientific partners and user-partners were held to design the interventions per user-partner. The intervention types were evaluated for each user-partner, based on technical compatibility, geographical fit, availability and accessibility of communication channels, and the likelihood of attaining expected impact. As a result, the intervention packages were matched with the user-partners, and the associated communication channels were selected and fine-tuned for smoother implementation and greater impact. Following the matching of intervention packages with the user-partners, the targeted behavioural changes and data requirements were also determined.



Table 2 below shows types of interventions to be implemented that are determined, the targeted behavioural change, communication channel and data collection instruments.

*Table 2. Planned Intervention Strategies, Instruments and Design (based on user-partners' involvement)*

User-partner	Type of Intervention	Targeted Behaviour	Communication Channel	Data Collection Instrument
Energie Kompass – 7energy platform	• Information provision	• Energy savings behaviour	Self-reporting of energy consumption/saving through 7energy platform	7energy platform Electricity bills
Energie Kompass – Energy Account App	• Monetary incentives	• Energy savings behaviour	Energy account app	Energy account app Electricity bills
Badenova - Hansgrohe	• Information • Incentives	• Maintenance behaviour • Consumption behaviour	Interview on water and energy consumption habits (questionnaire) Installation of the “Pontos” system Interview after 4-6 weeks on water and energy consumption (questionnaire / interview)	Pre & post survey (interview) Questionnaire
Badenova - Solar Panel (with City of Freiburg and KPO)	• Information	• Energy consumption behaviour • Investment behaviour	Households have to respond to a questionnaire as candidature for the competition (also using channels from City of Freiburg and the NGO KPO) Selection of the winning household (according to technical criteria +	Questionnaire Interview



			<p>person not (previously saving energy on a daily basis)</p> <p>Installation of the solar panel</p> <p>Interview of the person 4-6 weeks after installation of the solar panel</p>	
Energia Positiva	<ul style="list-style-type: none"> <li>• Information</li> <li>• Feedback</li> <li>• Social norms</li> </ul>	<ul style="list-style-type: none"> <li>• Energy consumption behaviour</li> <li>• Investment behaviour</li> </ul>	<p>Questionnaire on energy consumption/investment behaviours</p> <p>Measured consumption overall/peak (referring to specific hours)</p>	<p>Questionnaire Self-report Electricity bill</p>
Fondazione (Ninfa Garden and Hydroelectric Power Plant)	<ul style="list-style-type: none"> <li>• Information</li> <li>• Incentives</li> </ul>	<ul style="list-style-type: none"> <li>• Investment behaviour</li> <li>• Maintenance behaviour</li> </ul>	<p>Questionnaire on energy consumption/saving behaviour and pro-environmental practices</p> <p>Immersive tour to the hydroelectric power plant</p> <p>Informative brochure about hydroelectric power plant</p>	<p>Questionnaire Self-report Contribution to charity box for maintenance</p>
Naturvernforbundet and Viken County	<ul style="list-style-type: none"> <li>• Information</li> <li>• Feedback</li> <li>• Social norms</li> </ul>	<ul style="list-style-type: none"> <li>• Energy savings behaviour</li> </ul>	<p>Self-reported behaviour on energy use behaviour,</p>	<p>Website for information, initial survey,</p>



(Website)	<ul style="list-style-type: none"> <li>• Commitment</li> </ul>		<p>energy consumption (kW and costs) pre- and post-intervention</p> <p>Information about how the people ended up on the website</p> <p>User behaviour on the website</p> <p>Self-reported energy consumption (kW and costs) pre- and post-intervention</p> <p>Comparison of who checks out the website and who does not (as far as possible)</p>	<p>and follow-up survey</p> <p>Email</p> <p>(TBD)</p>
Naturvernforbundet and Viken County (Energy upgrades)	<ul style="list-style-type: none"> <li>• Information</li> <li>• Feedback (energy audit)</li> </ul>	<ul style="list-style-type: none"> <li>• Energy savings behaviour</li> <li>• Investment behaviour</li> <li>• Maintenance behaviour</li> </ul>	<p>Self-reported investment and maintenance behaviour</p> <p>Monitoring activities on the web-counselling platforms measuring various activities.</p> <p>Measured and self-reported energy consumption (kW and costs)</p> <p>Changes in energy investment related mind-sets</p>	<p>Website</p> <p>Email</p> <p>Focus groups</p> <p>(TBD)</p>
Electrica (online)	<ul style="list-style-type: none"> <li>• Information including simplification</li> </ul>	<ul style="list-style-type: none"> <li>• Adjustment of everyday behaviours and behaviours in</li> </ul>	<p>Questionnaire</p> <p>Self-reported energy consumption/saving behaviour and pro-</p>	<p>Questionnaire</p> <p>Self-report</p>



	<ul style="list-style-type: none"> <li>• Feedback on own Consumption</li> <li>• Commitment</li> <li>• Social norms</li> </ul>	the private sphere	environmental practices, lifestyles Consumption data including historical data	
Electrica (offline)	<ul style="list-style-type: none"> <li>• Information including simplification</li> <li>• Feedback on own Consumption</li> <li>• Commitment</li> <li>• Social norms</li> </ul>	<p>Adjustment of everyday behaviours and behaviours in the private sphere</p> <ul style="list-style-type: none"> <li>•</li> </ul>	<p>Questionnaire (optional) Consumption data including historical data Other socio-demographic data owned by the company with respect to the specific consumers.</p>	Questionnaire Consumption data
Gediz Electricity	<ul style="list-style-type: none"> <li>• Information</li> <li>• Feedback</li> <li>• Social norms</li> </ul>	<ul style="list-style-type: none"> <li>• Energy savings behaviour</li> </ul>	Gediz smart phone app	Electricity bill
Izmir Metropolitan Municipality	<ul style="list-style-type: none"> <li>• Information</li> <li>• Social norms</li> </ul>	<ul style="list-style-type: none"> <li>• Energy savings behaviour</li> </ul>	<p>Izmir Metropolitan Municipality's transportation Database - IZULAŞ BizIzmir platform (web-based interactive platform hosted by the Izmir Metropolitan Municipality for information exchange, announcements, surveys etc.)</p>	<p>Survey Self-report through the questionnaire on the BizIzmir platform</p>



ACSD	• N/A	• N/A	N/A	N/A
Cluj Napoca	• N/A	• N/A	N/A	N/A

The design of interventions for some of the user partners yet to be finalized will be included as they become available.

## 2. Overview of The Tasks, Objectives and Goals

The pilot interventions are the parts of ENCHANT's work which utilizes psychological interventions to steer behavioural change towards sustainable energy choices and green lifestyles. In this sense, the interventions are also means of identifying the specific circumstances under which intervention designs can be successfully and effectively implemented.

For these purposes, the first step is the development of intervention packages (WP2). This started with a comprehensive review of psychological interventions geared towards changing human behaviour regarding sustainable energy choices. In doing so, existing theoretical models, available empirical data, best practice implementations are analysed. This analysis identified the psychological, social, and contextual drivers of energy choices, and sustainable energy lifestyles in the European society, highlighting how these drivers can be utilized in designing test interventions with scale-up potential.

In the next step, procedures and protocols will be defined for standardised intervention packages, which will be used in the preparation of specific intervention procedures and protocols to be implemented by each user partner in conducting the behavioural interventions. A significant component of this is the intervention matrix and the experimental research protocol.

The methodological technique for the experimental setup concerning the interventions relies on the implementation of RCTs. The RCT approach involves an experimental design requiring the identification of:

- the main independent variables
- the implementation strategy and the main communication channels to be used
- the outcome indicators to be taken for monitoring and assessing the success of the interventions.



After the definition of the details of the interventions (e.g., the interventions to be implemented by particular user partners, the communication channels to be used, and the intervention matrix), the guidelines, application principles, and an operational implementation plan for the pilots will be developed (WP4). This implementation plan includes the relevant preliminary work for the implementations, the actual implementation, and a time-phased planning and execution of monitoring and follow-up mechanisms. The development of guidelines will aim at ensuring the appropriate timeline, resource and operational planning to maximize the likelihood of attaining expected impact, and to enhance the replicability and reproducibility of interventions. In parallel, the monitoring plan will define the monitoring and follow-up mechanisms to assure the planned implementation of the interventions and collection of required data for evaluating the results thereof.

Following the completion of the interventions, the impacts corresponding to categories of policy support, awareness, outreach to general public, interventions, households, primary energy savings, reduction of greenhouse gas emissions, investments, and additional impacts will be measured through the KPIs (WP5). Another assessment will focus on the limitations, replicability and upscaling potentials of the interventions, according to the national, regional, or local frameworks. The information and experience derived from the interventions will be utilized to identify enablers and barriers in implementation and seek for ways to increase the potential for enablers to overcome barriers in real life situations.

Finally, this knowledge base will be transformed by the matching of policy instruments with the interventions. That is, a policy instrument matrix will be developed, in which all interventions with potential will be matched with policy-ready recommendations for their implementation.

Figure 1 below depicts the work package structure of ENCHANT, highlighting the workflow and interactions between the above-mentioned work packages (ENCHANT, 2020).



## ENCHANT WORK PACKAGES, WORKFLOW, AND INTERACTIONS

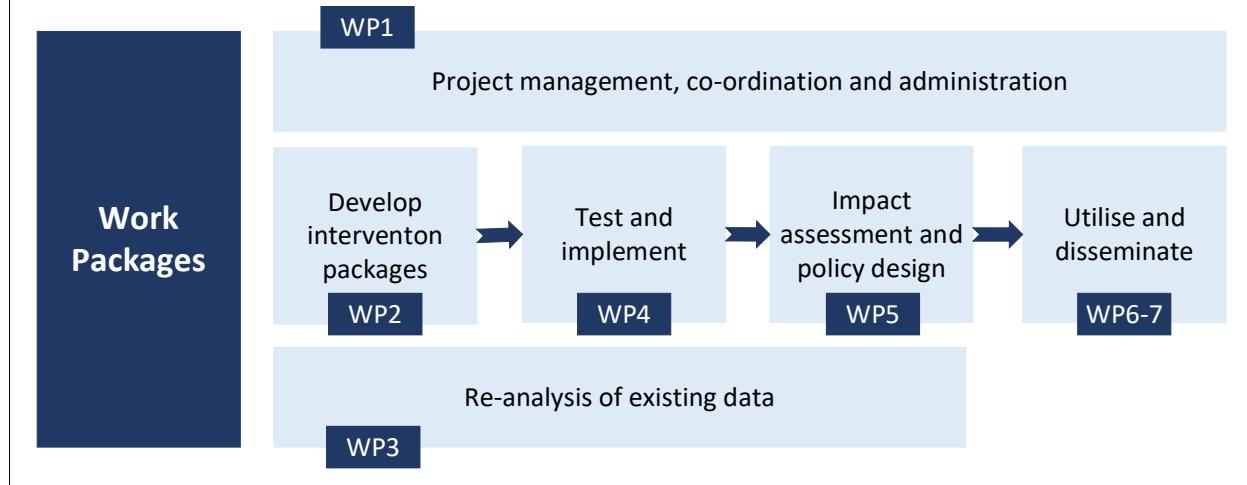


Figure 1. ENCHANT Work Packages, Workflow, and Interactions

### 3. Methodology

The interventions are significant in terms of ENCHANT's concept and methodology. Interventions to promote sustainable energy transition have been in the focus of psychological and behavioural research fields from the 1970s. Interventions are described as systematic actions or programs aiming to act on "people's abilities and motivation to engage in sustainable energy action". These types of interventions are valuable strategic tools to stimulate behavioural change promoting sustainable energy transitions, and to unlock the energy efficiency potential across social groups and sections of the general public. ENCHANT involves the design and implementation of the relevant interventions in different districts and cities through different user partners, with the Randomized Controlled Trial (RCT) methodology.

Randomized Control Trial (RCT) is a type of experiment in which the subjects are randomly assigned to one of two or more groups, defined as experimental and control groups (Kendall, 2003). The experimental group(s) receive an intervention to be tested while the control group is subject to an alternative (generally conventional) or no treatment. Consequently, the two groups are observed to identify any differences between them. RCTs are central to determining the causal relationship between the intervention and the outcome (Sibbald and Roland, 1998). One important criterion for applying RCTs is choosing the appropriate target population for the intervention (Begg et al., 1996). In the literature, there are various examples of studies using the RCT methodology in energy efficiency studies. Andor and Fels (2018) conduct an analysis of behavioural interventions



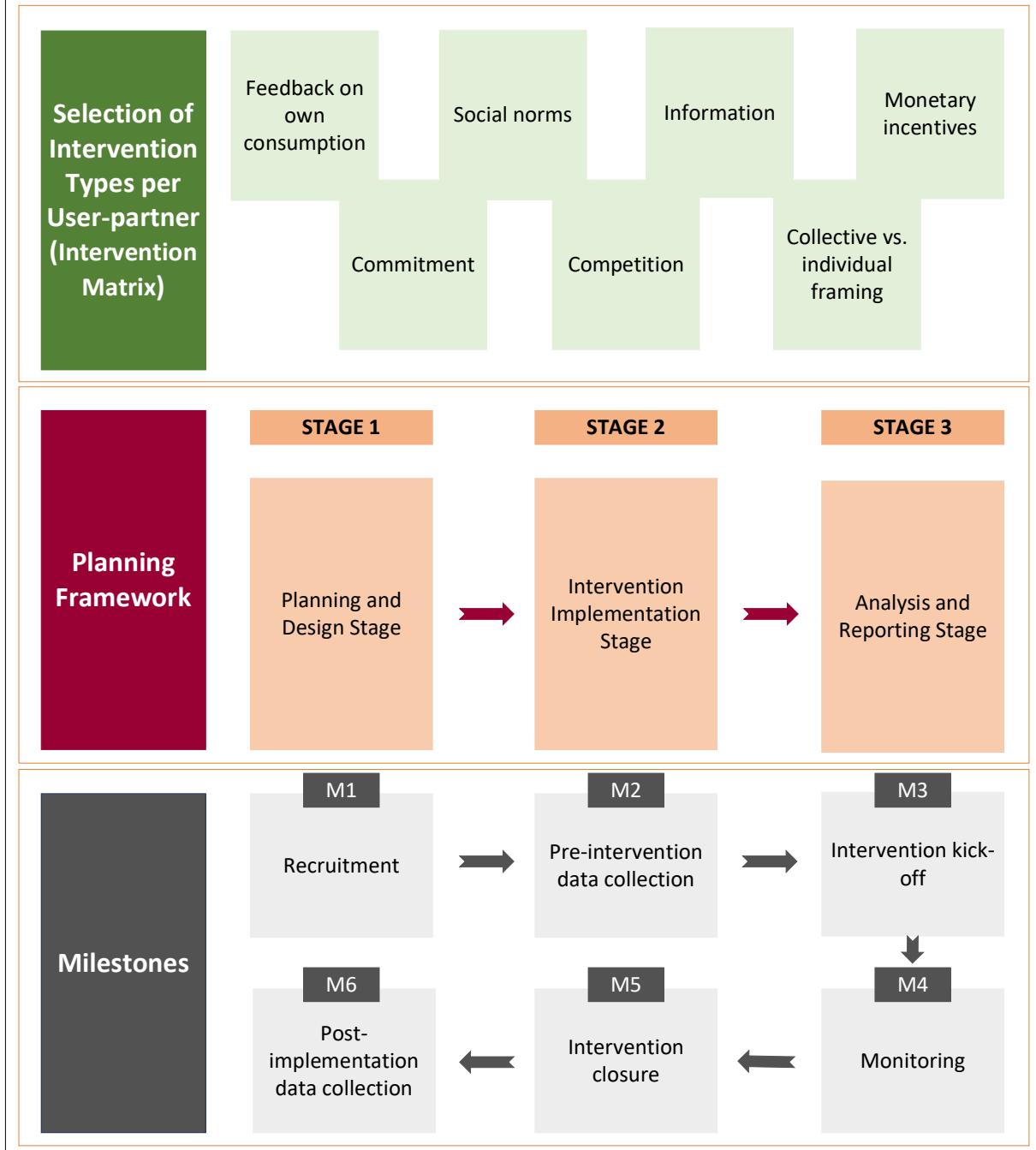
reported in 44 studies from 1978 to 2017, with a particular focus on social confrontations, engagement devices, goal setting and labelling on energy usage. In their meta-analysis, the authors use data from RCTs, identifying the causal relationship between the intervention and the outcome of interest. Similarly, Nisa et al. (2019) perform an analysis on voluntary behavioural changes in households and individuals through a meta-analysis of 83 randomized controlled trials.

ENCHANT uses RCT to make the study scientifically vigorous. To this end, the RCT will aim to single out the marginal or joint effects of the selections of independent parameters on the dependent parameters. The experimental design in ENCHANT will be based on the selection of different dependent and independent variables, number of trials, and sample and sample size choice. In other words, instead of a full-factorial experimental design in which all possible factors are combined, the project will construct and test scenarios, where each scenario is defined by the specification of the parameter(s) selected as dependent variable(s) and the parameters selected as independent variable(s). This means that it is not possible to apply each and every intervention (and all thinkable combination of interventions) in all contexts. Rather, only the interventions most relevant to the context will be implemented and assessed in order to conserve resources and provide more reliable results. In addition, the RCTs in the projects will be selected to ensure that the intervention packages and other parameters have the greatest replicability and scalability. This approach provides an opportunity to conduct concrete experiments within generalizable patterns and rules.

Accordingly, the guidelines and operational plan for the interventions is designed using a framework addressing issues of autonomy, information exchange, governance, and clearly defined responsibilities. Figure 2 illustrates the methodological framework for the Guidelines and Operational Intervention Plan, starting from the selection of intervention types per user-partner, and demonstrating the multi-staged planning framework, and milestones to be achieved.



## METHODOLOGICAL FRAMEWORK FOR GUIDELINES AND OPERATIONAL INTERVENTION PLAN



*Figure 2. Methodological Approach in the Guidelines and Operational Intervention Plan*

Various work packages contribute to the design, planning, implementation and monitoring of the interventions in different ways (ENCHANT, 2020), as depicted in Figure 1. Work Package 1 aims to ensure that the project is solid in terms of methodology and ethical considerations. The data management plan (ENCHANT, 2021) formulated as part of WP1 ensures a systematic structure for following the data protection regulations regarding the interventions.



WP2 constitutes the fundamental and first phase of the project through identifying and developing the intervention packages. In WP2, key factors affecting intervention impact on energy behaviour are identified, the intervention packages are designed, and the main independent variables are defined. Moreover, the protocols for standardized interventions for behavioural change are established. This is particularly important in terms of the interventions' replicability, and suitability for upscaling and comparability. The methodological approach to meet these targets in WP2 is based on a comprehensive review of existing behavioural interventions, through published studies, reviews, and meta-analytical synthesising the relevant body of literature.

WP3 makes an inventory of all relevant data sets and conducts a data review in order to inform the development of the intervention packages and their implementation. In this work package, energy efficiency and consumer behaviour data are collected from the user-partners and previous projects. Thus, through a re-analysis of the existing data, triangulation is achieved.

Following the selection and development of the interventions in the first part of the project, WP4 will test and then implement the intervention packages. In this process, the intervention packages are fine-tuned, operational plans are developed, and monitoring mechanisms established for impact assessment. During the project, the intervention packages will be developed and tested with the aim of unlocking full energy efficiency potential.

The implemented interventions in WP4 will be evaluated in the third phase of the project. Hence, WP5 will assess the impact of the tested interventions, as well as their replicability, up-scalability, and limitations, establishing key performance indicators (KPIs) related to the impact categories. These impact categories are: policy support, awareness, outreach to general public, interventions, households, primary energy savings, reduction of greenhouse gas emissions, investments, and additional impacts. Additional impacts include support for digital municipalities, breaking up the silos through linking municipalities, SME, NGOs and research organisations, establishment of business models through collective perspective, opening options for the energy poor, and strengthening trust in the public (see ENCHANT deliverable D5.1 for detailed information). Another aspect of WP5 is the identification of the barriers and success factors for the transfer of best practices and the development of a policy instrument matrix to match the intervention matrix for standardised interventions for behavioural change.

Utilizing and disseminating the results of the interventions through a web-based decision tool constitute the final phase of ENCHANT. Accordingly, in WP6, a decision-making tool will be designed for policymakers, energy providers, NGOs, and municipalities. This involves the transfer of data from WPs 2-5, and supplement the quantitative analyses in WPs 3 and 5, for the purpose of designing a recommender system. The system will use an



algorithm to be developed and trained in WP6. The tool will be adjusted, with the close involvement of user-partners, to meet the needs of the specific user groups, and validated by tests in the pilot environment.

ENCHANT will be presented throughout the project period and beyond via a multimedia platform, designed in WP7. A strategy will be adopted for the effective dissemination and exploitation of the ENCHANT results to all relevant users of the web-based tool. WP7 is particularly important for increasing the project's impact on policy, business, and citizen initiatives in promoting energy efficiency. The results delivered in WP 2-5 will guide the execution of WP7, and the interpretation of the results will consider policy relevance in WP5.

## 4. Planning Factors

Implementation of the interventions requires the completion of a series of tasks for an efficient operational process. To this end, this deliverable on ENCHANT's Intervention Guidelines and Operational Intervention Plan provides a systematic planning framework.

Preparedness is required before the implementation of the intervention, and prior to initiating the intervention, several tasks will need to be completed. The components of the extensive planning framework are divided into three stages, each consisting of respective sub-sections. Figure 3 illustrates the extensive planning framework.



# PLANNING FRAMEWORK FOR ENCHANT INTERVENTIONS

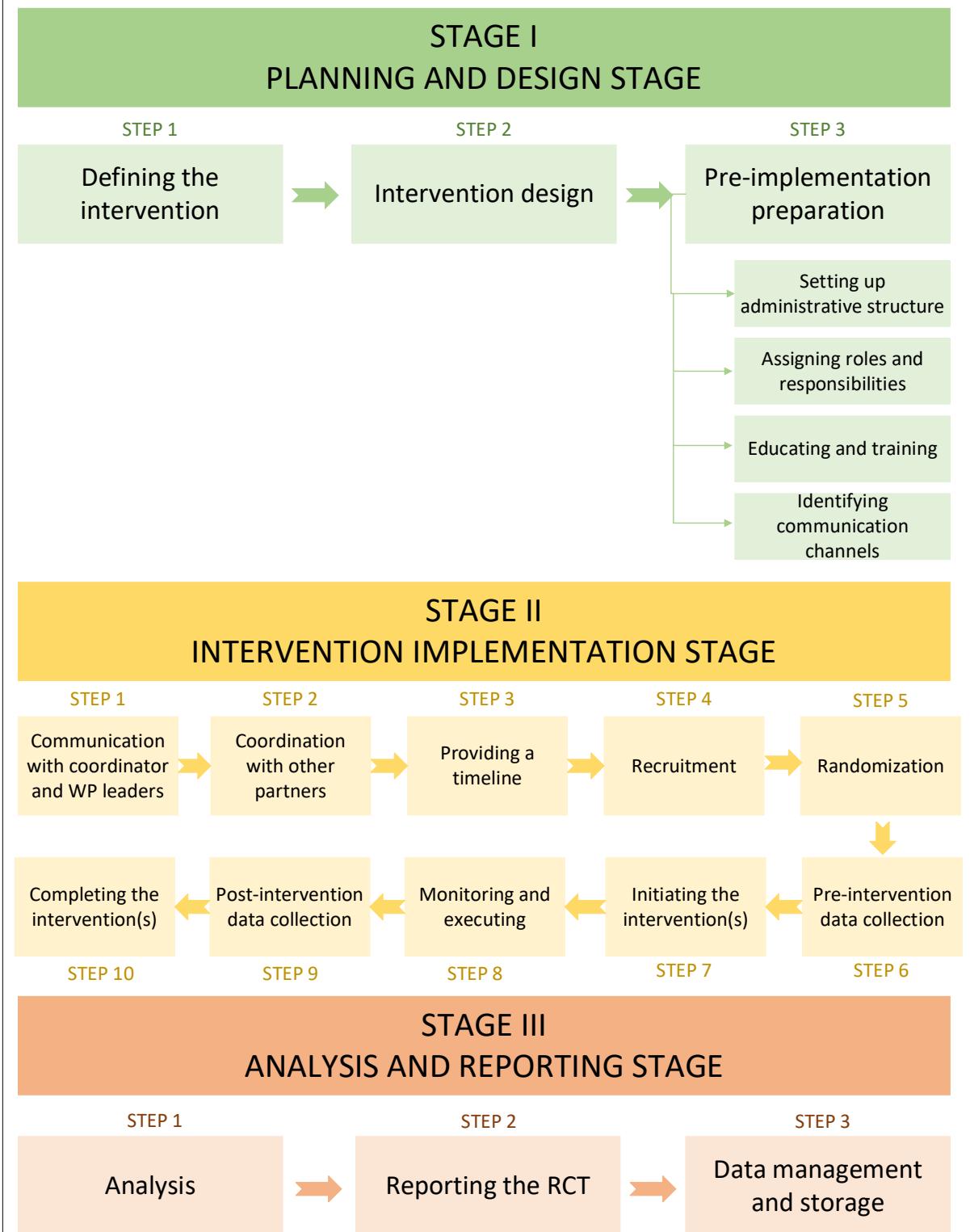


Figure 3. Planning Framework



Guidelines regarding the three stages of the planning framework and the required operational components are defined in the following sections.

## 4.1. Stage I - Planning and Design

The planning and design process is divided into three main stages, each of which includes a number of individual steps to be planned prior to the intervention implementation stages. These steps concern (1) definition of the current situation, needs and concerns deriving the intervention strategy, (2) design of the intervention plan, and (3) preparation of the pre-implementation preparation framework.

### 4.1.1. Defining the intervention, with a particular focus on the current situation, needs and concerns

Each society or environment has specific characteristics, needs and concerns. Therefore, before designing the intervention in detail, it is important to define and document the current situation, the characteristics of the sample society, and its needs. The identification of the needs will have profound impacts on the proposed intervention strategy, and its implementation. Before the implementation, there should be a re-evaluation of the extent to which a particular intervention and communication channel matches the experimental and control groups, and the current situation. Hence, it is important to clearly define the key factors that are expected to influence the intervention and its impact on energy behaviour, with a particular focus on the current situation, needs and concerns.

### 4.1.2. Intervention design

Behavioural change in sustainable energy choices and green lifestyle may be possible through psychological interventions. Accordingly, the interventions should be designed to maximize change in energy-related behaviours and suit the current situation of the relevant society. The interventions should be selected by considering their implementability in the target group, as well as their replicability and upscalability at the local, national, and European levels. This requires joint decisions and actions between the scientific partners and user-partners in the consortium (energy providers, municipalities, NGOs). For different intervention designs, key parameters should be considered, such as applicability of the intervention for user-partners, technological fit, geographical fit, suitability of the communication channels, and the availability of the tools via which the intervention will reach the experimental or control groups.

### 4.1.3. Pre-implementation preparation

Following the identification of the current situation, needs and concerns, and the design of the intervention, other practical aspects should be considered in the pre-implementation preparation step. These aspects will constitute the planning and design requirements immediately prior to the intervention kick-off. Planning requirements of the pre-implementation preparation step can be categorized under four main headings: (1)



setting up and operating the administrative structure, (2) assigning roles and responsibilities to the personnel/staff, (3) educating and training the personnel for their relevant roles, responsibilities, and ethical considerations, and (4) identifying the necessary communication channels and equipment (including interfaces, webpages, apps, tools, etc.).

#### **4.1.3.1. Setting up and operating the administrative structure**

The administrative structure is the operating mechanism of the intervention plan, and includes the people defined by their competencies, skills, and functions. The administrative structure is essential to realizing the interventions, and allows interaction within and between organizations, as well as with the staff in outer administrative structures. Each intervention plan should be implemented with the support of user-partners, supported by specialist, small-scaled administrations organized in a hierarchical structure. The administrative structures in each intervention plan will be responsible for conveying the messages to the target samples of the interventions, communicating with experimental and control groups, recruiting their own personnel responsible for executing and monitoring the intervention, and reporting their activities.

#### **4.1.3.2. Setting up and operating the administrative structure**

The permanently and temporarily employed personnel, and associated personnel should be assigned to a specific, appropriate task. Distribution of tasks among the personnel should be impartial and unambiguous, with clear position descriptions and qualifications. Each involved personnel member should have a relevant role and responsibility during the implementation of the intervention(s), and their activities should be consistent with determined roles and responsibilities. The authority in their unique administrative structures in each intervention plan should monitor the personnel's activities and workouts.

#### **4.1.3.3. Educating and training the personnel**

Following the assignment of individual roles and responsibilities, the personnel may require additional education and training to enhance their respective competencies for their assigned roles and responsibilities (especially the knowledge and skills that are mission-specific). Thus, the appropriate education and training should be provided for the selected staff. For example, this might concern general information about the specific intervention, timeline, characteristics of target population, RCT procedures, data collection, or ethical considerations (e.g., anonymization, voluntary consent, etc.). Compulsory participation in these education and training activities is recommended, with verifiable attainment of the essential competencies at the end of the education and training programs.



#### **4.1.3.4. Identifying the necessary communication channels and equipment**

The communication channels (including interfaces, webpages, apps, tools, etc.) through which each intervention is to be conveyed to the public should be selected on the basis of appropriateness. Not every communication channel will be suitable in all intervention plans. For instance, bills or invoices might not be utilized as communication channels by NGOs. Therefore, the user-partners should select and focus on the communication channel(s) most suited to their targets and intervention strategies.

### **4.2. Stage II - Intervention Implementation**

Following the completion of all the required planning steps outlined in Stage I, the second stage of the intervention planning framework pertains to the planning requirements for the intervention implementation phase. This stage is particularly important in terms of an appropriate and efficient organization of resources (including human resources) and initiation of the intervention strategies. The eight steps in the framework for planning the Intervention Implementation Stage are as follows: (1) communications with the coordinator and WP leaders, (2) coordination with other scientific partners and user-partners, (3) providing a timeline, including milestones for each intervention, (4) recruitment (5) randomization, (6) pre-implementation data collection, (7) intervention kick-off, (8) intervention monitoring and execution, (9) post-intervention data collection (10) intervention closure.

#### **4.2.1. Communicating with the project coordinator and WP leaders**

The project coordinator and the WP leaders are the formal authorities for coordination and control structures, and it is highly important for user-partners to communicate with these authorities, especially when requiring assistance to achieve the expected impacts and targets. Clearly, communication will also facilitate the progress of the intervention and the relevant processes. The project coordinator and WP leaders' consent is essential to implement the intervention and should be sought prior to any task in the intervention plan.

#### **4.2.2. Coordinating with other project partners (scientific partners and user partners)**

Since the scientific partners and user partners are interdependent, coordination of their activities is essential. This is particularly important when there is a procedural timeline for task completion in each intervention plan. Therefore, the authorities in unique administrative structures in each case (intervention plan) and the staff should coordinate their efforts with others, for example, through regularly scheduled meetings involving the relevant stakeholders. Leaders or the responsible persons in each intervention plan should be informed about the process and planning framework in other intervention plans, for instance, by the scientific partners and the project coordinator. Such



coordination is expected to enhance the performance and the ultimate benefits and allow observation of and solutions to barriers for the implementation phase.

#### **4.2.3. Providing a timeline and standardized reporting structure**

Specifying the timeline and standardized reporting structure along the course of each intervention is crucial to maintaining the project timeline, ensuring all staff member's timely contribution, and facilitating the tracking progress. Defining specific timelines and milestones enhances the measurement of short-term success, and the ultimate effectiveness of the intervention strategies. Achieving a milestone will bring encouragement to the scientific and user partners and affirm that the intervention plan is proceeding on schedule. For convenience, these milestones should be set using the same indicators as defined in the ENCHANT proposal (e.g., the target population to be reached, the total number of households reached, energy savings). Furthermore, timelines should specify the times by which each of the milestones should be achieved.

Reporting progress is vital for each intervention. The scientific and user-partners should report their activities through progress reports with standardized elements. A standardized reporting structure for the intervention plans will be provided in Section 12.

#### **4.2.4. Recruitment**

The voluntary participation of adult participants in the interventions is a key factor in ENCHANT. In this regard, the adult participants (18 years or older) will be asked for informed consent for participating in the studies. The participants 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. It is important to ensure that resources are assembled and organized in accordance with the operational plan. Thus, the smooth management depends on arranging potential sources for recruitment, in accordance with the specified number of participants from identified backgrounds and with identified characteristics. Following that, the experiment and control groups will be established among the recruited participants in the "randomization" step.

It is possible that participant recruitments might be lengthier and more time-consuming than expected. The recruitment process is considered as a key event, the timely completion of which should be highly emphasised. Within this process, it is also essential to consider that the aim of the study should be communicated and explained to potential participants. For instance, the purpose of the experiment and control groups should be clearly elaborated on. The control group is equally as valuable to the evaluation as the experiment group undergoing the intervention. The potential participants should understand the difference between experiment groups and control group, and it is essential that they read the Participant Information Sheet and give their written consent as acceptance to participate in the study. Namely, the better the participants understand



the demands of the study (e.g., participating in the intervention, data collection), the greater the commitment, and less likely they are to drop out. On the other hand, the information to be provided to the participants should be selected carefully so that results of the study are not affected by participants in the control group being aware of the intervention and changing their behaviours or responses accordingly.

Do make sure that recruited participants do not lose interest in the study while waiting for it to begin, the first stage of data collection should start as soon as possible after recruitment.

#### **4.2.5. Randomization**

Following recruitment, the next step that needs to be planned and implemented is randomization. The methodological strength of RCTs utilized for the interventions of ENCHANT derives from the random assignment of participants into the experiment and control groups following the initial recruitment. Random assignment is essential to guaranteeing that different groups are balanced, therefore participants will not be allowed to self-select their group. There will be one randomly assigned control group, i.e., a group without any intervention. The randomization process should be consistently applied, without any changes made. To achieve this, careful planning is needed. In case any amendments arise in the randomization process, the partners should record these amendments, and inform the coordinator about the potential amendments. Additionally, all events potentially causing a “leakage” between the randomized groups (e.g., a newspaper article reporting about the interventions, thereby making them also accessible for the control group) need to be recorded.

#### **4.2.6. Pre-intervention data collection**

Collection of the pre-intervention data from the participants is crucial and the planning for this step needs to be addressed in detail. The data to be collected for ENCHANT interventions is measured either directly (e.g., by digital data tracking or by collecting consumption data obtained from utility companies) or indirectly (e.g., from the consumers self-reporting through mobile or web-based apps, from surveys). For data collection, certain criteria should be followed. These are discussed in detail in Section 11. One of the most important aspects is that for all groups (experiment and control group) data should be collected within the same timeline and under the same conditions. This principle is also important for post-intervention data collection. Any factors or events confounding this principle need to be recorded if they cannot be avoided.

#### **4.2.7. Initiating the intervention**

Following the completion of the tasks and planning factors defined above, including pre-intervention data collection, the actual intervention(s) may be initiated. The intervention will be implemented through the communication channels decided by the user-partners



and will be built upon the tasks mentioned in the previous steps of the planning framework.

#### **4.2.8. Monitoring and executing the intervention**

Once the intervention is initiated to meet the defined objective, the respective milestones should be achieved. Reports should be made of any interruptions or delays in the planning framework of operational plan and their root causes. If there are delays in the milestones, an alternative planning should be immediately prepared to avoid any possible deviation. Furthermore, any unexpected events potentially impacting the target behaviours (e.g., new legislations, campaigns by other stakeholders not involved in the consortium) need to be recorded.

#### **4.2.9. Post-intervention data collection**

Collection of the post-intervention data needs to be carried out as specified by the intervention design. This step also needs to be planned for earlier, to avoid any possible discrepancies with the intervention design, collected pre-intervention data, and problems with data collection. During post-implementation data collection, ENCHANT's principles and guidelines on data collection and ethics should be followed with utmost care.

#### **4.2.10.Completing the intervention**

After the successful implementation of the intervention, completion criteria should be determined for the project. The end point, which includes the completion criteria, will be defined as the "exit strategy", delineating when and how the intervention will be terminated. The intervention will be completed when all such end points are accomplished. This occurs when all milestones have been reached, components and relevant tasks of the intervention plan finished, and suitable actions taken to complete the operational process.

### **4.3. Stage III - Analysis and Reporting**

The planning for the analysis and reporting stage calls for designing how the pre-intervention and post-intervention data will be analysed and reported. In order to assure the consistency and coherence with the preceding stages of the intervention (such as selection of the sample sizes and data collection methods), these steps must be addressed together with other relevant topics, before the intervention starts. This stage delineates the key principles of data analysis and reporting. It also emphasizes the importance of managing, storing and archiving intervention data and providing it to the wider research community.

#### **4.3.1. Analysis**

The first step of this stage is the analysis of the pre-intervention and post-intervention data. The data collected for the interventions may be data generated during the intervention timeline (primary data), or already existing (secondary) data, such as datasets provided by the user partners. Thus, both primary and secondary analysis will be



conducted regarding the interventions. The necessary anonymization will be applied to all primary and secondary data.

#### **4.3.2. Reporting the RCT**

Transparency in randomized control trials and intervention implementation is essential. Results of the RCT experiments need to be reported so as to demonstrate the quality of the study, which should also be verifiable by the other partners. As indicated above already, any unexpected events that may have impacted the RCT outcomes need to be documented.

#### **4.3.3. Data Management and Storage**

It is crucial to follow the principles of transparency beyond intervention reporting, into the intervention data's management and storage. A successful research practice considers the following three issues: how to record and securely hold all primary/raw data and related materials in a way that allows clear understanding for multiple users in the future (e.g. including an easily understandable documentation of meta-data), how to best back up electronically held data and how to store duplicate copies in a secure and accessible format, and finally, how to ensure the digital continuity and future accessibility of electronic records and data. Data management and storage in ENCHANT will make the data available to the wider research community. This is particularly important in allowing verification of the results of the studies, conducting secondary analysis, and linking and referring to other datasets for further research purposes.

The following general data management and storage principles of ENCHANT should also be followed during the whole processes pertaining to the interventions:

In accordance with data management principles of ENCHANT, all collected data should include a metafile when stored. After the project has ended, external users will also have access to the file. The partners are expected to prepare metafile including metadata concerning the type 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. Consult the project's data management plan for more detailed information and reporting templates.

Within the framework of ENCHANT's data protection principles, all partners are required to store the personal data on ENCHANT's encrypted server space for secure data storage. The storage solutions for personal raw-data and anonymised data will include daily backup routines to prevent data loss.

### **4.4. Planning Checklist**

A planning checklist can guide scientific and user partners in precisely following the planning framework. For this purpose, Table 3 provides a checklist for the planning



framework allowing scientific/user-partners to follow the process during the implementation phase of the interventions.

*Table 3. Checklist for the planning framework*

Step	Action	Planned Completion Date	Actual Completion Date	Deviation(s) from Plan	Explanation and Corrective Measure (in case of deviation)
1	Define the intervention				
2	Design the intervention				
3	Define administrative structure				
4	Assign roles and responsibilities				
5	Education and training				
6	Identify communication channels				
7	Recruitment				
8	Randomization				
9	Establish timelines and milestones				
10	Communication with coordinator/WP leaders				



## 4.5. Potential Challenges and Barriers for Intervention

### Planning

Possible challenges and barriers might threaten the implementation of the planning framework. The following target groups are determined a priori: the sizes of the target population in terms of total accessible population, target group directed towards a more sustainable lifestyle, target group directed to use transportation technologies with higher energy efficiency within 5 years, and target group directed to make improvements to increase energy efficiency in buildings. However, potential barriers and risks may prevent the achievement of the proposed numbers and the reaching of target populations. Furthermore, the effects of the COVID-19 pandemic might reduce participation levels among the citizens, undermining efforts to reach the targeted numbers and impacts.

There is no standard strategy for motivating or incentivizing households, making it potentially challenging to standardize across partners. A similar concern pertains to the implementation of similar types of intervention by different partners, with different samples. There may be diversity or conflict between partners on how the interventions will be implemented. This makes it more difficult, but at the same time, more important to define and implement a comparable, standardised approach. Furthermore, any deviation needs to be documented to be able to adjust in the analysis stage.

Attitudes of households, negative reactions or resistance against the interventions may also be another barrier adversely impacting implementation. Participants' concerns related to data security or other ethical considerations may also contribute to negative reactions or resistance. In such case, it is crucial to ensure a proper selection of the sample, as well as effectively communicating information about the intervention.

The collection of pre-intervention and post-intervention data may also involve challenges. It is important to identify and address these during the intervention design phase, and to follow the guidelines closely during the intervention implementation and data collection phases.

## 5. Resources that will be Required (Including Personnel, Equipment, and Supplies)

The resources required may take the form of personnel, equipment or material, supplies, additional work force (e.g., support personnel), etc. Human and material resources required to implement the intervention need also to be defined in the operational plan. The project aims to ensure ENCHANT's user-partners deliver the various intervention packages as part of their daily operations, and also the harnessing of knowledge from many sources including their past and current experiences, activities and know-how of



customers of energy companies, municipal citizens, members of NGOs in the energy domain, or visitors of cultural sites. There is wide variety of user-partners, in terms of the communication channels used, and different types of recipients. These will provide both complex and contextual knowledge of how to affect energy behaviour and, not least important, how various energy efficiency related interventions could be applied outside behavioural laboratory situations within resource-constrained conditions.

The goals and objectives specified in interventions should be synthesized and matched with the resources. The research teams in the ENCHANT project organized meetings with their user partners, and they agreed upon the relevant intervention packages, the communication channels, and resources. Following the meetings, the partners are expected to report on the required resources (personnel/team, additional work force, material or equipment). In some of the case study interventions to be implemented and tested, these may also include informative posters and billboards in public places, such as tram stations. The relevant user-partners will organize their respective activities within their own organizational structure, and report on the resources required to carry out these activities.

## 6. Timelines and Milestones

The timeline and the milestones are clearly critical on the pathway to achieve the proposed targets in each intervention plan. There are two particular criteria to be followed. First, the timelines and the milestones should be realistic, and second, they should be agreed by the partners. This will allow the clear definition of the progress for start-up time, end point, and the time required for completion.

The framework for the timeline and milestones is depicted in Table 4. Within this framework, six milestones are identified for each intervention. These are: recruitment (M1), pre-intervention data collection (M2), intervention kick-off (M3), monitoring (M4), intervention closure (M5), and post-implementation data collection (M6). Each user-partner is expected to use this framework to provide the necessary information, indicating the type of intervention and intervention strategy, user-partner information, the objective to be achieved, target dates for each milestone, and the status regarding the achievement of each. The progress will be tracked periodically (e.g., every 15 days).

*Table 4. Framework for Timeline and Milestones*

Intervention	User-partner	Objective



Type of intervention and intervention strategy	User-partner responsible for the intervention	Main objective of the intervention
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Milestones	Target Date(s)	Status	Comments
M1: Recruitment	<i>Date planned for achieving the milestone</i>	<i>Completed/deviated/not started/ dependency on other milestone (please name)</i>	<i>Reasons for deviation from plan, potential risks, suggestions, etc.</i>
M2: Pre-intervention data collection			
M3: Intervention kick-off			
M4: Monitoring			
M5: Intervention closure			
M6: Post-implementation data collection			

This standardized schema for timelines and milestones, consisting of common agreed-upon indicators, is one of the most critical components of a guideline and operational intervention plan. It provides the opportunity for different user-partners and stakeholders to work in harmony, track progress and enhance coordination. Deviations from the timelines should be assessed by the user-partner, and the associated scientific partner should be informed about the deviation. It is important for the user-partners to consider and evaluate deviations from the timelines and milestones in terms of changing



conditions, resource availability, and/or equipment supply, by identifying any critical failures in the provision of the interventions.

## 7. Administrative Structure

The administrative structure for each intervention plan should be clearly described to facilitate project management. To this end, it is important to clearly define job descriptions, and identify staff responsible and in charge of the implementation and monitoring of the intervention, number of personnel involved, and the lines of responsibility. In addition, planning should take into account changes pertaining to recruitment, arrangements for the responsibilities of staff, and replacements for foreseeable staff turnover. In this regard, the administrative structure and the roles and responsibilities regarding the interventions need to be clearly defined for each user-partner.

Considering the project organization of ENCHANT, WP4 leads the monitoring of the operational implementation plan to which all user-partners also contribute. In addition, there is a need for user-partners and scientific partners to be self-organized for their own particular interventions.

For each user-partner, the administrative structure needs to be identified concerning persons responsible for the following tasks: the approval of data collection/use/inquiry (i.e., data protection officer), the recruitment of experiment and control groups, the operation and monitoring of the intervention, and the collection of data. The administrative planning should also account for the timely achievement of the milestones (see Section 6. Timelines and Milestones).

Table 5 provides a template for administrative planning per user-partner, matching the responsibilities with the pre-determined milestones. The user-partners are expected to provide the necessary information in the table, addressing the job descriptions and work distribution.

*Table 5. Administrative Planning Template*

Intervention	User-partner	Objective
Type of intervention and intervention strategy	User-partner responsible for the intervention	Main objective of the intervention



Administrative Roles and Responsibilities		Related Milestone(s)
Main Responsible	<i>name of the main responsible</i>	M1-M2-M3-M4-M5-M6
Data protection officer	<i>name of the data protection officer</i>	M2-M6
Recruitment	<i>name of the person(s) responsible from recruitment</i>	M1
Implementation and monitoring	<i>name of the person(s) responsible from implementation and monitoring</i>	M3-M4-M5
Data collection	<i>name of the person(s) responsible from data collection</i>	M2-M6

## 8. Roles and Responsibilities

The operational intervention plan should include the roles and responsibilities of the project coordinator, scientific partners and user-partners, and it is important to define the number and types of personnel required to accomplish the project. The partners are expected to define the specific roles and responsibilities as position descriptions for the personnel stating the required level of expertise in the related subject. Accordingly, the partners should address the competencies required and the qualifications needed.

For an efficient management framework and governance structure, the roles and responsibilities need to be clearly defined. The ENCHANT consortium has multiple partners, potentially making decision-making process impractical and inefficient. Therefore, a Steering Group, consisting of the project coordinator, work package leaders, and two representatives from the user-partners is established to monitor and harmonize activities and progress of the project, preparing input for the general assemblies.



The project coordinator is directly responsible for the administration and management of the tasks on the general level of the project.

The scientific partners will be responsible for the coordination of the work execution within work packages, taking decisions regarding the initiation, implementation and execution, and the closure of work package activities within the respective WPs. This involves playing a key role in handling the dependencies and the interactions between the various work package activities; thereby, assembling and monitoring activities pertaining to coordination, output, and time planning. Furthermore, the scientific partners will be responsible for the follow-up of the operational intervention plan for their respective intervention strategies.

The user-partners are responsible for implementing the intervention strategies and will roll out interventions through their already existing communication channels. All user-partners will be extensively involved in ENCHANT to ensure high impact interventions and will work closely with the scientific partners. User-partners will deliver the various intervention packages and will also contribute knowledge from their past and current experiences, their experience of activities and know-how as customers of energy companies, and their roles as municipal citizens and members of NGOs in the energy domain.

The user-partners will provide the necessary staff (See Section 7. Administrative Structure) using the template illustrated in Table 5 to achieve the proposed milestones and assign the responsibilities. This will ensure that staff roles and responsibilities are properly defined for each user-partner.

The main responsible person for each user-partner will be responsible for:

- Examining the intervention progress periodically, on a regular basis (assessing what has and has not been achieved)
- Executing corrective action where there is failure to achieve tasks on time, or at all
- Ensuring that resources will be available when needed
- Supervising, supporting and encouraging the staff to ensure that tasks are undertaken
- Reporting problems to the related scientific partner and the project coordinator.
- ENCHANT will involve the voluntary participation of adult participants in the interventions. To this end, the personnel responsible for recruitment will establish experiment and control groups with voluntary participation through:
  - Identifying potential research participants



- Delivering the informed consent procedures necessary for participation
- Preparing, in the local language, if necessary, templates of the Informed Consent Forms and Information Sheets covering the voluntary participation and data protection issues in intelligible terms.

The personnel responsible for the implementation and monitoring will organize the initiation, application and completion of the intervention. The relevant responsibilities are:

- Coordinating with other staff members regarding the activities in the intervention strategy and the timeline
- Ensuring the proper use of resources (human and/or material resources) for the achievement of the intervention's goals
- Planning and organizing the method and timeline for how and when the resources will be used (e.g., in the case that posters or billboards are used for informative purposes, when, how and where these will be used)
- Mitigating the effects of delays, interruptions and obstacles that are likely to pose barriers for efficient and routine-functioning of the intervention plans
- Managing the process and people/staff
- Ensuring the milestones are achieved
- Ensuring that all staff have the necessary information and resources to complete the tasks and discharge their responsibilities
- Communicating any changes to the relevant scientific-partners
- Ensuring that the ethical considerations are followed
- Reviewing each member of personnel's workloads and responsibilities

The behavioural change in ENCHANT will be tested through pre and post-implementation data, thus data collection and protection is of great importance. The roles and responsibilities of the data collection personnel, and data protection officer are:

- Signing and collation of all necessary Informed Consent Forms prior to the collection of any data, and securely storing the forms afterwards. In case of electronic data collections, consent may be given online.
- Ensuring required anonymization is performed during data collection and processing
- Confirming that all data collection and processing will be carried out according to EU and national legislation
- Reporting the collected data for archiving



- Providing detailed information for archiving on the procedures to be implemented for data collection, storage, protection, retention, and destruction, and confirmation that these procedures comply with national and EU legislation.

## 9. Resources, Budget, and Funding

The user partners will use their own infrastructure and equipment (e.g., apps, websites, virtual platforms) required for the implementation of the interventions. ENCHANT project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 957115. The planned user-partners' budget allocation covers the reimbursable expenses, as stated in the Grant Agreement. There will be no additional compensation for any of the partners regarding the interventions. Any possible amendments concerning redistribution of a partner's budget among budget items is subject to terms as defined in the Grant Agreement.

## 10. Mechanisms for Monitoring Intervention Progress

The mechanisms for monitoring progress of ENCHANT interventions are based mainly on tracking the milestones (See Section 6. Timelines and Milestones).

Table 6 provides the framework for the monitoring mechanism regarding the implementation of ENCHANT interventions.

*Table 6. Framework for Intervention Monitoring*

Intervention	User-partner	Objective
Type of intervention and intervention strategy	User-partner responsible for the intervention	Main objective of the intervention

Milestone	Planned Date	Monitoring mechanism	Staff responsible for monitoring
M1: Recruitment		<ul style="list-style-type: none"> <li>• Compare targeted number of participants versus actual recruited</li> </ul>	



M2: Pre-intervention data collection		<ul style="list-style-type: none"> <li>• Confirm that the data collection method is as planned</li> <li>• Compare the designed data to be collected versus actual data collected for content and size of data</li> </ul>	
M3: Intervention kick-off		<ul style="list-style-type: none"> <li>• Check whether the intervention is started on time</li> <li>• Check whether the participants and involved parties are informed about the procedures.</li> </ul>	
M4: Monitoring		<ul style="list-style-type: none"> <li>• Check whether the monitoring mechanism is implemented</li> </ul>	
M5: Intervention closure		<ul style="list-style-type: none"> <li>• Confirm that the intervention is closed on time</li> <li>• Check for any delay/deviation affecting intervention closure</li> </ul>	
M6: Post- implementation data collection		<ul style="list-style-type: none"> <li>• Confirm that the data collection method is as planned</li> <li>• Compare the planned data to be collected versus actual data collected in terms of content and size of data</li> <li>• Check the compatibility with pre-intervention data</li> </ul>	

Table 7 shows the total number of households targeted, the target population for adoption of a more sustainable lifestyle, the target population for adoption of energy efficient transport technology in the next 5 years, and the target population for adoption of energy efficiency upgrades of buildings. These are significant in terms of the monitoring mechanism for interventions previously demonstrated in Table 6.



Table 7. Number of households adopting a more sustainable energy consumption behaviour

Partner	Total number households targeted	Country	Adopting a more sustainable lifestyle	Adopting energy efficient transport technology in the next 5 years	Adopting energy efficiency upgrades of buildings
Izmir	1,420,000	Turkey	45,400	10,300	5,700
Gediz	3,000,000 1,42 mio in Izmir 1,58 mio in other cities	Turkey	50,560	11,530	6,320
EK	18,182	Austria	600	100	100
Naturvernforbund	15,500	Norway	500	100	100
Viken	600,000	Norway	19,200	2,400	2,400
Fondazione	86,957	Italy	2,800	600	300
Energia Positiva	522	Italy	20	5	2
Electrica	3,800,000	Romania	121,600	27,800	15,200
ACSD	70,000	Romania	2,200	500	300
Cluj-Napoca	140,000	Romania	4,500	1,000	600
Badenova	700,000	Germany	22,400	5,100	2,800
<b>Total</b>	<b>8,431,161</b>		<b>269,780</b>	<b>59,435</b>	<b>33,822</b>

## 11. Ethics

ENCHANT requires the research activities to comply with national and European legislations. Therefore, as with all ENCHANT tasks, ethical dimensions, and national and international regulations constitute the basis for ENCHANT interventions. All project beneficiaries are aware of ethical issues, particularly conduct relating to personal data collection (ENCHANT, 2021a, 2021b).



All activities will conform to Horizon 2020 ethical guidelines, including the Data Protection Directive (95/46/EC) and new Data Protection Regulation, “Data protection and privacy ethics guidelines”, the “Guidance for Applicants on Informed Consent”, and national regulations (ENCHANT, 2021a).

ENCHANT protects data collection and processing, through the General Data Protection Regulation (GDPR, 2016/679) effective since May 2018, as well as through national requirements. This section will identify ENCHANT’s approach to ethical considerations during intervention implementation process. In this regard, fundamental aspects are addressed, including the recruitment process (i.e., involvement of human participants, informed consent procedures, data collection and processing, data storage and curation, and data anonymization). For more in-depth information, consult the Data Management Plan (D1.4) (ENCHANT, 2020) and the ethical requirements deliverable (D1.7) (ENCHANT, 2021a).

### **11.1. Recruitment (Involvement of human participants)**

The voluntary participation of adult participants is critical in ENCHANT, and children and adults unable to give informed consent will not be allowed to participate, neither will vulnerable groups or individuals (ENCHANT, 2021a, 2021b). Participants should be at least 18 years old, and must be able to give informed consent. Prior to their participation in interventions, the participants should be informed about the aim of the study, the collected data, and if relevant, the aim of connecting the survey data with secondary datasets (such for example energy consumption data). The participants will be able to withdraw from the study, without penalty, and without having to give a reason, until the data is anonymised. Furthermore, a contact channel (i.e., telephone and e-mail) will be provided for information about their stored project data. ENCHANT will also make use of other empirical studies, such as in-depth personal interviews, focus groups and workshops, to which the same ethical principles will be applied. Accordingly, all information about the project is presented in written form during the recruitment process, and again immediately before the data collection. Consent forms are signed by participants before every interview, focus group or workshop. Participants of this part of the empirical work will be recruited locally from the general population of customers/citizens/members of the user partners, older than 18 years and able to give informed consent (ENCHANT, 2021a, 2021b).

### **11.2. Informed consent procedures**

Voluntary consent is mandatory in ENCHANT, prior to participants’ engagement in the study activities (e.g., interviews, focus groups, workshops). Principles of written informed consent will be applied, when possible (in online surveys, consent will be given explicitly by clicking the “I agree to participate” button), and informed consent will be sought through informed consent forms and information sheet. These 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. The partners should prepare templates for these documents in national languages whenever necessary. These templates will be archived in updated versions of the data management plan. EC services may request the submission of the prepared templates of the consent forms (ENCHANT, 2021a, 2021b).

### 11.3. Data collection and processing

The data collection procedures will be conducted according to the ethical principles in ENCHANT. Quality assurance, quality control, and consistency throughout the project are the fundamental aspects of ethical considerations in data collection and processing. Accordingly, all procedures will be developed to meet general scientific quality criteria for data collection, namely, accuracy, efficiency, effectiveness, feasibility and timelines, relevance, security, and utility. The data collected must be correct and complete, and the data entry procedures should be reliable. The partners should ensure that resources are utilized as efficiently as possible. The data to be collected and analysed should be cost-effective, and it should provide current information in a timely manner. Moreover, the data should be relevant for primary stakeholders, and data collection should be compatible with other efforts. Confidentiality and data protection must be ensured. Finally, the data should provide the information appropriate to the questions being addressed (ENCHANT, 2021a, 2021b).

### 11.4. Data storage and curation

Ethical principles in ENCHANT require all personal data to be stored on ENCHANT's encrypted server space for secure data storage. Backup routines for personal raw-data and anonymised data are carried out daily to prevent any possible data loss (ENCHANT, 2021a).

### 11.5. Data anonymization

The privacy of all stakeholders and users is prioritized and respected in ENCHANT. To avoid potential identification of individuals, personally identifiable data collected and processed through appropriate data handling procedures and protocols is anonymised and aggregated at the earliest possible timepoint before sharing the data with the consortium. The research team in ENCHANT ensures that the data will be anonymised where necessary. The mapping of the anonymised and the actual ID will be safeguarded, and will only be available to persons directly working with the data. Full anonymization will be applied in results subsequently published in project reports and scientific papers. Anonymization is guaranteed for all material in ENCHANT, with strict attention to confidentiality and privacy in accordance with legal and regulatory requirements, avoiding harm to participants, stakeholders, or any unidentified third parties. By the end of the



project, all data will have been anonymized and will be stored at the ENCHANT's SharePoint solution in an encrypted and password-protected form (ENCHANT 2021a, 2021b).

## 12. Intervention Reporting

Intervention reporting involves the narration of the problem definition, intervention strategy, intervention design, objectives, methodology, data requirements, analysis and discussion of the intervention. Therefore, it is crucial for intervention monitoring. Following the guidelines proposed by Hales et al. (2016), this section provides a comprehensive framework for intervention reporting for ENCHANT.

### 12.1. Title of the Implementation and Brief Summary

This section will include general information about the summary of the case and intervention plan, study context, objectives to be achieved with this intervention strategy, and the user-partner that will implement the intervention.

### 12.2. Introduction

#### 12.2.1. Background

The practical background pertaining to the intervention and implementation will be provided in this subsection. This subsection will also provide an insight about what is already known about the issue. Issues such as geographical situation, physical, economic, and/or socio-cultural aspects may also be addressed.

#### 12.2.2. Problem

There will be a definition of the problem, concern, or need which requires change the households' behaviour, targeted by the intervention. The nature and the severity of the problem might also be addressed. A discussion will take place over what triggered the decision to take the intervention and change the existing energy behaviour pattern.

#### 12.2.3. Intervention

This section will introduce the type of intervention to be implemented, detailing areas such as feedback, social norms, information, monetary incentives, commitment, competition, and collective vs. individual framing. This will also involve examining the reasons for selecting the intervention to be applied in the relevant context and case study.

#### 12.2.4. Behaviour

The targeted behavioural change (energy savings behaviour, maintenance behaviour, or investment behaviour) will be described, as well as the plans to achieve this.



### **12.2.5.Implementation strategy**

The intervention strategies that are expected to bring change will be described. In this section, the communication channels for the realisation of the proposed intervention will also be identified, as well as plans to test, measure and analyse the results. Other information indicated is the intervention's duration and intensity, including the method and timing, as well as additional resources required to support the implementation.

### **12.2.6.Methods**

This section involves the methodology, manner, and process by which the intervention will reach the targeted population. The section will include discussion of the methodological tools for data collection and analysis (e.g., quantitative, qualitative, and/or mixed) to be used.

#### **12.2.1.Expected goals**

Particular aims of the proposed intervention strategy will be stated, addressing changes and improvements in processes and outcomes. Namely, the expected effects of the interventions will be investigated.

### **12.3. Study Design**

#### **12.3.1.Setting**

This section will detail the locations of the intervention strategy. It will also specify population characteristics and relevant dates for intervention implementation, monitoring and follow-up, data collection, and intervention closure.

#### **12.3.2.Participants**

Recruitment procedures and criteria for the selection of the potential voluntary research participants will be described. Following the selection of participants, the experiment and control groups are determined with respect to the Randomized Control Trial (RCT) methodology. The experiment and control groups need to be discussed and the randomization process needs to be explained in this section.

#### **12.3.3.Variables**

In this section, the variables for measuring behavioural change need to be defined, for example, monthly energy consumption, behavioural change variables including investment behaviour, maintenance behaviour with relation to energy efficiency, and everyday energy saving behaviour. The variables will be categorized as dependent (the targeted behaviours that ENCHANT aims to change), and independent (the modifiers that influence and change the households' behaviour). The dependent and independent variables will be measured during the pre-intervention phase in experiment and control groups, and again in the post-implementation phase in the same experiment and control groups. This will allow assessment of the impacts of interventions for achieving changes on the targeted behaviours.



#### **12.3.4.Data sources/type of data**

This section will identify methods of collecting household data. Examples of possible data collection instruments are questionnaire, self-reporting, observational study, structured test, interviews, focus groups, online data tracking, and electricity bills. In this section, methods should be specified for processing data before and during the intervention implementation.

#### **12.3.5.Ethical Considerations**

ENCHANT follows the appropriate procedures for the ethical considerations, such as consent procedures, confidentiality, and anonymity. In this sense, the intervention process should also ensure participants are free from feelings of coercion to participate at any point in the study, including energy-use estimates, data-tracking, self-reporting of energy use or related behaviours, qualitative interviews and focus groups, or surveys (ENCHANT 2021a, 2021b). Hence, trust will be gained through each individual's voluntary participation and consent. Furthermore, the research team makes efforts to guarantee the confidentiality of the information and anonymity of the participants/respondents. Accordingly, this section should include discussion of how the process will be managed so that ethical principles are followed.

### **12.4. Analyses**

#### **12.4.1.Descriptive data**

The descriptive data regarding the participants of the interventions will be presented and analysed in this section. The descriptive data may also be cross-tabulated to demonstrate the breakdown of participants according to variables such as demographic, social characteristics, response rates and behavioural change for the experimental groups and the control groups. The number of participants involved in the intervention needs to be compared against the targeted numbers.

#### **12.4.2.Outcomes**

In this section, the actual course of the interventions will be discussed, including the sequence of steps, or phases followed, type and number of participants at key points, and unexpected results. The changes in processes and outcomes associated with the intervention should also be enumerated.

#### **12.4.3.Main results**

The aim of this section is to enlighten the main findings, namely inferences and interpretations. It might also include the integration of the results with prior research or theory. This section will report on estimates of intervention effect, and synthesis of the quantitative and qualitative results, if applicable.



## 12.5. Discussion

### 12.5.1. Key results

Key results will be summarized with reference to study objectives.

### 12.5.2. Limitations

The discussion in this section will focus on the limitations of the study, including the possible sources of confounding, bias or imprecision in design, measurement, and analysis likely to influence study outcomes. Unexpected events that are relevant for the dependent variables will also be documented here.

### 12.5.3. Interpretation

The results will be interpreted, taking into account the objectives, limitations, multiplicity of analyses, replicability of the study, results from similar studies, and other relevant evidence. The results of the implementation might be compared and contrasted with the relevant findings in the literature.

### 12.5.4. Contextual Factors

This section will present the success factors, enablers, and barriers. Actions taken to overcome the potential barriers, if available, will also be discussed.

### 12.5.5. Generalizability

The generalizability or the external validity of the results should be discussed. Possible issues include representativeness of participants, effectiveness of implementation, and applicability to other settings.

## 12.6. Concluding Remarks Regarding the Intervention

This section will finalize the overall practical expediency of the intervention. The conclusion section will involve a discussion of how the results might be translated into practice. Also relevant are implications of the implementation programme, and suggestions for further studies and research.

## 13. Conclusion

The ENCHANT project has multiple objectives. These include increasing the sustainability of the European households' energy behaviour under real-life conditions, reviewing and systematizing existing knowledge base regarding psychological interventions which aim to steer human behaviours towards more sustainable energy choices, and taking a multi-disciplinary approach to identifying knowledge about psychological, social and contextual drivers of energy choices and sustainable energy lifestyles in European society. The main methodological tool for achieving these objectives is the implementation of interventions



to be subsequently replicated and upscaled at the level of European, national and local institutions.

The seven typologies of behavioural interventions utilized in the design of the ENCHANT interventions are as follows: feedback on own consumption, social norms, information, monetary incentives, commitment, competition, and collective vs. individual framing.

The interventions to be tested in ENCHANT will be implemented in various European geographical, cultural and organizational contexts. For this purpose, three main typologies of user partners will act as formalized actors, each focusing on a different group and category of target populations. These are, energy providers and/or producers (electricity, gas), municipalities and governmental energy agencies (centralized or local), and NGOs in the energy and sustainability sector.

ENCHANT interventions' target is to reach 8.4 million European households in six countries selected to account for the cultural variability of Europe. The associated user partners are EKG (Consultancy, Austria), Badenova (Energy provider, Germany), City of Freiburg (through Badenova, Local government/Municipality, Germany), KGO (through Badenova, NGO in the energy and sustainability sector, Germany), Fondazione (NGO in the energy and sustainability sector, Italy), Energia Positiva (Energy provider, Italy), Naturvernforbundet (NGO in the energy and sustainability sector, Norway), Viken County (Local government, Norway), Electrica (Energy provider, Romania), Cluj-Napoca (Local government/Municipality, Romania), ACSD (NGO in the energy and sustainability sector, Romania), Izmir Metropolitan Municipality (Local government/Municipality, Turkey), Gediz Energy Company, (Energy provider, Turkey).

The design, planning, implementation, and monitoring of the interventions needs to be systematic, with the wide geographical coverage and the inclusion of multiple stakeholders, including user-partners, scientific partners, and other stakeholders. The guidelines and operational plan therefore address the planning requirements for the intervention design and planning, intervention implementation, and analysis and reporting stages of the interventions. Without such a systematic framework, it would be very challenging, if not impossible, to ensure the coordination of the interventions and the conformity to pre-determined timelines.

Successful implementation of the interventions also relies on support from an appropriately designed administrative structure with clearly defined roles for the responsible staff.

An indispensable component of the ENCHANT interventions is compliance with ethics requirements at all stages (ENCHANT, 2021b). Ethical issues may arise at any time in the interventions, and especially during the steps of recruitment, informing and consent procedures, data collection, required anonymization of data, and data storage. Any failure



to address ethical concerns appropriately may result in undesirable outcomes for participants, and partners, and may also threaten the validity of the results, or even the completion of the interventions. Therefore, it is important that these issues are considered in the guidelines and operational plan.

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