European Common Energy Data Space Framework Enabling Data Sharing - Driven Across – and Beyond – Energy Services

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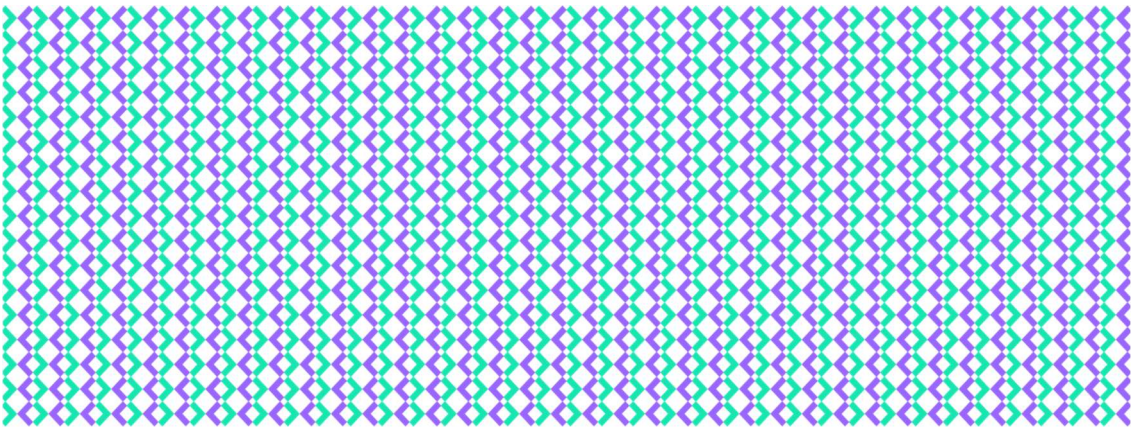
D2.2 - Report on the data sharing incentive design for consumers and local communities

The SPUR framework and requirements for
energy data-sharing incentive and service design



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List of Acronyms

C2B2B	Consumer-to-Business-to-Business
C2B2C	Consumer-to-Business-to-Consumer
CPO	Charge Point Operator
DER	Distributed Energy Resources
DR	Demand-Response
DSF	Demand-Side Flexibility
DSO	Distribution System Operator
EC	European Commission
ENERSHARE	European Common Energy Data Space Framework Enabling Data Sharing - Driven Across – and Beyond – Energy Services
ESCO	Energy Service Company
EV	Electric Vehicle
kW	KiloWatt
kWh	KiloWatt hour
RES	Renewable Energy Source
REC	Renewable Energy Community
CEC	Citizen Energy Community
RTO	Research and Technology Organization
SCADA	Supervisory Control And Data Acquisition

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TSO	Transmission System Operator
PED	Positive Energy District
WP	Work Package

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Key Definitions

Aggregator	An aggregator is a market actor that helps to accumulate and exchange decentralized flexibility. They act as an intermediary between end-users and the distribution system operator, and other flexibility requesting parties, such as Balance Responsible Parties (which includes Energy Suppliers) and transmissions system operators.
Demand response (DR) products and services	Products and services which provide incentives for consumers to modify their consumption patterns
Financial DR incentives	Price-based DR incentives that motivate energy consumers to change their energy consumption patterns.
Non-monetary DR incentives	DR incentives that focus on non-price incentives and rewards participating consumers for demand change from established baseline.
Data consumers	Parties interested in using the shared energy data in the European Energy Data Space
Data owners	Energy consumers and prosumers of whom data about their usage can be acquired
Data providers	Aggregators of energy data who wish make this available to the European Energy Data Space
Energy communities	Energy communities are groups of active consumers (supported by a legal framework or are a legal entity), who organize collective energy actions around open, democratic participation and governance, share common interest and/or attitudes in energy services and activities (generation, storage, transport, consumption and sale of energy) as well as provision of costs and benefits.
Consumer-to-Business to-Business (C2B2B)	This is a business model where a business buys a product from an individual and resells it to another business.
Consumer-to-Business-to-Consumer (C2B2C)	This is a business model whereby a business acts as an intermediary between two consumers who exchange goods. This exchange is a business transaction in which one of the individuals acts as a seller and the other acts as a buyer.
Citizen engagement	Citizen engagement refers to the inclusion of society in energy transition processes, designs, implementations, exploitations and outcomes, facilitated by decentralized governance. It is created by co-design of the (transition) process itself.
Consumer engagement	Consumer engagement refers to aspects of DR products and services (e.g. design) that improve usability and consumer experience, and thus facilitate and increase the adoption of these products and services by consumers.
Distribution System Operator	Entity responsible for distributing and managing energy from the generation sources to the final consumers.
Energy prosumers	Consumers who also produce energy, at times if not always
Energy prosumagers	An energy prosumer who also owns and manages distributed energy storage.
SCADA system	A system architecture used for controlling, monitoring, and analyzing industrial devices and processes.
Transmission System Operator	An entity entrusted with transporting energy in the form of natural gas or electrical power on a national or regional level, using fixed infrastructure.
Psychological human needs / values	Any need / value that is essential to mental health or that is otherwise not a biological necessity

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Narratives	What occurs in the use case, when, why, with what expectation, and under what conditions - from a user point of view
Experiences	An event or occurrence which leaves an impression on someone
Reference architecture	Recommended structures and integrations of IT products and services to form a solution.

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Executive summary

A European Energy Data Space (EEDS) may contribute to system-level increased efficiency by enabling the development of smart services and innovative business processes. Together with the adoption of new data-driven services this can facilitate the green energy transition, to the benefit of both the energy sector and citizens. The ENERSHARE project aims to deliver a common energy dataspace framework to enable and facilitate energy data sharing within Europe.

To motivate and facilitate stakeholders to participate in data sharing and data usage, the energy sharing services and incentives need to comply with the values, needs and desires of these stakeholders, and therefore not only the technical perspective, but also the social and psychological perspective are important to consider. This deliverable describes the outcomes of an exploration to provide support for the development of services and interactions that are useful, usable and desirable by data owners (which are energy consumers and prosumers who can provide energy data).

A desk research of relevant European projects, and approaches from the Social Science and Humanities and Design Thinking domains, and through pilot discussions with pilots who focus at residential data owners, has resulted in the following outcomes:

1. The SPUR framework: comprising a process, methods and tools that support data providers to develop services and incentives In this process, participation and engagement of citizens, consumers and prosumers at broad scale and throughout the design and exploitation process is essential.
2. Requirements: requirements that data providers need to consider when developing services and incentives, including requirements to engage the intended users
3. Implications for the EEDS development: this deliverable focuses on the data owners and data providers and their interaction. However, the outcomes of the presented work also affect the reference architecture of the EEDS, and data-driven services for cross-sector value chains.

The framework, requirements and implications presented in this deliverable will be further developed in the course of the ENERSHARE project and provide value to the data providers, data owners, technical service developers within ENERSHARE, and to energy data space initiatives throughout Europe.

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1 Introduction

1.1 About the project

The ongoing digitization of the energy system brings about an enormous amount of data about households (consumers, prosumers, and prosumagers) opening up opportunities for new data-driven services. Accumulating and sharing this data can enable cross-value chain service development which contributes to system-level increased efficiency and together with the adoption of these new data-driven services facilitates the energy transition. According to (IDSA, 2023): "*data spaces provide the basis for fruitful cooperation, lowered barriers to entry and limitless innovation in the data economy of the future*". Data spaces enable the development of smart services and innovative business processes, while the control of the data remains with the data providers. Data sharing in the energy sector is lagging behind, mainly due to a lack of trust, the risk of privacy breaches and business models immaturity[1]. The ENERSHARE project aims to deliver a common energy dataspace framework to enable and facilitate energy data sharing within Europe. Pettenpohl et.al. (2022) explain and visualize the outlines of an international data space that is applicable to an energy data space as well (Figure 1).

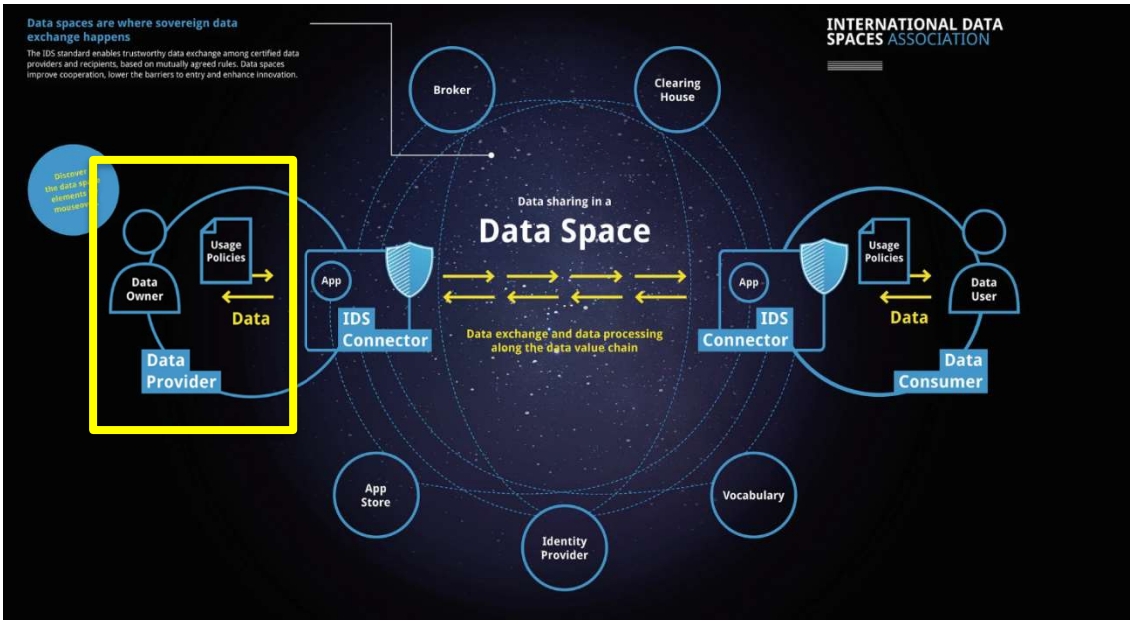

Figure 1: International Data Spaces by Pettenpohl et.al. (2022). The yellow rectangle is added to indicate the focus of this deliverable.

[1] ENERSHARE Grant Agreement

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In this energy data space, data owners can opt to make their data available to data providers who accumulate these and make them available to the open data space. Parties that intend to make use of this data, the data consumers, can then request this data from the data providers. To make this system work, various relations and interactions between these types of stakeholders need to be considered. Within Work Package 2 of this project, the requirements and the reference architecture of the European Energy Data Space (EEDS) will be defined to enable a streamlined product and service development process. This process is then applied within pilot demonstrations that aim to develop services and interactions that facilitate data sharing and usage within an international data space and incentives that encourage stakeholders to participate in data sharing and usage.

1.2 Scope and objective of this deliverable

This deliverable is an output of ENERSHARE Task 2.2 on data-driven value-added service design and data sharing incentive design for consumers and local communities. The energy data required for the EEDS comes from the data owner (see the yellow rectangle in figure 1). Data owners can be residential users, commercial users and private and public building users. This deliverable specifically investigates the role of the residential data owner, individual or organized within a community. The residents can be consumers, prosumers (consumers who also produce energy, at times if not always) and prosumagers (energy prosumers who also own and manage distributed energy storage).

The objective of this deliverable is to report on a framework and requirements for a) designing incentives to motivate data owners to share their energy data, and b) developing services and interactions to facilitate data owners to share their energy data (Figure 2).

Figure 2: Data sharing flow from data owner to the International Data Space. This deliverable focuses on an approach to facilitate and motivate data sharing by data owners.

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This framework and the requirements will be further developed in the course of the ENERSHARE project (based on evaluations in WP9). By combining incentive and value based service design, the aim of the ENERSHARE project is to develop a social-technical framework (the SPUR framework) and requirements to ensure a holistic and participatory development process that takes into account the diverse needs and preferences of data owners and other stakeholders in the data space. Ultimately, this framework will enable the design of energy community activities (if needed in collaboration with other stakeholders) that are more sustainable, more user-friendly, and more effective at reducing energy consumption and promoting energy efficiency.

The work presented in this deliverable comprises the following three outcomes:

1. The SPUR framework: a framework based on Design Thinking, human psychological core values and value proposition design. The framework comprises a process, methods and tools that support data providers to develop services, interactions and incentives that facilitate and motivate data owners to share energy data to the EEDS and that comply with data owner values, needs and desires (chapter 3).
2. Requirements: requirements that data providers need to consider when:
    a. Starting activities of the SPUR framework: requirements that are of primary concern before any other activities are undertaken
    b. Engaging citizens and consumers: to design services and incentives which are useful, usable and desirable, it is essential to engage citizens, consumers and prosumers at broad scale and throughout the design and exploitation process.
    c. Developing incentives and services for data owners to motivate and facilitate energy data sharing

    As incentives and services depend on the type of data that is collected, this chapter also describes relevant data types that are publicly available, and that data owners have available and want to share, and data that would still be required. The relation between the SPUR framework and the requirements is visualized in Figure 3. The requirements provide input for the SPUR framework in different phases and for different methods and activities carried out by the data provider.
3. Implications for the EEDS development: this deliverable focuses on the data owners and data providers and their interaction. However, the outcomes of the presented work also affect other parts of the EEDS, such as the reference architecture of the EEDS, and data-driven services for cross-sector value chains. This deliverable therefore presents input for the development of the EEDS from the perspective of the data owner (chapter 5).

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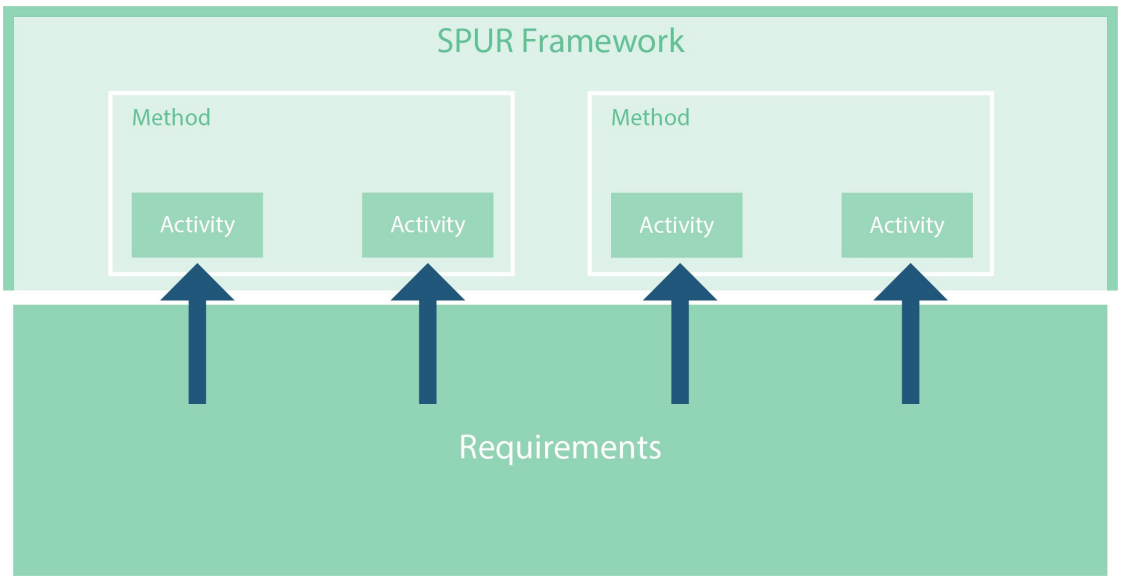

Figure 3: Relation between the SPUR framework and the requirements

The outcomes will allow the design of energy- data-driven incentives and services fully meeting user expectations in terms of functionality and design, and will be applied in the Living Energy community in the Portuguese pilot and also leverage on the Italian pilot. Furthermore, the outcomes will provide input to ENERSHARE in designing Consumer-to-Business-to-Business (C2B2B) and Consumer-to-Business-to-Consumer (C2B2C) business models built around energy data sharing. For example, regarding what could be shared (data assets, data-driven services), reward mechanisms (pay per consumption, flat subscription-based fee, dynamic fees), and especially in how to distribute and socialize revenues and benefits along all the energy data sharing stakeholders (WP7).

1.3 Intended audience

The intended target audience for this deliverable are:

- Data providers, pilot leaders and Energy Communities within ENERSHARE and throughout Europe can use the SPUR framework and the requirements for engaging and learning about data owners and for developing incentives and services to motivate and facilitate data sharing
- Technical developers (service developers, business case developers) within ENERSHARE and who work on other data sharing projects, and energy data space initiatives can use the implications for the EEDS to develop data sharing technologies.
- People and organizations with an interest in:

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- the SSH perspective on the developments of the EEDS and what needs to be taken into consideration from a citizens' perspective when developing processes, products and services for the EU Energy Data Space.
- The co-design of data sharing incentives together with citizens or energy communities.
- The co-design of energy community services with citizens or energy communities based on shared and available (energy) data.

Relation to other work packages and tasks in the ENERSHARE project

This deliverable provides direct input to Task 2.4: Integration of privacy, ethical, cybersecurity, legal and regulatory compliance in the Reference Architecture and Task 2.5: Reference Architecture for a European federated Energy Data Space, as well as to Task 7.3: Data sharing incentive and business models design for regulated and non-regulated domains. The developed framework and approach will be evaluated in Task 9.5: Engagement and social acceptance assessment.

1.4 Reading recommendations

This document is divided into 7 chapters. Chapter 1 is the introduction (this chapter). Chapter 2 provides an overview of the methodology and methods used in the research for Task 2.2 and this report. Chapter 3 provides an overview of the resulting SPUR framework, and chapter 4 specifies the requirements for data sharing and incentive design that need to be considered within the SPUR Framework. The implications of these results for the development of the European Energy Data Space are presented in chapter 5. In chapter 6 the results are discussed indicating open issues and further research needed in the continuation of Task 2.2 and in related tasks and Work packages. Chapter 7 provides a conclusion.

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2 Methodology

The ENERSHARE research is built on methodologies from various disciplines within Social Sciences and Humanities. From these disciplines a mixed-method approach is created that focuses on the experiences of the data-owner. This methodology combines insights from prevailing SSH frameworks with a User-Centered Design approach.

This chapter addresses the methodology used throughout Task 2.2. The first part of the research in Task 2.2 consists of creating an overview of the lessons learned from desk research and research in other projects regarding engagement, service design and incentive design. This has led to the creation of the SPUR framework. The second part of the research consisted of pilot discussions in which the current state of the pilots was inventoried in terms of available data, engagement and product and services development.

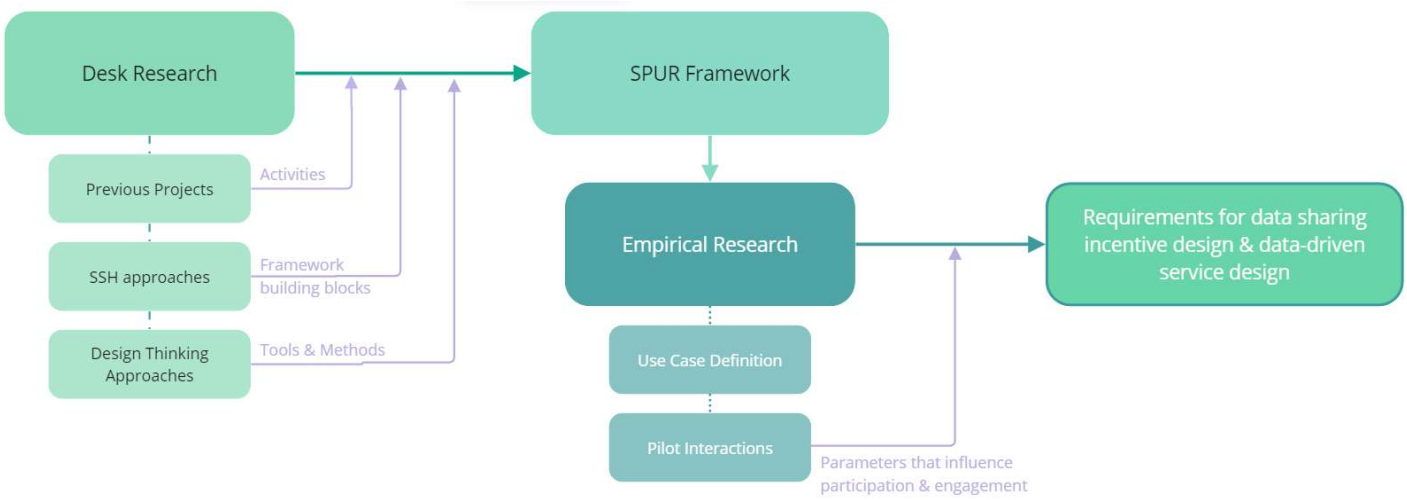

Figure 4 Research flow diagram

2.1 Desk research

The desk research performed within this task had three focuses:

1. Identify relevant lessons learned regarding incentive design, service design and data sharing from previous projects;
2. Identify relevant approaches with a Social Science and Humanities perspective;
3. Identify relevant Design Thinking and Human Centered Design approaches for the development of consumer engagement in incentive and service design

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This research aims to explore the current practices of these approaches in order to guide the development of energy data sharing services. By doing this, we can provide an overview of the applied methods for service design and incentive design and combine those insights into the SPUR framework.

2.1.1 Relevant projects

These focuses are addressed in several other ongoing TNO projects, which share a foundation in value-based proposition design and citizen and consumer engagement. Of these projects a selection was made to analyze projects that focus on building energy communities and energy data sharing. Within the existing projects, we performed an analysis regarding existing frameworks, guidelines and requirements for stimulating engagement and designing services and incentives.
Table 1 shows an overview of the selected projects and why they were found relevant. For further information on the specific projects, links can be found in Table 1.

PROJECT	DESCRIPTION	Relevance to ENERSHARE
COMMUNITAS	European research project that explores the concept of community-based environmental governance.	Member engagement techniques in energy communities
BRIGHT	Boosting DR through increased communIty-level consumer engaGement by combining Data-driven and blockcHain technology Tools with social science approaches and multi-value service design	Developed framework for citizen and consumer engagement
POCITYF	European research project that aims to develop a framework for transforming cities into positive energy districts.	The handbook for tenants' engagement for housing corporations provides guidance on the development of a communication and participation strategy to engage tenants in large renovations projects that promote energy efficiency.
MakingCity	European research project that aims to address and demonstrate the urban energy system transformation towards smart and low-carbon cities, based on the Positive Energy District (PED) concept	The Unified Citizen Engagement approach, is a tool for engaging citizens in the co-design of sustainable urban solutions.

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BRIDGE	European Commission initiative which unites Horizon 2020 and Horizon Europe Smart Grid, Energy Storage, Islands, and Digitalization Projects to create a structured view of cross-cutting issues which may constitute an obstacle to innovation	Overviews of citizen and consumer engagement strategies, success indicators for engagement and methods and tools used to promote and maintain engagement at a citizen and/or consumer level.
GO-e	Dutch research project that investigates smart flexibility services to avoid net congestions, and as an alternative for grid improvements in the build environment	Overviews of user requirements described on different product/services levels

Table 1 Selection of relevant projects

2.1.2 Approaches from the Social Science and Humanities perspective

The development of the framework combines several Social Science and Humanities (SSH) perspectives. To this end, we performed desk research into different SSH perspectives and methods which focus on the development of products and services for consumers, (in general and within the energy domain). Methods and frameworks were selected based on their relevance to energy data sharing as well as their described effectiveness. Table 2 describes brief summaries of the analyzed frameworks and methodologies.

Framework	Description
VUX (de Kort et.al., 2017)	Value based User Experience framework. This is a tool for research and design of the user experience of products and services.
Pro-environmental behavioral values (Steg & de Groot, 2012)	Framework that describes values that determine environmental preferences, beliefs, attitudes, norms and choices.
Ladder of Citizen Participation (Arnstein, 1996)	A framework for engagement and public participation at different levels.

Table 2 Analyzed frameworks

2.1.3 Design Thinking and Human Centered Design approaches

With the aim to develop consumer engagement in incentive and service design, relevant Design Thinking and Human-Centered Design approaches are utilized to both facilitate the data

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gathering from the pilots as well as framework building. Methodology is implemented from social and cultural anthropology, design thinking and user-centered design, value-based proposition design and service design. A selection of the wide range of available methods, tools and principles were analyzed and serve as a base for the framework as well as design of the interactions with the pilot and thus the resulting requirements. This selection was made by the social innovation team based on the methods' applicability to the context of communities and data sharing in the researcher's experience.

Method	Description
Capability Driven Design (Mink, 2016)	Step-by-step approach for obtaining comprehensive insight into the user context to develop products and services that fit consumers values, needs and desires.
Applied Ethnography (Sanders & Stappers, 2008)	The qualitative description of cultures and cultural practices, which is based on observational research (and borrows from anthropology)
Contextual inquiry (Karen, 2017)	Method of gathering user requirements through observation and interviews within the context of use.
Service Design (Stickdorn et.al. 2018, Polaine et.al., 2013).	Methodology that focuses on creating user-centred services by considering the entire user journey and incorporating stakeholders' needs and perspectives.
Participatory design and Scandinavian methods (Sanders & Stappers, 2008)	This methodology is characterized by the use of physical artifacts as thinking tools throughout the participatory design process.
Context Mapping (Sleeswijk Visser, 2009)	A generative approach, aimed at creating deep insight into the environment and the underlying motivations of a consumer (Sleeswijk Visser, 2009). Key principle in this approach is that the users are considered experts of their own experiences.
Value-based proposition design (Osterwalder et.al., 2015)	Describing the customer-profile of a target-user and alignment within the value map of an organization.

Table 3 Selection of methods analyzed for the creation of the framework

2.2 Empirical Research

To define requirements for the SPUR framework, Task 2.2 of the ENERSHARE project also encompasses empirical research focused on identifying the needs of data owners in the co-

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creation of new services with data providers. To this end we report on the activities within several pilot sites that have started the development of services to understand what these pilots and use-cases are about, what information is currently available within them and in which stage of development they are. It is also relevant to learn what these pilots need, desire and what their concerns and considerations are regarding the use-case goals and specifically regarding data collection, generation, storage and sharing. For this task, three of the pilots involved with the ENERSHARE project were selected on the basis of their focus on households and citizen engagement, whereas the other pilots focus on companies and industries.

Each pilot contains a unique set of stakeholders and focuses on specific challenges and use cases:

1. The Portuguese pilot (pilot 2 in Figure 5) with thee use-cases.
2. The Italian pilot in Terni (pilot 5 in Figure 5), with three use-cases of which two are focused towards citizens.
3. The Latvian pilot (pilot 7 in Figure 5).

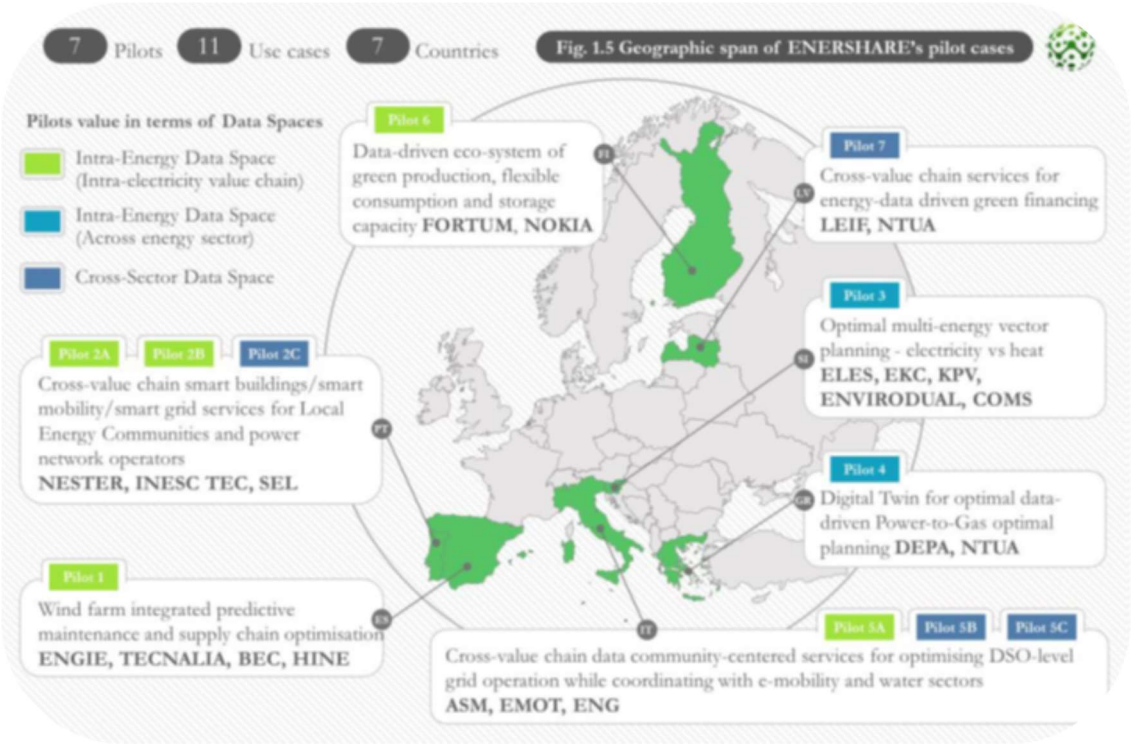

Figure 5 Overview of the ENERSHARE pilot sites

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The research performed with the pilots is described in the following section. Appendix B provides detailed information regarding the pilots. The outcomes of the pilot discussions can be found in chapter four, in the form of requirements for the SPUR framework.

2.2.1 Research with the Pilots

In task 2.1 the use cases were defined, facilitated by the IEC62559-2 EU template. From this template an add-on was developed to include a social perspective. The template was completed in multiple discussions with the pilots, hosted by the social innovation team. This template was then used as a basis of the use case description. Furthermore, Miro canvases were developed iteratively to facilitate interactive sessions with the pilot leads. The aim of these discussions is to deepen and broaden the use case description of the pilots with the insights of various stakeholders in the pilots projects. Table 4 provides on overview of the topics addressed in these sessions. The following sections address the interactions with each individual pilot.

Pilot description and stakeholders	
	What are the pilots and use-cases about? Who is involved and what are their roles? Which products and processes are in place, where, with which goal?
Community members	
	Which user types and groups are part of the energy community? Which products, services and activities are, or will be, offered to the members? What knowledge is available about the members (values, needs, socio-demographics), what are their gains and pains regarding data sharing and service use?
Stage of development	
	Based on previous research a pilot development process has been defined which guided the discussions on where the use-cases are in the development process, what has been done already, and what are the goals / KPIs
Citizen engagement	
	Based on the goals of the different use-cases, the engagement activities that have been conducted and are to be conducted have been discussed, as well as the discovery needs and desires. Drivers to engage energy community members have been identified.
Value-based framework	
	Which incentives have been developed already? Based on which knowledge, ideas? What are conditions of involvement? What do citizens find important?
Concerns and considerations	
	What needs to be explored? What is not going well (yet)? What do the use-cases / pilots need?

Table 4 Discussion topics with pilot leads

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2.2.1.1 Portugal

In October 2022, the pilot leads completed the use case template and then participated in an online meeting to discuss their inputs. This allowed the Social Innovation team to gather valuable information and perspectives on the social innovation themes relevant to each of the use cases enclosed within the pilot. Additionally, the team met with the leads in person as part of discussions at the November 2022 consortium meeting in Lisbon. This provided an opportunity for more in-depth discussions and face-to-face collaboration.

Furthermore, the team organized an online workshop with Smart Energy Lab (SEL) representatives, using a set of Miro canvases, taking place in January 2023, and an online workshop with SEL, INESC TEC and RD NESTER representatives in February 2023. These workshops focused on discussing in detail the stakeholder makeup using the RACI framework, collecting their previous research relating to the work, understanding their end users and the pilot setup, and establishing the pilot's social innovation needs through each of the four design phases. These workshops allowed for a more focused and collaborative approach to developing the appropriate methodology for the pilot in Porto.

2.2.1.2 Italy

In Terni (Italy), the leads completed the Use Case template and participated in an online meeting to discuss their inputs in October 2022. To further develop the methodology, TNO and SIN representatives travelled to Terni in December 2022 to meet with the ASM Terni team and to tour the pilot site. During this visit, a workshop was conducted using a Miro canvas to collectively work through their stakeholder makeup (R.A.C.I.), previous research relating to the apartment complex in which the pilot is based, available communication methods with the pilot participants and its end users. An additional site visit made the physical set-up of the pilot clear.

In a subsequent online workshop with ASM Terni and eMotion representatives in January 2023, the available design and social science methodologies were discussed, and the pilot's needs through each of the four design phases were established. These engagements allowed the Social Innovation team to gain a deeper understanding of the Terni pilot's unique characteristics and requirements, which informed the development of an appropriate methodology for the pilot.

2.2.1.3 Latvia

In Latvia, the leads completed the Use Case template and joined an online meeting in October 2022 to discuss their inputs with the team and develop an appropriate methodology for their

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project. The Social Innovation team then developed a Miro canvas and arranged another online meeting in December 2022 with LEIF and Government of Latvia representatives, where they discussed the pilot plan in more detail. This included timing, end users, relationship to the ENERSHARE project and stakeholder mapping using the R.A.C.I. model.

In a subsequent online workshop with LEIF and Government of Latvia representatives in January 2023, the Social Innovation team shared their values-based innovation framework and phases of development. They also discussed how SSH could be best utilized in the pilot, taking into account the specific needs and context of the project in Latvia. These engagement approaches allowed for a collaborative and thorough process of developing an appropriate methodology for the pilot.

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3 The SPUR framework

The SPUR framework for data sharing incentive and data sharing service design is visualized in Figure 6. It has been developed based on the desk research of previous projects, SSH and Design Thinking, and has been iteratively improved upon during the pilot discussions. The SPUR framework is designed to support the data providers, in this case the pilots, with an approach, specific methods and tools. The goal of the framework is to enable the design of services and incentives that stimulate data sharing of citizens (data owners). The SPUR framework aims to facilitate a co-design process in which citizens are actively engaged. In this chapter the framework is presented and described.

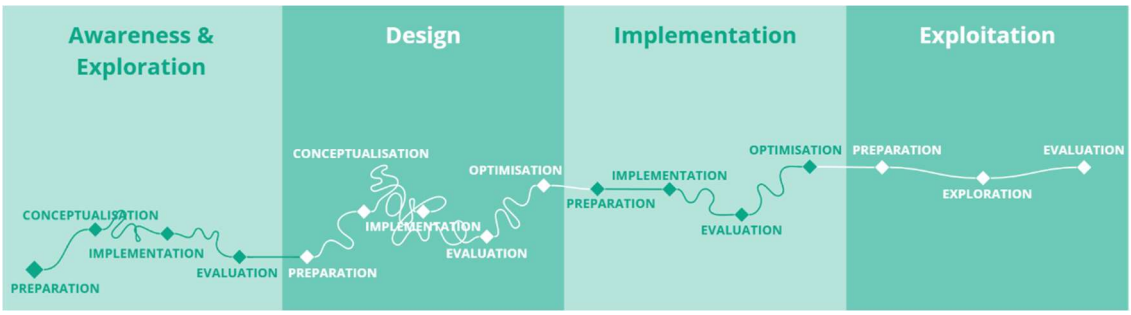

Figure 6 The SPUR framework

The SPUR framework is based on the human-centered design process, and thus consists of four consecutive in phases: awareness & exploration, design, implementation, and exploitation. Based on previous projects, each of these phases is defined by a set of steps and activities that are critical to the success of the process. Figure 6 shows the four phases of the process and the activities that take place within each.

Although the process is visualized as separate phases and steps, it is not a linear process. It is a fuzzy and iterative process where often one needs to return to earlier steps and phases to re-evaluate previous decisions, especially in the first two phases. The line graph in Figure 6 highlights the iterative nature of the process, emphasizing the importance of testing and feedback in designing effective solutions. To complete the consecutive phases and perform the associated activities of the SPUR framework, different methods can be deployed. Methods are particular procedures for accomplishing or approaching something. The methods presented in the SPUR framework have been compiled and selected from various design approaches by the social innovation team, to present a complete and useful framework for the data providers. The methods can be used in each phase, but do not all necessarily need to be applied. The selected methods are briefly described per phase and include references for further reading.

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3.1 Awareness and Exploration Phase

The first phase of the human-centered design process is awareness & exploration. This phase involves understanding the social challenge at hand, gathering insights about the people affected by the challenge, and identifying potential solutions. Activities in this phase include research, stakeholder engagement, problem framing, and ideation. The objective of this phase is to create awareness for (the importance of) (local) energy communities and data-sharing products and services applied in ENERSHARE use-cases, and for the relevance of data sharing, as well as exploring the values, needs and desires of all stakeholders.

Specific actions in this phase comprise:

- Preparing and providing information to consumers and communities about the importance and benefits of narratives applied in ENERSHARE use cases.
- Getting insights into consumer and community values, drivers, barriers, gains and pains.
- Defining socio-(economic) requirements from a consumer/community perspective.
- Defining socio-(economic) KPI's from a consumer/community perspective.
- Performing design research and design interventions and community action to create awareness about narratives applied in ENERSHARE use cases.
- Implementing interventions and communications to create awareness about narratives applied in ENERSHARE use cases.
- Evaluating the interventions and communications in practice, with consumers and/or communities.

Methods in this phase comprise:

- **Observation ethnography:** observing and recording behaviors and interactions in natural settings without influencing or interrupting the participants. In the context of working with pilot leaders from the energy sector, observation can help to identify how data sharing services are used in practice and their impact on social interactions.[2]

[2] Further reading: Angrosino, M. V. (2016). Naturalistic observation. Routledge; Martin, B., & Hanington, B. M. (2012). *Universal methods of design: 100 ways to research complex problems, develop innovative ideas, and design effective solutions*. Rockport Pub.

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- **Photographic ethnography:** taking photographs to capture social phenomena and to better understand the environment and context in which they occur. In the context of data sharing services in the energy sector, photographs can be used to document the use of technology and the physical and social environment in which it is being used.[3]
- **Diary studies:** distributing a diary format to record user behavior over a period of time to gain a sense of the user's current activities and how a future intervention can support the user.[4]
- **Home tour:** visiting the participants' homes to observe and understand their social practices and behaviors in their natural setting. In the context of data sharing services in the energy sector, a home tour can provide insights into how households are using and interacting with these services.[5]
- **Virtual tour:** using virtual reality or other digital technologies to create an immersive experience of a social context. In the context of data sharing services in the energy sector, a virtual tour can help to simulate the use of the services and provide a better understanding of the user experience.[6]
- **Board game:** using a board game as a tool for participants to engage in discussions and explore social phenomena. In the context of data sharing incentives and services in the energy sector, a board game can be used to facilitate discussion around the use and impact of incentives and services.[7]
- **Timeline:** creating a visual representation of the social practices and behaviors related to a specific topic. In the context of data sharing incentives and services in the energy sector, timelines can be used to identify how these incentives and services have evolved over time and their impact on social practices.[8]
- **Thing ethnography:** studying the material culture and objects that are associated with a social phenomenon. In the context of data sharing services in the energy sector, thing ethnography can be used to understand the physical objects and technology that are used in relation to these services.[9]

[3] Further reading: Pink, S. (2020). Doing visual ethnography. Doing Visual Ethnography, 1-304.
[4] Further reading: Martin, B. & Hanington, B. M. (2012). *Universal methods of design: 100 ways to research complex problems, develop innovative ideas, and design effective solutions*. Rockport Pub.; van Boeijen et.a. (2020). *Delft Design Guide*.
[5] Further reading: Mink (2016). *Capability Driven Design: A step-by-step approach.*
[6] Further reading: Crichton, S., & Kinash, S. (2003). *Virtual ethnography: Interactive interviewing online as method.* Canadian Journal of Learning and Technology, 29(2).
[7] Further reading: Wood, G., et.al. (2014). *Serious games for energy social science research.* Technology Analysis & Strategic Management, 26(10), 1212-1227. Knol, E., & De Vries, P. W. (2011). *EnerCities-A serious game to stimulate sustainability and energy conservation: Preliminary results*. eLearning Papers, (25).
[8] Further reading: Mink (2016). *Capability Driven Design: A step-by-step approach.*
[9] Further reading: van Boeijen et.al. (2020). *Delft Design Guide*.

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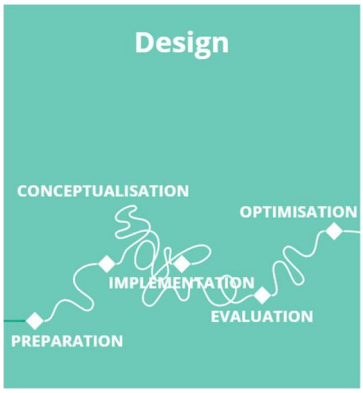
- **Longitudinal studies:** collecting data from the same participants over an extended period of time. Diary studies and photo diaries are examples of longitudinal studies that are commonly used in user experience research to capture participants' daily experiences and behaviors.[10]
- **Interviews:** establishing a dialogue with a participant to obtain deep insight and broad understanding of the participant by shared learning and communication. With help from interviews qualitative data is collected from a small number of participants on their behavior, choices, thoughts, emotions and motivations. Interviews can be informal, semi-structured or structured of nature, depending on the goal of the interview[11].
- **Combinations** of the above for triangulation.

3.2 Design phase



The second phase of the human-centered design process is design. This phase involves prototyping and testing potential solutions to the social challenge. Activities in this phase include developing prototypes, validating them with users, and iterate the concepts based on user feedback. This phase is critical to ensuring that the solutions designed are effective and meet the needs of the people they are intended to serve. The objective of this phase is to design service and incentive concepts for the ENERSHARE use-cases based on consumer and community values, drivers, barriers, gains and pains as well as on social-economic KPI's.

Specific actions in this phase comprise:

[10] Further reading: Chen, Y., Fan, Y., & Feng, S. *Longitudinal study on the effectiveness of an energy management system in university buildings.* Energy and Buildings, 2019, Vol. 183, pp. 352-361; O'Neill, Z., & Rogers, Y. *Longitudinal research methods in HCI: Challenges and opportunities*. In Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems, 2019; Azar, E., Menassa, C., & El-Gohary, N. (2017). *Using longitudinal monitoring to optimize building energy performance: A review*. Energy and Buildings, 152, 479-490; Epp, A. M., Anderson, K. M., & Biddle, R. (2015). U*sing photo diary methodology to investigate the adoption and use of electric bicycles in the United States*. Transportation Research Part A: Policy and Practice, 74, 219-229.

[11] Further reading: van Boeijen et.al. (2020) *Delft Design Guide*, Mink (2016). *Capability Driven Design: A step-by-step approach*; Martin, B. & Hanington, B. M. (2012). *Universal methods of design: 100 ways to research complex problems, develop innovative ideas, and design effective solutions*. Rockport Pub.

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- Defining values and requirements of consumers and/or communities to be addressed in the narratives of ENERSHARE use cases (based on the data collected in the exploration and awareness phase).
- Defining the consumer and community experiences you want to realize with ENERSHARE data sharing services for data owners (based on the data collected in the exploration and awareness phase).
- Designing value-added services and data sharing incentive concepts that address consumer and community values, drivers and barriers, gains, pains and desired experiences for ENERSHARE use cases.
- Prototyping the services and incentives (preferably with input from consumers or communities) of narratives of ENERSHARE use cases.
- Evaluating the service and incentive concepts and narratives on the consumer and community values, requirements and experiences for ENERSHARE use cases.
- Designing the final service and incentive concepts for implementation.

Methods in this phase comprise:

- **Personas:** Creating archetypical representations of user groups to describe and visualize their behavior, values and needs based on insight into their lives. They can be used to develop specific incentives and services for specific target users.[12]
- **5P model:** a model that consists of five key elements that are interrelated and must be considered together in the design of a service: People, Process, Product, Place, and Performance. They provide guidance on how to use the 5P model to identify opportunities for innovation in service design and to create a more holistic and customer-centric approach to service design.[13]
- **Stakeholder responsibility matrix:** developing a chart defining each stakeholder within the pilot project as either Responsible, Accountable, Consulted or Informed, commonly known as RACI. The goal is to understand the stakeholders involved in each pilot in detail and to plan engagement with them accordingly.[14]

[12] Further reading: van Boeijen et.al. (2020) *Delft Design Guide;* Fuglerud, K. S., Schulz, T., Janson, A. L., & Moen, A. (2020). *Co-creating persona scenarios with diverse users enriching inclusive design*. In Universal Access in Human-Computer Interaction. Design Approaches and Supporting Technologies: 14th International Conference, UAHCI 2020, Proceedings, Part I 22 (pp. 48-59). Springer International Publishing.
[13] Further reading: Pryor, M. G., Anderson, D., Toombs, L. A., & Humphreys, J. H. (2007). *Strategic implementation as a core competency: The 5P's model.* Journal of management Research, 7(1), 3-17.
[14] Further reading: Villanova University (2023): www.villanovau.com/resources/project-management/responsibility-assignment-matrix-raci-chart

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- **Stakeholder mapping:** a visual map of all stakeholder groups that relate to the design problem. This is predominantly visualized by drawing concentric circles and placing the actors organically based on their influence or involvement[15].
- **Journey mapping:** a tool from service design tool that enables the team to visualize the customer experience from start to finish, including all touchpoints and interactions with the service. By mapping out the customer journey, designers can identify opportunities for improvement and create a more customer-centric service.[16]
- **Empathy mapping:** a tool used in service design to help designers understand the needs and experiences of users. By understanding the user's experience in this way, designers can develop a deeper understanding of their needs and create more effective solutions.[17]

Development / Design

- **Brainstorming and brainwriting:** Brainstorming is an oral exchange of ideas, where brainwriting starts with participants writing down their ideas individually. These creative techniques are aimed at generating a large number of ideas, based on the presumption that quantity can lead to quality. Both approaches prescribe a specific set of rules and procedures to be carried out effectively. [18]
- **How-To's:** How-To's are problem statements written in the form of questions that support Brainstorming. These questions deal with 'how to do something' to stimulate idea generation. Clustering methods can be used to find common threads in the ideas and enhance the overall outcome. [19]

Validation methods

During the design phase, concepts and solutions are validated to ensure the accuracy, consistency, and reliability of data collected. Validation methods are:

- **Experience sampling:** a method of gathering real-time information from the user about their experience of daily life, as it occurs. Typically, users receive a prompt where they

[15] Further reading: Giordano, F. B., Morelli, N., De Götzen, A., & Hunziker, J. (2018). The stakeholder map: A conversation tool for designing people-led public services. In Service Design and Innovation Conference: Proof of Concept. Linköping University Electronic Press.

[16] Further reading: van Boeijen et.al. (2020), *Delft Design Guide*; Stickdorn, M., Hormess, M. E., Lawrence, A., & Schneider, J. (2018). *This is service design doing: applying service design thinking in the real world*. O'Reilly Media, Inc.

[17] Further reading: Brown, T. (2009). *Change by design: How design thinking transforms organizations and inspires innovation.* Harper Collins.

[18] Further reading: Heijne, K., van der Meer, et.al. (2018). *Survey on Co-design Methodologies in Urban Design*; van Boeijen et.al. (2020), *Delft Design Guide*; Martin, B. & Hanington, B. M. (2012). *Universal methods of design: 100 ways to research complex problems, develop innovative ideas, and design effective solutions*. Rockport Pub.

[19] Further reading: Heijne, K., van der Meer, et.al. (2018). *Survey on Co-design Methodologies in Urban Design*; van Boeijen et.al. (2020), *Delft Design Guide*.

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are asked to communicate their thoughts, perceptions of events and allocation of attention regarding the topic of interest in real-time to validate a designer's assumptions of use.[20]

- **Product concept evaluation:** a panel of stakeholders evaluate ideas or concepts, based on a set of predetermined issues. This method aims to determine which aspects of a proposal should be optimized and what elements are valued by stakeholders.[21]
- **(Experience) Prototyping**: a prototype approximates a feature or multiple features of a product, service or system. Through the use of a prototype designers can simulate the interaction between the user and the product. This method analyses how a user who experiences a product or service is affected by the context in which this experience takes place. [22]
- **Focus group meetings:** To bring together a group of stakeholders to discuss possible requirements. This method is useful for requirements elicitation and issue identification. The idea is to establish a collective view which is larger than the individual parts through the process of discussion. [23]
- **User testing:** Concepts of the solution can be tested with the users, for example with prototypes to gain further insight into the interaction between the user and the proposed solution.
- **Questionnaires:** a way of quantitively gathering information, for example to gain insight into the frequency of certain opinions, behaviors or needs. Knowing the frequency of perceived (dis)advantages of a proposed solution can validate design choices and challenge assumptions[24].

[20] For further reading: Christensen, T. C., Barrett, L. F., Bliss-Moreau, E., Lebo, K., & Kaschub, C. (2003). A practical guide to experience-sampling procedures. *Journal of Happiness Studies*, *4*(1).

[21] For further reading: Antonides, G., Oppedijk-van Veen, W.M., Schoormans, J.P.L. & Van Raaij, W.F., 1999. *Product and Consumer.* Utrecht: Lemma

[22] For further reading: Boess, S., Saakes, D. & Hummels, C., 2007. *When is role playing really experiental?: case studies*. In proceedings of the 1st international conference on Tangible and Embedded interaction (pp.279-282). ACM.

[23] For further reading: FARLEY, J., Ed. (1997). The Focus Group: A Strategic Guide to Organizing, Conducting and Analyzing the Focus Group Interview (2nd edn). Templeton: Probus Publishing

[24] For further reading: Creusen, M., Hulting, E., & Eling, K. (2013). Choice of consumer research methods in the front end of new product development (International journal of market research).

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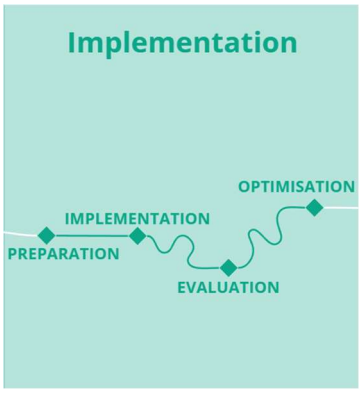
3.3 Implementation phase



The third phase of the SPUR framework is implementation. This phase involves bringing the solution to life, whether it is a new program, product, or service. Activities in this phase include pilot testing, scaling, and integration into existing systems. This phase is critical to ensuring that the solution designed is implemented effectively and has the desired impact. The objective of the implementation phase is implementing and evaluating the service and incentive concepts for ENERSHARE use cases in practice with the help of consumers and communities.

Specific actions in this phase comprise:

- Preparing the plan for implementation of the service and incentive designs at the consumer and community end.
- Defining roles and responsibilities of all stakeholders involved to implement the service and incentive designs in the ENERSHARE use case.
- Implementation of the service and incentive designs in the ENERSHARE use case.
- Evaluating the ENERSHARE service and incentive designs in practice with consumers and communities, on the consumer and community values, requirements and experiences for the ENERSHARE use case.
- Fine-tuning the ENERSHARE service and incentive designs based on the outcomes of the above evaluations.

Methods in this phase comprise:

- **Usage analytics:** In this phase usage analytics can be used to optimize the user journey and aid users in completing their intended actions efficiently. The quantitative data method can be used to optimize the design and identify bottlenecks in tasks that need to be performed. Usage analytics can be combined with other user probing based research methods to understand the underlying motivation of a user's actions[25].
- **Comfort evaluation:** Comfort relates to both physical and emotional/cognitive factors of subjective experience. The experienced comfort can be evaluated by comparison of concepts or environments.[26]

[25] Further reading: Collaborative, T. D. (2023). *Usage Analytics*. From Think Design: https://think.design/user-design-research/usage-analytics

[26] Further reading: van Boeijen et.al. (2020). *Delft Design Guide.*

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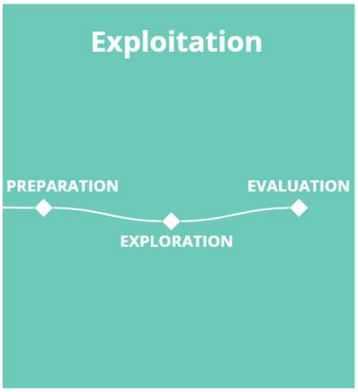
- **Experience sampling:** the proposed solution is tested through repeated assessments in the user's natural environment. The user may receive prompts or questions in the context of the solution, to be answered in real-time to provide a profile of the user's behavior.
- **Product usability evaluation:** To both improve the design and test if the product can be used successfully an evaluation is performed with both users and experts. By focusing on product perception and acceptance, the usability of a solution is evaluated based on a prescribed set of criteria.[27]
- **Questionnaires:** to capture the subjective impressions of the concept(s) formed by users, based on their experiences with a prototype or mock-up, questionnaires can be administered in the implementation phase.

3.4 Exploitation phase



The final phase of the human-centered design process is exploitation. This phase involves maximizing the impact of the solution designed. Activities in this phase are concerned with monitoring and evaluating, dissemination of best practices, and sustainability planning. This phase is critical to ensuring that the solution designed continues to have a positive impact on the social challenge it was intended to address. The objective of the exploitation phase is to assess the success of the implemented ENERSHARE service and incentive designs via the continued consumer and community engagement (acceptance and adoption).

Specific actions in this phase comprise:

- Preparing exploitation and maintenance (e.g. contracts, maintenance plan, setting-up/finalizing the business case, etc.).
- Defining roles and responsibilities of all stakeholders involved in the exploitation of the service and incentive designs in the ENERSHARE use case.
- Exploitation and maintenance of the service and incentive designs in the ENERSHARE use case.
- Evaluating the socio-(economic) KPI's defined for the ENERSHARE use case.

[27] Further reading: Maguire (2001). *Methods to support human-centred design.* International journal of human-computer studies, 55(4), 587-634.

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Methods in this phase comprise:

- **Usage analytics:** This method can be deployed during the exploitation phase to reveal patterns that were unforeseen during the implementation phase. Insights gained from analytics can be used to both monitor the usability of the service as well as to improve it by combining it with qualitative insights.
- **Comfort evaluation:** The focus of comfort evaluation can be relayed to evaluate the experienced comfort of use over a longer period of time, in the actual environment of use. In the exploitation phase optimizations can be made to increase the level of physical and physiological comfort.
- **Product usability evaluation:** during exploitation, validation of product usability can be performed in actual use conditions. Findings of this evaluation method can serve to further improve the service in terms of efficiency, effectiveness and satisfaction.
- **Questionnaires:** during exploitation, questionnaires can be administered periodically to gather data needed to perform for example usage analytics

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4 Requirements for data sharing incentive design and data-driven service design

The SPUR framework, as described in chapter 3, presents data providers with an approach, methods and tools to develop incentives and services for energy data sharing. Through the empirical research performed with the pilots, a set of requirements and criteria were derived that should be taken into consideration with the use of the SPUR framework. This chapter reflects upon the discussions held with the pilots, and provides a comprehensive overview of the found criteria for incentive and service development. Additionally, concrete recommendations are made on how these requirements can be implemented.

In this overview, three types of criteria of equal importance and relevance are defined throughout the development process:

1. Requirements of *primary concern*: these criteria can be seen as prerequisites for undertaking any sort of activity within the ENERSHARE incentive and service design framework.
2. Requirements for *engaging and learning about data owners*: these criteria are essential for building a relationship with data owners that facilitates the exchange of data and knowledge.
3. Requirements for *developing incentives and services*: these criteria are essential for the successful implementation of design activities within the development framework

Important to note is that these lists of requirements are based on 'narrow-scope' data sharing scenarios, meaning that no specific use case from the international data space perspective was provided to the data owners. For specific use-cases which may go beyond energy related services, additional requirements or strategies present themselves and as such, this list is not exhaustive.

Chapter 4 starts off with a description of the three pilots and their individual use cases in 4.1 before the learnings from the pilots are presented in 4.2. Additionally, a comprehensive overview of the availability of relevant data types for each individual pilot is given 4.3. After which, the chapter continues with a complete overview of all requirements categorized in the aforementioned typology can be found in 4.4.

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4.1 Pilot Descriptions

This section describes the use cases of the individual pilots as a result of the interactive sessions with the pilot leads in which a template was completed.

4.1.1 Pilot 2 | Porto, Portugal

The Living Energy pilot offers Portuguese citizens the opportunity to participate in the development of new services or products focused on energy transition that include EV charging, PV monitoring and household electrification together with the visibility provided by humidity, temperature, and appliance censoring. To this end, consumers and prosumers from different socio-economic backgrounds, including vulnerable consumers, share time series data about active power and static data about installed assets. Based on this data, and in order to develop the UC's, the consumers are paired together to create virtual communities. The outcome is a network (consumers/prosumers are nodes and benefits are edges) that can be used to assess mutual benefits and construct multiple communities. With the help of several human-centered methodologies, the collected data provides insights on how to design better products. The aim, from a SSH standpoint, is to define an approach for creating a community focused on designing and helping develop new data-driven products and services that aid the advancement of energy transition through consumers inputs – routines, social uses, perspectives, and perceptions. Figure 7 provides an overview of the end-user perspective regarding the Living Energy pilot.

Participants

The living energy participants "explorers", comprise a community of 58 active users, from which 52 have continuously provided reliable data, in three ways. Firstly, each user has their home equipped with a variety of sensors to capture data (consumption, temperature, and humidity). Secondly through short individual or group activities such as questionnaires or product/service testing. And thirdly, specific projects that entail various methodological approaches and are more extended in time.

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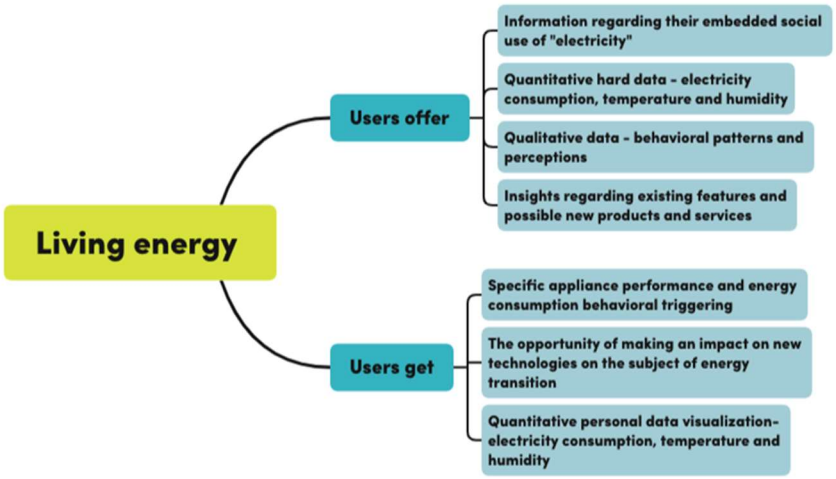

Figure 7 Living Energy pilot, from the data owner's perspective

For use-case 2B and 2C additional participants, living in social housing/vulnerable households, and seniors living alone are currently being identified. Additionally, 2-3 office building will be added to the group of explorers as well as 10 condominiums for which the sum of apartment consumption is measured. More detailed information can be found in appendix B.

Description of use case(s)

The goal of this pilot is to provide insights regarding data sharing that are essential to enable new business models such as peer-to-peer energy settlement and definition of incentives to identify and mitigate vulnerable consumers. Furthermore, to understand and classify domestic behavioral patterns accordingly to the different socio-economic contexts. This democratization of monitoring data can then be leveraged through meaningful alarmistic notifications. Therefore, there is a strong focus on services that provide monitoring capabilities based on the main loads characteristics and profile usage. To reach the different goals of the pilot, three different use cases are developed.

Use case 2A	
Leveraging on consumer-level load data to improve TSO's operational and planning procedures (RD NESTER).	The objective of this use-case is to assess the value of behind-the-meter (consumer-level) load data to the TSOs in improving operational and planning procedures, by taking advantage of the Energy Data Space ecosystem's advanced capabilities for data sharing. The goal of this use-case is to quantify the improvement of well-established procedures for network planning and operation that TSOs are responsible to execute, and translate it into the value – monetary and/or social – of the available behind-the-meter data.

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Use case 2B	
The instantiation of energy communities and digital simulation of business models (INESC TEC)	The objective of the second use case is to create renewable energy communities (REC) through data sharing and targeted pairing of consumers. These REC are formed through careful consideration of economic evaluation of REC and/or CEC business models, the consumption and generation profiles available in the Data Space, as well as other data sources such as open market data (prices) and weather data, and the possibility of assets sharing models. This is done with special attention to people living in social housing (vulnerable consumers).
Use case 2C	
Services for elderly people living isolated and for domestic consumers (SEL)	2C1 | This use case intends to explore the concept of an assisted living digital service offer based on changes in an individual's energy consumption. It is assumed that a 'typical' consumption profile, that reflects an individual's daily routines, habits and health status can be determined. This profile is than compared to real-time data communicated via EMS to detect any deviation to the typical pattern of consumption which may indicate a need for support. 2C2 | With the objective to conserve household energy consumption, this use case passively measures the energy consumption of most relevant household appliances, through a non-intrusive device. These patterns are monitored to identify irregularities indicating appliance retrofit or maintenance opportunities.

Stakeholders

The stakeholders involved with the living energy pilot have been mapped on a R.A.C.I. map. An overview of the stakeholders can be found in the Table 5.

Table 5 Stakeholder overview in Portuguese Pilot

Stakeholder	Description	within ENERSHARE	Use case
Smart Energy LAB (SEL)	Green dream factory for any new or improved product, service or process that contribute to accelerating energy transition	Pilot Lead. Responsible for data provision for the use cases in Portugal.	2C (responsible) 2A, 2B (accountable)
INESC TEC	Portuguese research institution	Development and testing of data driven services	2B (responsible)

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NESTER	Portuguese RD&I center for applied research and innovation of power systems	Assessing the value of consumers' behind the meter data in planning and operational procedures from the System Operator	2A (responsible)
End-users: Living Energy Slack	The consumers / prosumers whom take part in the Living Energy pilot	Informed about all activities taking place, and are consulted regarding perceptions of any new service or product	2A, 2B, 2C (informed/ consulted)
Transmission System Operator (TSO)			2A (consulted)
Energy Service Companies (ESCOs)	The community operators	They are delivering the service to the citizens	2B (accountable/ consulted)
Distribution System Operator (DSO)			2B (accountable/ consulted)
Municipality	Different municipalities in Portugal are involved in the Living Energy pilot	They aid in defining the end-users and other stakeholders (interested parties and end-users, specifically those who live in energy poverty).	2C (accountable/ consulted)
Appliance maintenance providers	Yet to be identified	Consulted regarding services.	2C (consulted/ informed)

4.1.2 Pilot 5 | Terni Italy

Pilot 5 is located in Terni, Italy and focusses on cross-value chain, data driven community-centered services for optimizing grid operation at the Distribution System Operator (DSO) level, while coordinating with e-mobility and water sectors. The pilot has three use cases which all have the goal to take advantage of the sources of flexibility offered to reduce the reverse power flow into the power distribution grid and in this way reduce the impact on the distribution grid. A profile of the end-users can be found in appendix B. Use case 5C was considered to be out of the scope of this research, as the focus is on increasing locally generated electricity for water supply services, without engagement of citizens.

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The anticipated use-case outcomes are the following:

1. Optimized grid management, which leads to increased self-consumption and self-sufficiency, reduced losses, and detailed observability of parameters in real time, to reduce the number of faults on the grid.
2. Advantages for consumers, such as greater continuity of supply, less environmental impact from their own consumption, greater awareness of their impact on the energy system and a drive towards active and more sustainable behavior.

Use case 5A

Cross-sector Flexibility Services for aggregators and DSO	Use case 5A aims to reduce reverse power flows into the distribution grid by showing end-users what their consumption is and provide real-time advice on how to better manage electrical loads. By the use of real-time sensors, fast data transmission and the presence of a SCADA system (Supervisory Control And Data Acquisition: a control system architecture used for controlling, monitoring, and analyzing industrial devices and processes), it becomes possible to build a system that aims to reduce net congestion issues. See Figure 8.
Participants	50 households in multi-residential apartment building in Terni, equipped with IoT smart meters

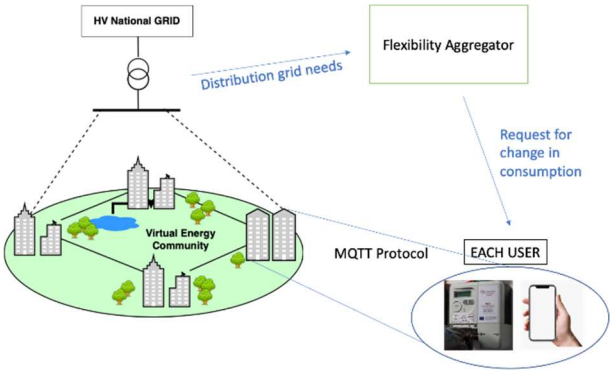

Figure 8 End-user perspective placed in use-case 5A

Use case 5B

Services for e-mobility CPOs, EVs drivers (or communities of EV drivers)	In this use-case, electric mobility will be used as a flexibility (e.g., DR) with the aim to implement an optimal charging system, which provides benefit to both consumers as well as to the grid. The increasing number of electric vehicles, increases the amount of electricity that must be supplied which requires strengthening of the power lines. With this use case, the Terni pilot aims to increase the CPO ability to attract EV users to their charging stations by offering reduced charging costs during peak hours.

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	This dynamic charging/pricing is aligned with the grid thanks to the help provided to the DSO (Distribution System Operator) for managing the grid congestion level. See Figure 9.
Participants	10 eMOTION employees living in Terni region (demo)

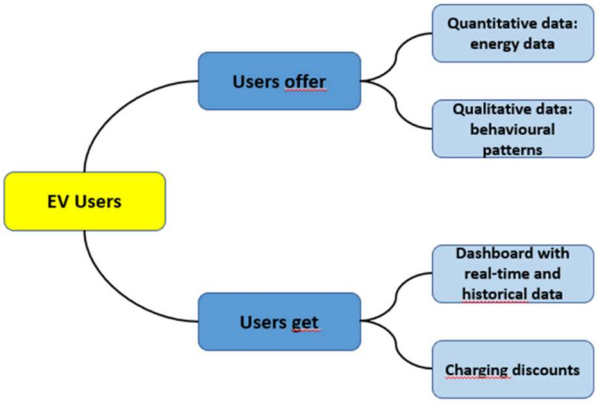

Figure 9 The end-user's perspective in use-case 5B

Stakeholders

The stakeholders involved with the Terni pilot have been mapped on a R.A.C.I. map. An overview of the stakeholders can be found in Table 6.

Stakeholder	Description	within ENERSHARE	Use case
ASM Terni S.p.A.	Distribution system operator (DSO) operating in Terni.	Pilot Lead. Responsible for data provision.	5B (accountable) 5A, 5C (responsible)
eMOTION	Charging station manufacturer, Charging Point Operator (CPO), electric mobility service provider (eMSP)	Technical partner, CPO and eMSP responsible for charging stations and electric vehicles in Terni pilot	5B (responsible)
Ingegneria Informatica S.p.A. (Engineering)	Italian organization, specialized in creating digital ecosystems	Work package partner and project coordinator	5 responsible
Terni Municipality	Majority shareholder of ASM Terni		
Umbra Energy	Energy supplier in Terni	Decide on tariffs of the supplied energy	

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Consumers/ prosumers	Consumers and prosumers are organized in an Energy Community	Participants	5A (consulted/ informed)
Employees of eMOTION	Group of 10 eMotion employees are demo users in 5B	Participants	5B (consulted)

Table 66 Stakeholder overview of the Italian pilot

4.1.3 Pilot 7 | Latvia

The aim of this pilot is to create a solid framework through cross-sectoral integration of a large volume and variety of heterogeneous historical and streaming data on financial performance of energy efficiency projects, in order to inspect, improve, exploit and further enrich data sharing principles encouraging more connection and collaboration between green financing/green loans organization and institutions, which can result in important new findings and enhanced methods within the field. The scope is to strengthen debt and equity financing of energy efficiency investments, providing investors and project developers the opportunity to easily evaluate key performance indicators of future projects. Besides traditional AI-based green financing analytics services, in the context of this pilot the evaluation of energy data sharing to other sectors and the exploitation of how this pilot concept should evolve to become a more generic data sharing solution will be further investigated. The scope of this pilot stems from the need of providing innovative services which will be based on Data Spaces, counting on cross-value chain stakeholder data-driven services, at the interplay among smart meters data and financing.

The Latvian pilot does not differentiate different use cases, however its goals are twofold:

1. Reduced energy costs for the private household. The user would like to reduce the costs for the energy consumption in the private households thus, the alternative ways to produce energy individually are investigated. An obstacle here is the lack of specific RES technologies for energy production in the market. In the pilot a service is developed to calculate the potential scenarios for energy production if different RES technologies are installed, this includes a calculation of energy efficiency improvement/savings and a calculation of the costs of installation for PV, boiler, heat pump, etc.
2. Facilitate effective and safe project investments. The investors are looking for financially secured projects and effective investments. Investors would like to provide a trustful calculation tool for potential project developers (the energy community) to evaluate RES technologies. This tool should be usable by the project developers.

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The pilot realization will give LEIF the support tool for its customers to plan and manage financial investments in energy efficiency projects and actions more precisely and to raise awareness of the energy efficiency actions. The use of the tool will contribute to achieve the national climate goals and will stimulate energy independence and RES technologies use in Latvia.

Stakeholders

The stakeholders involved with the Terni pilot have been mapped on a R.A.C.I. map. An overview of the stakeholders can be found in Table 7.

Stakeholder	Description	within ENERSHARE
LEIF	Latvian Environmental Investment Fund	To increase the capacity of municipalities and commercial organizations in preparation and carrying out of qualitative and effective projects
NTUA	The National Technical University of Athens	Responsible for the technical tool development for the Latvian pilot. They are also educating energy auditors.
The Ministry of Economics	Latvian ministry of economics	The Ministry of Economics have created financial programs to support RES and create awareness. They create the policies and frameworks of the financial support programs and manage these programs and the financial instruments. They are also the evaluators of the project proposals submitted for the calls of the financial instruments
Application evaluators		Evaluators of project proposals submitted for the calls of the financial investments are consulted to provide input based on the project proposals and feedback from consumers.
Potential investors	The Ministry of Economics and the Ministry of regional development and environmental protection	The ministries create the policies and frameworks of the financial support programs and manage

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	(which is undergoing a reorganization now) have created financial programs for households to support RES in the private sector and to raise citizen awareness on RES.	these programs and the financial instruments.
The community of private households (project developers)	The private households in Latvia who want to make their house more sustainable and are eligible for funding. There are around 25% of Latvian inhabitants living in the private households in Latvia.	The owners/maintainers of these houses are the main energy community involved in the Latvian pilot.
Energy experts/auditors	Two energy experts are involved who are qualified to conduct energy audits.	They are accountable for these audits and are consulted to provide input for the pilot and the technical tool development.
Energy Service Companies	Latvian Energy Service Companies (ESCOs)	Consulted to provide input and the technical tool development, and are informed about the progress of the pilot.
Banks	Latvian Banks	Consulted to provide input to the pilot and the technical tool development, and are informed about the progress of the pilot.
Energy agencies	The Riga energy agency and the Zemgale region energy agency	Informed about the Latvian pilot

Table 7 Overview of the stakeholders involved with the Latvian pilot

4.2 Learnings from the pilots

Through active discussion with the pilot teams, we were able to reflect together on the activities previously undertaken within their respective use cases. A detailed report of these activities per pilot can be found in appendix B. From the interactions with the pilots, various considerations for the implementation of the SPUR framework and the methods were derived. Moreover, points of concern were raised, which the pilots want to address. These insights from practice, build upon the presented framework and its methodologies, as introduced in chapter 3.

- **Getting to know the members and collection of user insights**

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A first learning is the importance of getting to know the pilot members and to collect user insights. In the Portuguese and Italian pilots there is an apparent need to get to know the users in order for forecasts of electricity usage from households and EV charging to be made more accurately. As well as, potentially, for flexible demand schemes to be developed.

In Portugal, this also involved uncovering the dynamics within the community of users in addition to individual practices and needs. Investigations like these proved important, not only to learn about the users themselves, but about their houses and facilities too. For example, the insulation of the houses of Italian consumers turned out to be poor, changing the focus of energy efficiency improvements. The Latvian pilot showed that entering a dialogue with end users is not always easy, especially during times of COVID where only remote surveys and webinars could be held. These did not facilitate the desired quality of feedback about the financial support schemes.

- **Communication with the pilot members and keeping them engaged**

It is important to keep pilot participants informed and/or engaged. Engagement leads to well-established design requirements and incentives, less design iterations and informed decision making (better-informed, easier access to users, reduce risks). It also leads to better applicable incentives, services, communication etc. and to better accessibility, applicability, acceptance and adoption of services by targeted user groups and types.

This flows into a second learning: communicate with pilot members and keep them engaged. The pilots experienced various challenges with communicating with data owners. In the Latvian pilot, it is unsure if the information about new subsidies actually reaches all of the intended audience and whether it is clear to them how to apply for it. In a similar sense, the calculation tool developed to provide insight into potential savings of sustainable assets was deemed too technical and did not appeal to consumers. In the Italian pilot the workshops were visited by less than half of the households, and 10 out of 50 households downloaded the newly developed app for demand response information and insight into usage. This demonstrates a low level of engagement. The households are not yet a community, they are more family-oriented than community-oriented and busy with other things in their lives. They did not see the energy community as a top priority. Paradoxically, they do want to receive notifications about grid congestion and information about peak hours and, as this information is real-time, it requires continuous engagement. Service developers are therefore face a dilemma between levels of engagement and participation. Struggles with engagement in Latvia resulted in, the government aiming for a minimum amount of paperwork to apply for subsidies and to store only small amounts of data on households, as households complain about the large amounts of paperwork and monitoring when applying for European subsidies. In Latvia, effectively communicating also

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proved to be relevant from an organizational perspective. Now, valuable time was lost due to big misunderstandings as it was not clear who was doing what within the pilot.

- **Data owner characteristics in the pilots that influence engagement**

Struggles with engagement vary between the pilot's community or group of data owners. Based on the pilot discussions, it became apparent that the dynamics of these specific groups resulted into different engagement related challenges. It was not only challenging to unite the various data owners, but also to get them to actively contribute to the activities together. In Italy, it proved especially difficult to install a sense of community in data owners as they are culturally more family-oriented. Living in the same neighborhood does not mean that people will act as a community. The fact that the Terni pilot has been established top-down, also added to this difficulty. This largely influences the engagement strategy: when created bottom-up, the community members are actively engaged already. Contrastingly, when created top-down, the urgency and relevance comes from outside stakeholders and households need to be made aware, interested and engaged. The other pilots range in between top-down and bottom-up, and in the Portuguese pilot this did lead to a higher level engagement. Here, households themselves could freely apply to participate only if they wanted to and were asked to participate through social media. Once they were part of the community, they are free to join 'challenges' for which they could even earn credits that could be exchanged for gift cards. Another factor that influences the engagement of these groups is the pilot leads' methods of communication. Additional to the findings on communicating with individual data owners, the ways that groups are addressed and can interact with each other during these moments, such as through ministry websites, going door-to-door, organizing face-to-face or online group meetings, workshops and social media, all have a different effect and result.

The group dynamics further encompass the composition of data owners and their geographical location. Data owners can differ greatly in interests, user type, country of origin, behavior profile, level of knowledge, environmental consciousness, level of interest and available time. This can prove to be another hurdle for effectively engaging these communities. When developing services for elderly, for example, this resulted in additional difficulties as elderly people are often less familiar with digital technologies. At the same time, tech-savvy participants of the Italian pilot demanded more innovative services as the novelty appealed to their interests. Dealing with this multitude of backgrounds, skills and interests adds difficulty to shaping energy communities. At the same time, energy communities can be located in one specific area or spread out around a country without being in close proximity to each other. In the pilot in Portugal, for example, participating the data owners could reside anywhere in the country. When geographically spread around a country, connections between members are more complicated than when they live in the same neighborhood. This fueled discussions

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regards the exact definition of a community and how the composition should be organized geographically.

- **Creating viable business models for services and incentives**

These strategies for engagement which aim to incentivize consumers to partake in data sharing relate to a larger concern on how to create value for both consumers as well as other stakeholders within the use cases. For the newly developed services to work, both sides are important. In the EV charging use case in Italy, KPI's are, up until now, formulated from the perspective of the charging operator. The needs and desires of the data owners have not yet considered in these targets. This does not mean to say that the pilots did not formulate any potential benefits for the data owners. For example, activities in the pilots were expected to educate them about their own consumption in various ways (usage, costs and environmental impact), give them a say in shaping their own energy community, offer them products that are accessible and democratic and give them the opportunity to attain rewards such as the gift cards in the Portuguese pilot. Until now these benefits have not been validated with the data owners. The benefits from the perspective of the data owner should become more of a priority. Within the use cases, new value propositions developed around consumers' values have been created such as demand response platforms in Italy, an appliance maintenance service for elderly in the Portuguese pilot and a calculation tool in Latvia. Whilst a need for these tools was identified, they still need to be evaluated from a user perspective. These new value propositions try to provide non-financial incentives to pilot members but incentives in general proved hard to materialize. In Italy, the energy prices of renewable energy are the same as traditional electricity, therefore, there is little incentive to change. Additionally, no guarantee can be provided that the energy supplied is fully sustainably produced. As prices vary over time it also turned out hard to provide accurate and concrete numbers for the calculation tool in Latvia. They instead opted for ranges to communicate potential savings to avoid damaging the trust consumers had in the tool's outcomes. In Portugal, the financial incentives had to be provided by the pilot leads. This works for now, but if the number of members grows rapidly, it becomes hard to find financial resources for the incentives.

Besides these incentives, the amount of knowledge about energy data sharing and its possibilities proved an important factor throughout all activities that is also decisive for the willingness of participants to invest their time, stressing the importance of appropriate awareness and communication.

- **Data privacy and security**

For energy community members to trust new services that make use of their energy data these services do not only need to be accurate and clearly valuable, but also in line with privacy

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regulations. In general, pilot leads from all pilots indicated that their members are be fine with sharing their data for the purposes described in the respective use cases if the data is handled correctly. This means making sure that all data are generated, stored and shared in a way that is GDPR compliant. Members should also have the option to opt out at any given moment, removing the already stored and shared information.

- **Learning about rules and regulations that slow down the process**

At the Italian pilot site, wind turbines are prohibited due to bird corridors and, to prepare households for using renewable energy with PV, heat pumps and EV charging points, various permissions had to first be granted. This can take a long time. So does applying for funding schemes. The application process for funding in Latvia can take up to several years, slowing down implementation.

4.3 Relevant data types

Talking to the pilots also resulted into insights into the types of data that they were able to collect from the data owners. Types of data that are of great influence for the potential use cases of a shared data space. Because of this importance, we also explored openly available national databases that contain household characteristics (census data) and energy relevant insights. Combining this with the data types collected from the pilots' research into their community members we intent to make a start at creating an overview of what data is available. All these available data types are reported on together with data types that the pilots still required but did not yet have access to.

4.3.1 National databases

Databases on national scale provide statistics about demographics and indicators of prosperity. Following the scope of the pilots involved in this project we provide a quick scan of their national databases. For each data base we list all openly accessible data types about household and energy related factors that could be of interest for the EEDS. These are deemed relevant by choosing data types that relate to the stakeholders and use cases within the selection of pilots of this deliverable. The databases that we consulted are Censimenti permanenti[28], Fundacao pordata[29] and the Official statistics portal[30] of Italy, Portugal and Latvia respectively. An overview of all data types coming forth from this quick scan is displayed in.

[28] Istat Statistics
[29] Portugal: Statistics by themes | Pordata
[30] Statistics Portal

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	Data type	Expressed in	Portugal	Italy	Latvia
Population	Population size	Citizens	x	x	x
	Population density	Citizens per km2	x		x
	Age	Numbers	x	x	x
	Gender	Male or female	x	x	x
	Citizenship	Domestic or foreign/stateless/double nationality	x	x	x
	Wellbeing	Material living conditions index/quality of life index	x		x
	Life expectancy	Years			x
	Poverty	% of total citizens/households			
	Material and social deprivation	% of total citizens/households	x		x
Housing	Type of housing	Private (conventional/non-conventional) or institutional/collective	x	x	x
	Family size	Members	x		x
	Number of children	Citizens			x
	Household size	Tenants	x	x	x
	Type of ownership	Buy or rent or other	x	x	x
	Dwelling type	Detached or semi-detached or apartment in flat			x
	Dwelling size	Useful area (m2)	x		x
		Number of rooms	x		
		Useable area per tenant	x		x
	Housing costs	Euro/month	x		
	Housing maintenance	Euro/month			x
	Domestic facilities	Percentage of total dwellings per facility	x		x
	Building conditions	Need for repair (no or minor/moderate/major)	x		

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	Construction date	Year	x		
	Homelessness	Homeless (male/female, age)		x	
Education	Educational level	Highest degree	x	x	x
	Digital literacy	% of people working from home			x
		Computer and internet usage (use frequency)			x
	Literacy	Citizens	x		
Employment	Working status	Active (employed/unemployed) or non active (pensioner/student/housewife/disabled)	x	x	x
	Disposable income	Euro/month			x
	Purchasing power	Specified goods (food types/vodka/petrol)			x
	Commuting status	For work (outside municipality of residence/not) or for study (outside municipality of residence/not)	x	x	
	Commuting time (average)	Minutes	x		
	Means of transport	Transportation modes	x		
	Occupancy	Types of labour	x		
Energy	Electricity consumption	kWh per type of consumption (domestic or industry or agriculture etc.)	x		
		kWh per type of industry	x		
		kWh per capita	x		
	Energy consumption	TJ per energy type (coal or gas or fluid etc.)	x		
	Fuel sales	Tonnes per fuel type	x		
	Production from renewables	kWh	x		

Table 8 Overview of data types per database along with the unit of measurement

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Additional information to the overview

All data from Italy and Latvia are available per county and province, Portuguese data is limited to a national level. More specified regions and spatial data can be of big significance when looking to develop new services or incentives in the energy domain as the local consumption of energy is an important factor in avoiding net congestion. The datasets from Portugal and Latvia are available for a long period of time so that changes can also be observed between years. In Italy, the data were captured in 2021 or 2022. Again, this extra dimension of time can give additional significance to the datatypes making them more relevant for potential applications. The data about production from renewables can be retrieved on a national base from the Fundacao pordata database but information about the production of renewable energy from households can also be found in the open access database of DSO E-redes[1].

What makes these data types relevant is how they could be used in potential use cases for the EEDS that aim to provide more efficient and responsive energy systems. To illustrate, data about commuters, fuel sales and modes of transport could inform EV charging operators to expand to certain countries or areas and combining that with information about the production of renewable energy can already give them a basic level of insight into the amount of additional energy that is needed for charging EVs using renewables. By using data that is openly available and ready, a rough basis can quickly be formed that can inspire new use cases and applications. In the spirit of the EEDS, this process could accelerate the development of a smarter energy grid.

However, this list of datatypes does not reflect the full set of opportunities that could come forth from openly available sources. These three national databases contain more detailed information on topics such as health and economics that could become relevant in the light of different use cases. More databases such as these are also likely to exist and more specialized datasets such as the household energy production data provided by E-redes in Portugal can be retrieved if a more specific query for data is sent out to them.

4.3.2 Collected pilot data

All pilots have conducted research into their community members. The community members have all consented to this data to be used for specific purposes. When this data is to be shared on the European energy data space (EEDS) platform, consent must be obtained again from all participants for this specific purpose. Only then can the data be generated, stored in the EEDS database and made publicly available in an anonymous way. In the different pilots different types of information is known. This information is described below.

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Pilot 2 | Living energy Portugal

- Consumer characteristics (age, gender, income level, household composition, income level). This data cannot be shared.
- Real time data about energy consumption of households in living energy (behind the meter)
- Use of gas and electricity equipment and efficiency (how long it takes to cook for example)
- Household composition
- Family (size)
- Type of housing
- Mode of transport (especially EV drivers)
- Availability of PV, other assets

Pilot 5 | Terni

- Socio-demographic data from H2020 WiseGRID project
- Energy literacy (i.e. knowledge on demand-response)
- Values, needs and desires about demand-response services from the H2020 BRIGHT project
- Demographics: age, gender and educational level
- Assets: heating and cooling, smart meters, EV, smart home products
- Energy consumption, expenditure and understanding thereof
- Desire of pilot members to have a better understanding of own electricity consumption
- Preference for charging mechanism
- Perception of:
    - Efficiency of energy use in household
    - Accuracy of smart meter
    - Reliability of power
    - Demand-response
- Desire to have a better understanding of own electricity consumption
- Willingness to
    - Switch of appliances during peak hours
    - Pay more for renewable energy
    - Produce own electricity and supplying it to the grid
- Care for:
    - Waste of electricity
    - Reduction of CO_2 emissions
- Interest in

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- Using smart technologies
- A personal mobile app for monitoring and controlling energy consumption at home
- Using demand flexibility services

Pilot 7 | Latvia

In Latvia, the funding program has started recently, no prior research or reports are yet available. The data providers are also aiming to reduce the paperwork and monitoring obligations for the funding scheme. They want to make it as easy as possible for house owners to apply. Publicly available data can be obtained from the national database.

4.3.3 Required data

At this point in the project, it is not yet clear which data has value for 'data consumer' on the EEDS platform and therefore, which data is required from their perspective (see Figure 10). Data providers, in this report the pilot leaders, however, still require additional data for developing energy related services. These data types are described below.

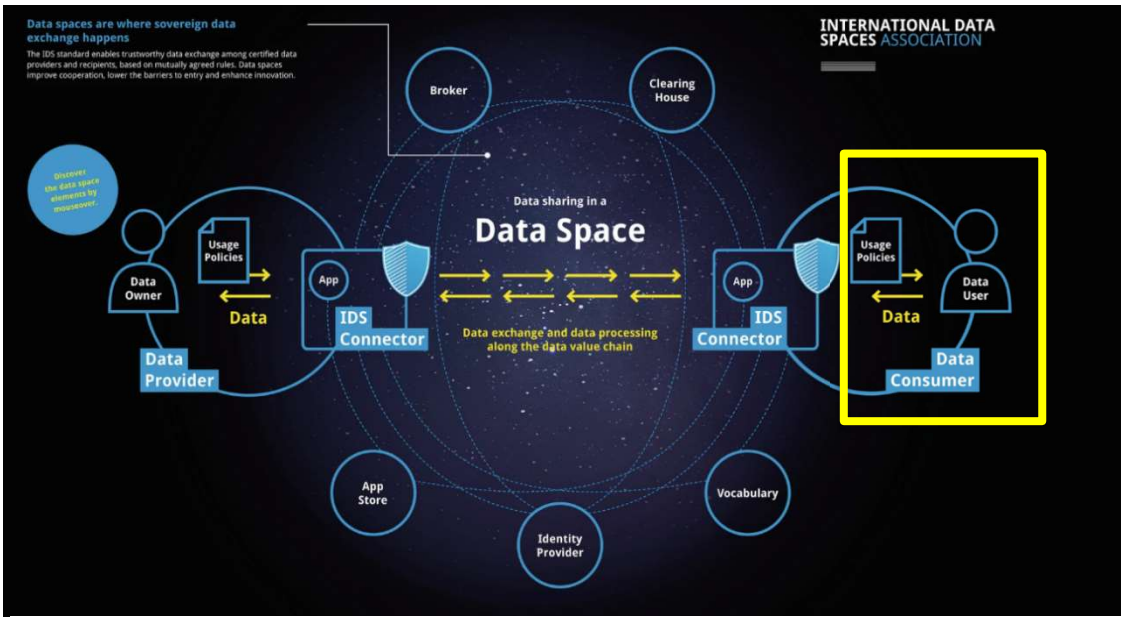

Figure 10: International data spaces by Pettenpohl et.al. (2022). The yellow rectangle is added to indicate the focus of this section on the data consumer

Pilot 2 | Living energy Portugal

- Community dynamics
- Household characteristics to be able to define specific user segments

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- Better understanding of habits and needs and peculiarities of specific user segments
- Willingness to pay for the services defined in the use-cases
- Energy consumption patterns
- Consumption of appliances and anomalies

Pilot 5 | Terni

- Household characteristics
- Forecasting (predictions of electricity generation)
- Type and amount of notifications per month that would be acceptable
- Habits, personal commitments, behavioral patterns for charging and flexibility services
- Current state of energy use and efficiency. Include cooling and insulation as well.
- Community dynamics
- The perception of the community on asset sharing

Pilot 7 | Latvia

- Household characteristics

4.4 Requirements that are of primary concern

Before undergoing any of the activities discussed in the SPUR framework there are some important aspects to consider before any other activities are undertaken. In total, three main types of requirements are found to be of primary concern: knowing the rules, planning for the future, and taking responsibility for the data. These are described in this chapter.

Know the rules

When undertaking any of the proposed activities it is vital to be up to date with rules and regulations that touch upon them. Concretely, data providers (who collect the data from the members and make them available to the Energy Data Space) should:

- Identify regulations, rules and required permissions
- Obtain the right permissions

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Plan for the future	
Any type of service or way of exploiting data held by data owners needs to have a perspective in the long run. To ensure a longer lifetime, data providers should:	• Create stable revenue streams and find partnerships for funding • Use wide margins when calculating energy savings or prices, these vary over time • Set a goal for the minimum amount of data owners that are needed to participate
Take responsibility for the data	
It is also important that any data collected and shared is treated in a correct and safe manner. Good etiquette for handling data dictates that data providers should make their intentions understood by data owners and other parties by:	• Being transparent towards data owners about "who, what and what for" personal data is used. • Explaining the difference between anonymous, pseudonymous and personal data.
They should also ensure that all data collected is the 'right' data and no excess data is accumulated or shared:	• Make sure personal data collected are (i) adequate, (ii) proportionate and (iii) relevant to the objectives of the service. • Guarantee that the personal data collected is accurate.
To operate in a safe way, data providers must keep data *private and secure* and consider to:	• Ensure data rights; the right to access (i), the right to physically or virtually approach a common-pool resource (ii), the right to withdraw (iii), to manage (iv), to exclude (v) and to alienate (vi). • Install data security measures / cybersecurity and removing stored and shared data if a person opts out.
And as a last aspect of taking responsibility, data providers must manage the data in an appropriate manner that coheres with the aforementioned aspects. This includes:	• Technical implementation: ensure anonymity of data owners, secure and sufficient storage, accessibility rights for data owners and data consumers, and trackability of data • Supervision: appoint an organization to ensure responsible data collection and data exchange, anonymity, storage, accessibility and trackability

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4.5 Requirements for engaging and learning about data owners

When setting up a data sharing service or retrieving incentives, data owners need to be sufficiently engaged to make them aware of the potential benefits of such a service and what they might contribute/get out of it. As the framework shows, a good relationship with data owners (community members) is also a great asset throughout the remainder of the development process as it facilitates continuous streams of feedback. If there is no expertise within the organization of the data provider, a person or agency can be hired to conduct engagement, learning and communication activities. We consider three aspects to this engagement strategy encompassing several requirements.

Establishing and maintaining a relationship with data owners

To form such a relationship there are some basic principles for data providers to adhere to:

- When establishing a relationship, be honest and realistic about data sharing benefits and constraints towards data owners (i.e. service delivery and rates).
- When maintaining a relationship manage expectations by being transparent, especially about things that are not going as expected to avoid disappointment.
- Empathize with the data owner and their context by learning about their situation without interpretation and judgement.
- Maintain interaction with data owners to keep them engaged (i.e. newsletters). Regular communication (once / 6 weeks) is important, not too little, not too much.
- Build a community by stimulating interaction between data owners (i.e. a joint meal, an energy fair, coffee & cake hop-ins, information meetings, etc.).
- Think of the level of participation you want to achieve, and match this with the methods you deploy (SPUR framework).
- Create/raise awareness for and knowledge of data sharing and the goal of data sharing.
- Create trust with the households you are engaging in data sharing.

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Communicating with data owners	
Closely linked to these basic principles are strategies and requirements for communicating with data owners. Data providers must strive to:	• Raise awareness about the existence of the EEDS and the possibility to contribute. • Communicate clearly to the data owners what the value is of what is offered to them (i.e. value propositions, being part of an energy community, contributing to sustainability). • Providing a range and not an exact number when promising data or discounts. • Communicate regularly, but do not overburden data owners with questions and information. • Use different forms of communication (e.g., technologies, tools, social media, websites, face-to-face meetings, letters) and introduce a variety of content, in order to address different data owners segments and to keep the attention of the data owners (to not lose 'edge'). • Make the tools / technologies visible and findable, marketing is important. • Provide visual materials.
Ensure a diverse sample	
A last important aspect of effectively engaging with data owners is to be *inclusive* and consider different levels of knowledge and skills. To do so, data providers have to:	• Provide information that everyone can understand (i.e. elderly) and that is sufficiently new to satisfy curiosity. Tailor to various profiles. • Think of eligibility criteria: who is excluded from the current activities, and why? Adjust these activities if necessary. • Make sure that all stakeholders are able to keep up with the pace of technological development.

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4.6 Requirements for developing incentives and services

A last set of requirements concerns the design of the services, technologies and incentives that data owners can develop to facilitate data sharing. The challenge is to strike a balance between the dreams of the stakeholders in relation to rules, regulations, technical and financial possibilities, user capabilities, and environmental benefits. As these designs revolve around the interaction between the two stakeholders (data owners and data providers) they should correspond closely to their values and follow the principles of human centered design and service design. We discuss strategies that are important to take into account when exploring *what* needs to be designed as well as requirements for *how* these designs could achieve this. Whilst this is not strictly a linear process where one activity follows from the other, these strategies and requirements do build on each other and their order of implementation should also be considered.

Gaining insights into users/contexts	
Typically, a first step to identifying opportunities for new services, technologies or incentives is to engage with the users and context you aim to develop them for. To retrieve these opportunities, a data provider can:	• Engage and learn from the data owner and their context already early on in the development of new services. • Depending on the community size and composition create user segments to develop value/incentives for specific target groups. • Identify values, needs, desires, motivations and barriers of data owners. What makes them thick? Financial benefit? The environment? Community sense? Identify the community perspective on different possibilities, such as asset sharing, different incentives, communication, etc. • Gain information about the household demographics and available technologies / assets.
Formulate value propositions	
When such an opportunity is identified, it needs to be further developed and formulated in a way that can inspire the creation of new concepts. The emerging propositions should connect to values upheld	• Create tools / technologies that are sustainable. • Incentivize 'green' behavior in data owners, not just the data sharing.

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by either data owners or data providers in a way that both parties are motivated to make use the concept. In creating new value propositions, data providers need to:	• Create value for data consumer: Explore the real value of data: which data is valuable on the data sharing market and how valuable is it?
	• Create tools/technologies for the data owner based on the collected insights about their personal situation to make them useful and desirable for them.
	  ○ Look beyond the economic and environmental benefits.
	  ○ Alignment with values on both a collective (household and community) and an individual level.
	  ○ Fit the incentives to user segments.
	• Stimulate ownership by engage households early on in the project, especially when products / services are developed.

But when values are identified the proposition still needs to be crystallized further into a more concrete way of leveraging the values of the stakeholders involved. To explore how this might be done, data providers can:	• Develop a profits sharing scheme for all stakeholders. • Divide the required effort in such a way that it is in line with the projected benefits for each stakeholder. • Define what is the value of certain data types and whether data owners require incentives to share them.
In this process of leveraging values it is important to ensure that all benefits and costs are distributed equally, also considering the people that are left out of the proposition. Important criteria to consider are:	• Diversity, non-discrimination and fairness (e.g. right of access and use, obligations (bidding obligation, opt-out)). Think of eligibility criteria: who is included, who is excluded, and why? • Distributional justice (Fair distribution (costs/benefits) across groups • Recognition justice (recognized justice by different groups, mutual understanding). • Procedural justice (e.g. development, roll-out, operation).

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Make it usable

To further develop concepts that emerge from the developed propositions data providers need to consider usability aspects of the forthcoming designs. To make sure anyone can make use of it, data providers have to fit the technologies and tools to the user's capabilities so that all are able to use it by:	• Creating technologies, tools and services that are accessible, applicable, acceptable, and adoptable for the intended data owner group. • Making sure that usability criteria hold true in the different contexts of the data owners. • Make sure that all stakeholders are able to keep up with the pace of technological development. • Providing information all intended users can understand
Making the design accessible also extends into making it simple and clear. Data providers should:	• Reduce the number and complexity of contracts, services, etc. • Avoid bureaucracy (i.e. filling in less forms and papers and avoiding non-essential actions and activities). • Provide clear and understandable status indication and result interpretation. • Provide clear feedback about input, output, changes in status, predictability in this, but also impact on routines. • Make the incentives visible and findable. • Keep the threshold for using the design to a minimum by matching the amount of knowledge required to operate hardware, software and to interact with the service provider, with the user's mental model.
Another aspect of keeping the designs usable and ensuring simplicity is to make them more predictable. This means that data providers must manage:	• The extent to which the interaction with the data owner is predictable for them and meets their values. • Degree to which the interaction (and outcome) are predictable for the connected party, but also has an impact on routines

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	• To what extent does the operation of the service correspond to the image people have of the operation (trust)
A final aspect stresses the pace at which users can adopt new design into their lives, making future use gradually easier. Concluding, data providers must consider:	• Developing features that enhance the speed with which users become familiar with the use (i.e. repetition and automation)
Make it attractive	
To also ensure desirability next to usability, the values embedded in the proposition need to be communicated clearly. That means enticing data owners to engage with the new designs and making their features prominent. In short, the design also need to be attractive to engage with, for which the following strategies can be used:	• Providing visual materials. • Making the services and incentives visible and findable, make use of marketing. • Use the *lead time* before people "receive" their incentive to build anticipation.

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5 Implications for the European Energy Data Space

The main focus of this deliverable are the data owners and data providers and the way they interact with each other. This is the primary touchpoint for data owners with the EEDS meaning that here lie opportunities for incentivizing them to participate in data sharing and agreeing on the right terms and conditions. Naturally, the agreements made in this part of the entire system (dotted square in Figure 11) also affect other parts of the EEDS (Figure 11). Not only do data providers need to treat the information provided by the data owners in a responsible and respectful manner, these data must be handled likewise throughout the entire duration that they remain shared across the data space. If data consumers at the end of the entire value chain want to make use of the data, all the stakeholders that were involved in delivering these to them must be right fully compensated for their efforts, in a way that is just considering the value of the contributions made. This could mean providing monetary compensation such as the ones that will be developed in WP7 but also non-monetary rewards. And, the intended use for the data needs to be proportional to the types and amounts of data stored and the risks that this might have for the stakeholders involved.

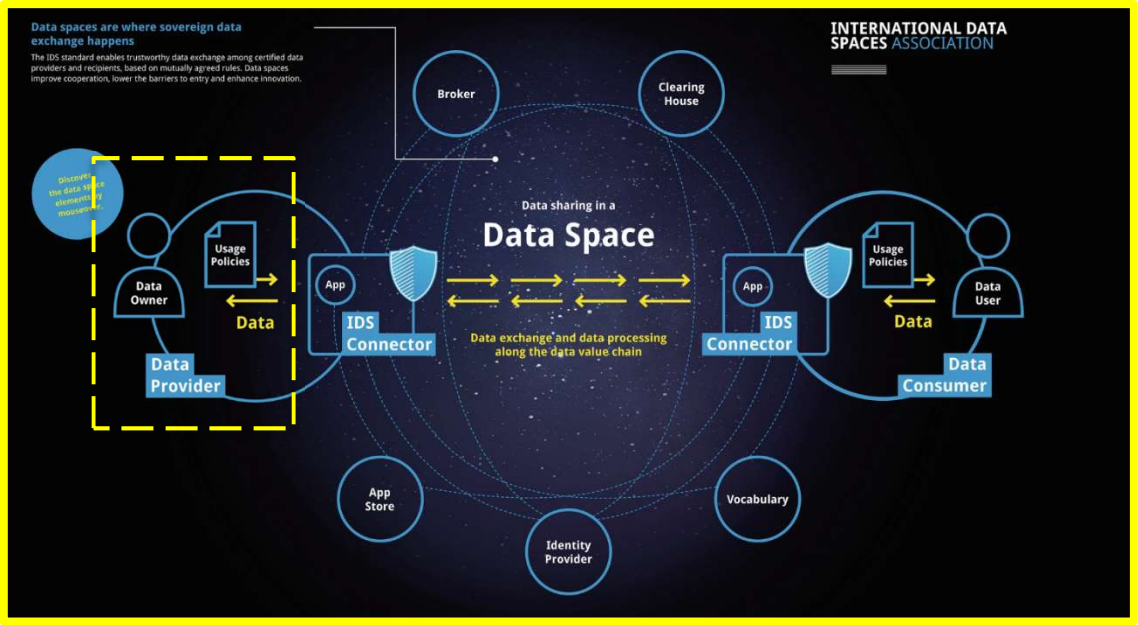

Figure 11: International Data Spaces by Pettenpohl et.al. (2022). The yellow dotted square is added to indicate the focus of this deliverable.

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Together, we derive four aspects from the results in this study that we deem relevant for the handling of data in the EEDS. To make sure that data is handled in line with social requirements, the checklist below can be used by stakeholders such as data providers and data consumers. In addition to this checklist they must also ensure that all data is handled in a way that is GDPR compliant.

Responsible

- All data has been anonymized where applicable and to an extent that the data owners are comfortable with.
- There is a clear overview of who has access to what data, what kind of data it is and for what purpose they (intend to) use it.
- All data is stored in a way that the origin of the information can be tracked down and verified if permission for this has been granted.
- There is a clear agreement on who is held responsible for the correct handling of the data and who can be held accountable in case of a breach of the agreed conditions.
- The way that the data is stored is communicated to all stakeholders in a way that they understand the implications, such as security risks, that this could have.

Proportional

- All data shared are adequate for the intended use, meaning that the purpose of sharing the data is achieved effectively through these data types.
- The data collected from the EEDS is representative of the intended user groups
- All data shared are proportionate to the intended use, meaning that the purpose of sharing the data is proportionate to the amount of data necessary.
- No excess data is stored that is irrelevant for the intended use.
- The servers used for storing the data are proportional to the data that is to be stored so they are not a limitation or too large.

Just

- There is an understanding of the value of the collected data to each of the stakeholders on how either sharing the data or keeping it private benefits them.
- All stakeholders, both data providers and data owners, are, financially or otherwise (other services, information, etc.), compensated for the use of their data or the aggregation of these.
- There is a clear use for the data from the moment that it is collected.
- The intended use for personal data that is collected does not in any way exploit the data owner or harm them.

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Respectful

- Consent has been obtained from all stakeholders, especially the data owners. Upon new intended use for the same data this consent will be renewed.
- It has been made insightful to what data owners are consenting. Optionally, they have been offered various ways to consent between which the level of sensitivity of the shared data various.
- Data owners have the right and means to access and manage data about them that is shared.
- Data owners have been given the right to withdraw their data from the EEDS at any moment.
- Insight coming forth from the data of data owners are also made available to them.

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6 Discussion

The desk research, learnings from previous projects and the pilot interactions provided several insights into the social factors that are important for the development of data sharing services and to incentive their use. In the previous chapters, these results have been captured in a framework for the development of these incentives and services and a list requirements that need to be taken into account when performing any of the activities described in it. Here, we will reflect on the validity of these results, the limitations of this study and the knowledge gaps that still need to be filled.

6.1 Validity of results and limitations

There are different points of attention to improve the validity of the results presented in this deliverable. The first on is the sample size and type of pilots involved. Three pilots with different characteristics have been included. This resulted in an overview of different parameters that influence participation and engagement and in different requirements. Although the results are broad, it would be valuable to continue this research with more and different pilots to gather more experiences and insights and design value propositions for the data owners based on the WP6 services.

It would be good to collect best practices, but also concerns and considerations: what went well, what could be improved, and what works for which type of pilot? The desk research can also be expanded to identify more methods and tools and to improve upon the ENERSHARE incentive and service design framework. All results (the framework, the requirements and the guidelines) remain open to critique and modifications, and they should expanded upon by further research and by sharing experiences and feedback. Within the ENERSHARE project itself, the development will also continue.

Another point of attention is the participants in the research. Until now, information is obtained from pilot leads and technical partners and/or the government. It would be valuable to expand this investigation by exploring needs, values and desires of all stakeholders, including households. Deploying multiple methods of inquiry can also provide additional information.
The formulated requirements about engagement and service development stress the importance of learning about the data owners and their personal situation and translating this data into tailored offers. Although this kind of information is crucial, we also acknowledge that data owners might prefer not to disclose this to data providers or to the EEDS. Responsible practice could aim to keep the amount of personal data needed proportional to the value that is offered back to the data owner.

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6.2 Further research and action

To further substantiate the findings in this deliverable and fill in the gaps of knowledge that the results and limitations identified, more research activities are necessary. We list the following recommendations for further research and follow-up actions:

- Primarily, there is a need for more extensive research along the same lines of this study. More investigation with pilots into their concerns and considerations can reveal opportunities for keeping energy community members engaged, evaluating whether the framework and requirements are of help and reveal what else the pilot leaders require in this respect.
- The current research does not guarantee that data owners will agree to make their data available to the EEDS as this will likely depend on how data consumers intent to use it. An evaluation within the pilots with concrete use cases from the perspective of data consumers could provide more insight into their willingness to share different types of data. Investigating what the data consumer is looking for and translating this into these use cases could at the same time build upon the insights into which data is relevant in the context of the EEDS.
- The pilots have trialed various incentives to encourage data owners to share their data. Despite their efforts, more experiments are still needed to come to a comprehensive advice on what incentives to use. WP9 will continue to report on the incentives used in a bigger set of ENERSHARE pilots and WP7 will explore monetary compensation schemes.
- We observed a dilemma when engaging the data owners in the pilots. Whilst they desire real-time insights into energy usage as an incentive to participate, they also did not want to be bothered too often. Although we suggest some strategies for dealing with this in the requirements, additional experiments could look into finding a ‘sweet spot’ in the frequency of feedback and information to the data owner.
- How to keep energy community members engaged? Do the guidelines work, and what is required more from the pilots in this respect.
- This deliverable reports about the study conducted to substantiate the SPUR framework and the set of requirements. Next to this output we also see the need for creating a handbook containing the framework and requirements to support the pilots in figuring out what incentives to use and what services to develop for every use case.
- The current research does not guarantee that data owners will agree to make their data available if these requirements are met as this will likely depend on how data consumers intent to use it. An evaluation within the pilots with concrete use cases from the perspective of data consumers could provide more certainty.

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7 Conclusions

In this deliverable of the ENERSHARE project the aim has been to investigate how data providers can develop services and incentives for data owners (energy consumers and prosumers) to motivate and facilitate them to share their energy data within a larger data space. More specifically, we explored how incentives can be developed for these data owners and how services can be developed that enable the sharing of data in a way that provides value for them.

The aim of task 2.2 is to support energy communities in co-designing incentives and services based on Design Thinking, human psychological core values and value proposition design. To this end we propose a SPUR framework for the service providers that want to develop new services or incentives for data sharing. In this framework we distinguishes four phases, each containing various methods and actions to be undertaken; an awareness and exploration phase, a design phase, an implementation phase and an exploitation phase. These four phases do not comprise a linear process but rather an iterative one where some steps might be undertaken a multitude of times. Phases of this framework were recognized in a variety of European pilots that had already undertaken activities to generate incentives and services and worked as a guide for mapping out additional activities to better fulfil this goal. More validation for this framework and its phases within the context of data sharing and the energy domain could extent on these experiences to verify its suitability.

A deeper reflection on the activities undertaken by the pilots together with existing knowledge from previous projects resulted in a set of requirements that need to be considered when developing data sharing incentives and services. Here we distinguish three types of requirements; one that are of primary concern before undertaking any form of action, ones directed at forming and maintaining a relationship with data owners and ones that are of importance when designing the incentives and services themselves. The insights about these criteria, however, limit themselves to concerns that come forth from experiences in pilots that mainly act within the energy domain. Additional criteria will most likely be needed if services in the data space are to be developed that go beyond this scope. Along with that, we also discovered a possibility for translating the requirements and the framework into a compact guidebook for current pilots and future data providers to use.

The types of data that could be shared with the network are mainly insights into socio-demographic data, energy usage, local energy production and assets available in households. Besides retrieving data through sharing practices with end users, we also found that to a certain extent these data types are openly available through national databases along with various other datasets that could be relevant depending on the use case. Every country keeps track of

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different data types in different ways, however, making their application very country specific. Required data is clear from the data providers perspective, but not yet from the data consumer's perspective. Knowing the value of different types of data provides more insight in possible incentives and services to promote data sharing.

To conclude, we look beyond the scope of this deliverable to reflect on the implication of this work for the development of a European Energy Data Space from the perspective of consumers and energy communities. We stress the importance of handling the data collected from data owners in an ethical and responsible way, making sure that it meets GDPR standards. In practice, this means obtaining informed consent, ensuring anonymity, being transparent about the usage of the data all the way from data owner to data consumer and allowing the data owner to opt out of the sharing agreements and the data to be removed. These factors potentially undermine the stability and efficiency of such a data space. Along with that, the current research does not guarantee that data owners will agree to make their data available if these requirements are met as this will likely depend on how data consumers intent to use it. An evaluation within the pilots with concrete use cases from the perspective of data consumers could provide more certainty. A final remark concerns the creation of value for end users and compensating them for sharing their data. As current compensation schemes from the pilots are not convincing enough or too expensive in the long run, more research should look into other ways where data owners might be paid by stakeholders within the data space.

To conclude, this deliverable provides a SPUR framework (1), requirements for data sharing incentive design and data sharing service design (2) and implications for the European Energy Data Space (3). The framework, requirements, and data implications will be improved and updated based on the feedback, experiences and new insights in the course of the ENERSHARE project. These outcomes provide value to the data providers, data owners, technical service developers within ENERSHARE, and to energy data space initiatives throughout Europe.

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References

Binod Koirala, N. d. (2021). *Overview of barriers and drivers for consumer engagement in demand* . https://www.brightproject.eu/wp-content/uploads/2021/12/BRIGHT_D3.1_TNO.pdf.

Creusen, M., Hulting, E., & Eling, K. (2013). Choice of consumer research methods in the front end of new product development. . (International journal of market research).

Gullstrom C., K. J. (2019). Enabling sharing and resource efficiency among neighbours by comparing trust and social cohesion in Sweden and the Netherlands. Utrecht, The Netherlands: IWSE 2019.

IDSA, I. D. (2023). *Data Spaces*. Opgehaald van internationaldataspaces.org: https://internationaldataspaces.org/why/data-spaces/

Karen, H. &. (2017). Contextual inquiry: A participatory technique for system design. *In Participatory design* , 177-210.

Kort J, K. N. (2017). Kort J, Koning N de, Gullström C. Creating successful transitions in energy - By respecting stakeholder values and securing trust and cohesion. Enschede, The Netherlands: University of Twente.

M. Mammina, A. R. (2022). Predictions in Resilient Hybrid AC/DC Grids Leveraged by an Interoperable and Secure ICT Platform. *1 pp. 1-6*.

Maguire, M. (2001). Methods to support human-centred design. *International journal of human-computer studies*, 55(4), 587-634.

Mink, A. (2016). Capability Driven Design: A step-by-step approach.

Osterwalder, A., Pigneur, Y., Bernarda, G., & Smith, A. (2015). Value proposition design: How to create products and services customers want. John Wiley & Sons.

Pettenpohl, H. S. (2022). International Data Spaces in a Nutshell. In B. t. Otto, *Designing Data Spaces.* Springer.

Sanders, E. B. (2008). Co-creation and the new landscapes of design. (Co-design, 4(1), 5-18.).

Sheldon KM, Elliot AJ, Kim Y. (2001). What Is Satisfying About Satisfying Events? Testing 10 Candidate Psychological Needs. JPSP 2001;80:325–39. https://doi.org/10.1037//O022-3514.80.2.325.

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Steg, L., de Groot, J. (2012). Environmental values. In book: The Oxford handbook of environmental and conservation psychology. Chapter 5, pp.81-92. Publisher: Oxford University Press. Editor: S. Clayton.

Van Boeijen, A. D. (2020). *Delft design guide: Perspectives, models, approaches, methods.* BIS Publishers.

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Appendix

Appendix A - Detailed background information of the ENERSHARE development Framework: Approach and methods

VUX Framework

The VUX framework (see Figure 12) identifies the basic psychological human needs - values - central to citizen and consumer engagement to explore their real drivers / motivators, and links them to a design thinking approach and concept designs to build successful and meaningful products, policies, services, experiences and processes (Kort et.al. 2017, Gullstrom et.al. 2019).

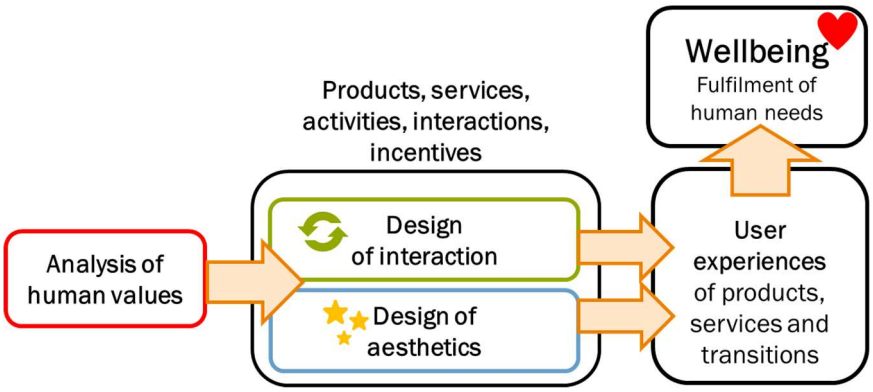

Figure 12: The VUX framework (Kort et.al. 2017, Gullstrom et.al. 2019)

For the analysis of human values in this framework, the human psychological values and needs of Sheldon et.al. (2001) are used. These values and needs can be found in Figure 12.

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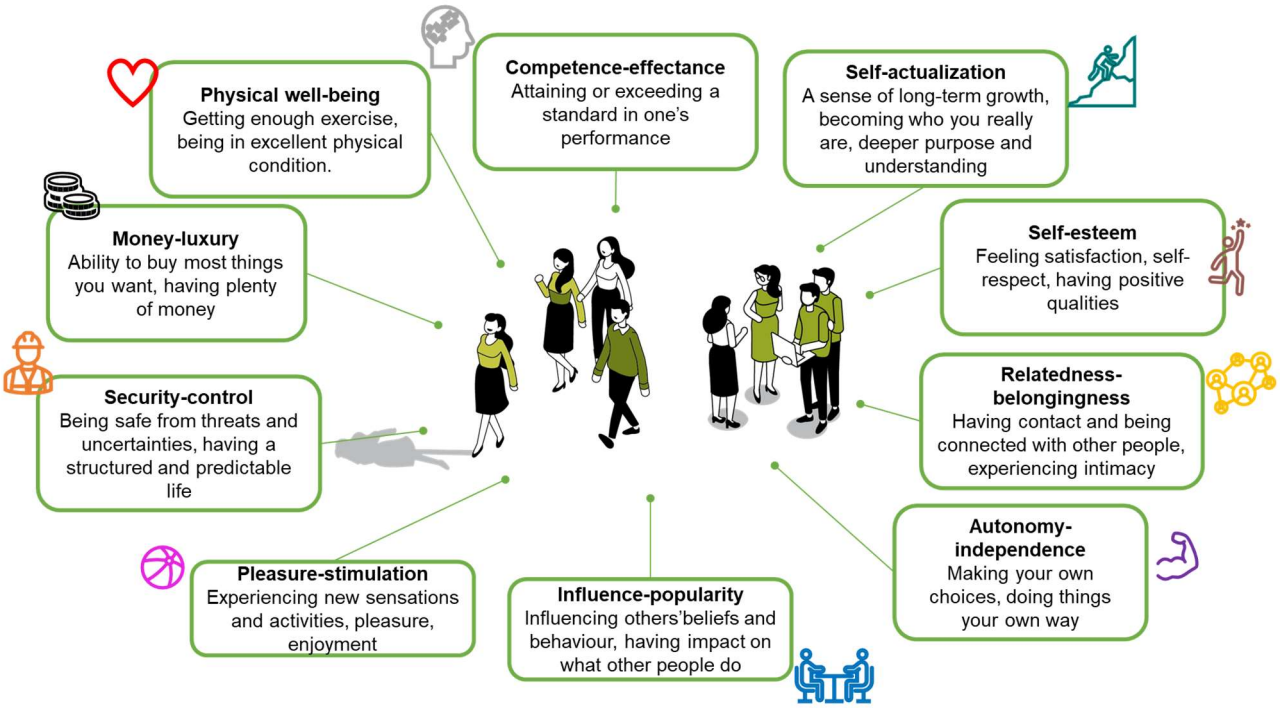

Figure 13: Human psychological needs of Sheldon et.al. (2001)

BRIGHT H2020 project – Citizen Engagement Framework

Within BRIGHT D3.1 a first concept of the Citizen and Consumer Engagement Framework was developed (see Figure 14). The process of developing services and incentives for citizens / energy communities is divided in this framework into four phases:

1) The awareness phase. This phase consists of:
    a. preparation of awareness concepts
    b. conceptualization of awareness concepts
    c. implementation of awareness concepts
    d. evaluation of awareness concepts
2) The design phase. This phase consists of:
    a. design research and testing of the communication strategy for DR technologies
    b. conceptualization of the designs
    c. implementation of the DR concepts
    d. evaluation of the DR concepts
3) The implementation phase. This phase consist of:
    a. preparation
    b. implementation and deployment of the DR services and of the communication material for DR services
    c. evaluation of the DR services

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4) The exploitation phase. This phase consist of:
    a. preparation
    b. exploitation and maintenance of the DR services
    c. evaluation of the DR services.

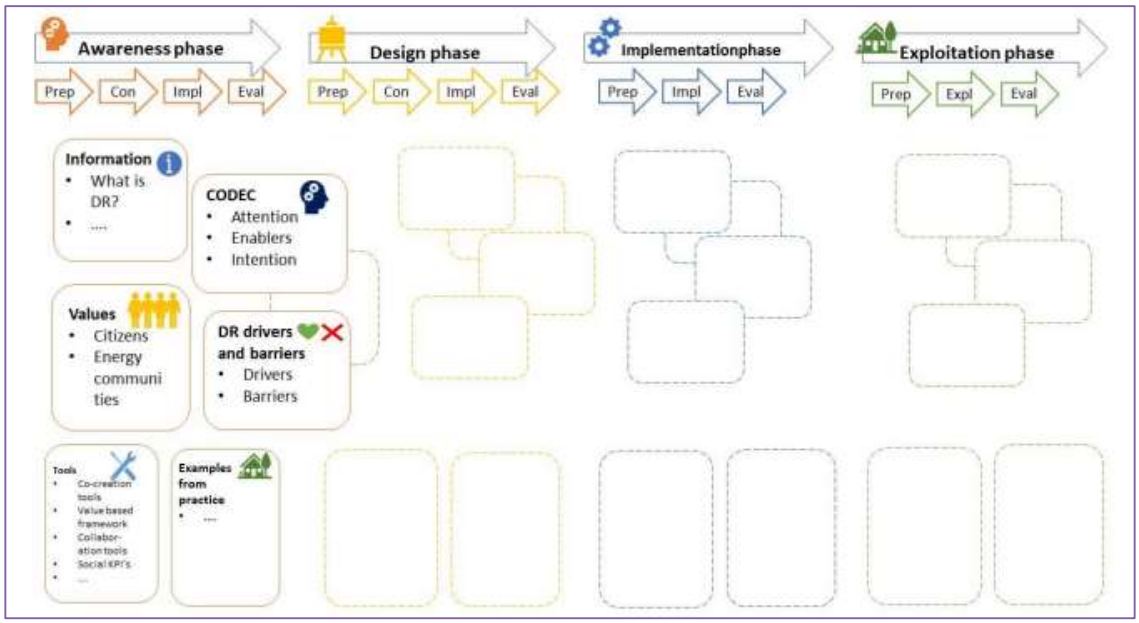

Figure 14: First concept of the Citizen and Consumer Engagement Framework developed in H2020 project BRIGHT (Deliverable 3.1)

Value-based proposition design

With help from a "value proposition canvas", a "customer profile" and a "value map" can be developed (see Figure 15). The customer profile describes the target users of the incentive or service. The value map provides the value proposition that will be delivered to the customer. The more the value map and the customer profile align, the higher the chance of successful adoption

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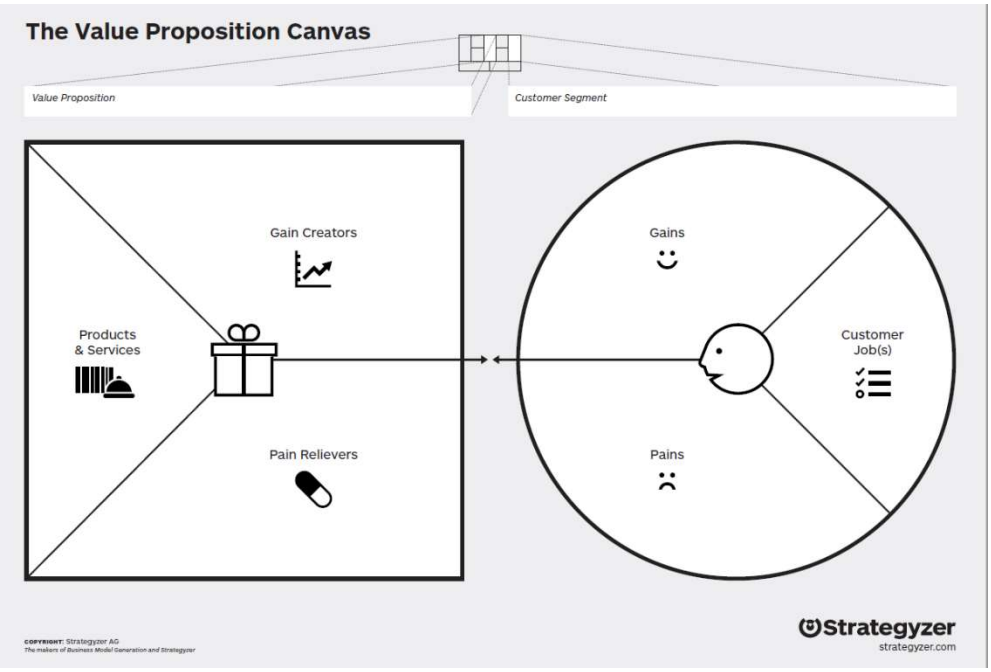

Figure 15: The value proposition canvas of Osterwalder (2001)

Context mapping

One of the design thinking approaches used within the framework is context mapping. Context mapping is a generative approach, aimed at creating deep insight into the environment and the underlying motivations of a consumer (Sleeswijk Visser, 2009). Key principle in this approach is that the users are considered experts of their own experiences, and as such actively contribute to the design process. Context mapping techniques evoke users to share personal life experiences in generative sessions from which the user's environment is mapped. The article 'Contextmapping: experiences from practice' by Sleeswijk Visser offers an overview of practical applications of this method.

Context mapping typically involves a sequence of research steps including sensitizing activities and generative sessions (Sleeswijk Visser, 2005). Sensitizing is a process where participants are triggered and encouraged to explore different aspects of their personal context. This is usually done through small activities that can be done in the participant's own time and environment. This step is performed in advance of a generative session to prepare a participant to access their related personal experiences. In a generative session participants partake in creative exercises that stimulate the expression of thoughts, feelings, and ideas regarding the researched topic. In this project, context mapping techniques were used to gather insights into consumer and community values in the different pilots. To this end, several tools were deployed that require different stimulative materials for the participants. Interviews, observations and generative sessions were held with participants of te different pilots.

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Capability Driven Design

The Capability Driven Design (CDD) approach developed by Mink (2016) is created to guide design teams to efficiently and comprehensively explore the user context in what is called 'Design for Development' projects (see Figure 16). By using the approach, the design team is supported to develop products and services that fit the values, needs and desires of its consumers, and to make deliberate design decisions throughout the process. Moreover, the obtained insights provide a source of inspiration. This approach is valuable during the first two phases of the ENERSHARE development cycle, with a focus on the different aspects of well-being (biological, mental, emotional, material, social and cultural) and on the actual opportunities that citizens have to do what they want to do and to be who they want to be. The approach includes a step-by-step approach:

1. Preparation
2. Informal insight
3. Deep insight
4. Verification and validation

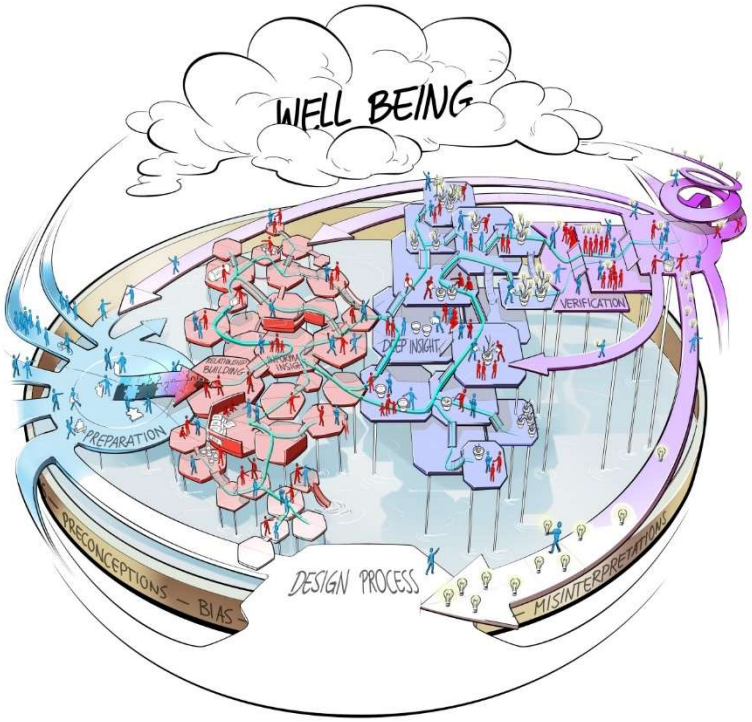

Figure 16: The Capability Driven Design approach (Mink, 2016; picture by Studio Blonk)

It also provides several methods, techniques and tools in order to rigorously obtain comprehensive insight. Prerequisites and guidelines for conducting fieldwork are also provided.

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Service design

Service design is a methodology that focuses on creating user-centred services by considering the entire user journey and incorporating stakeholders' needs and perspectives, as described in "This is Service Design Doing" by Marc Stickdorn, Jakob Schneider, et al., and "Service Design: From Insight to Implementation" by Andy Polaine, Ben Reason & Lavrans Løvlie.

By applying services design principles, the pilot teams can ensure that the Energy Data Space and related services are designed with a deep understanding of user requirements and preferences. Specific tools include:

- Contextual inquires and user interviews allow teams to gain insights into the data space's final users and beneficiaries, understanding their motivations, challenges and expectations regarding the transfer and use of data.
- Journey mapping, to help visualise the user experience and identify touchpoints for engagement and interaction (see Figure 17).
- Co-creation workshops involving both final users and admin users to foster collaboration, allowing stakeholders to actively contribute to the design and implementation of the platform.

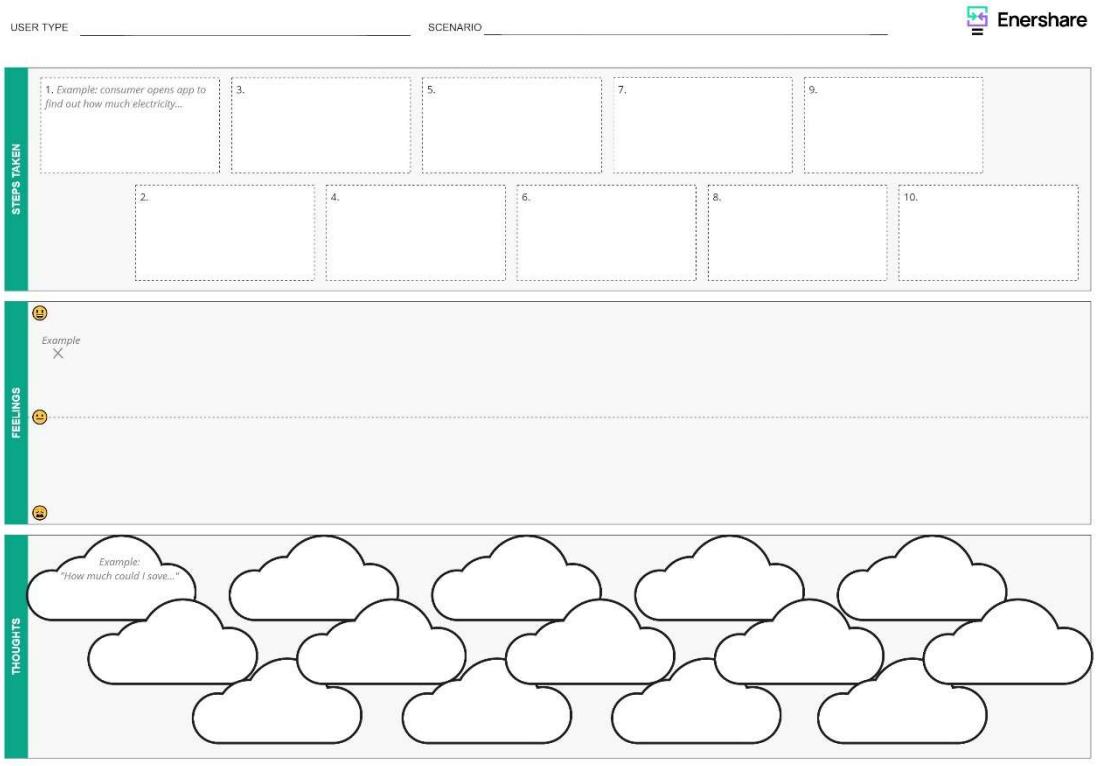

Figure 17: Template for a journey map, revealing the user's perspective as they engage with a service.

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Through the application of service design principles, the pilot teams can create an inclusive and participatory environment where user engagement becomes an ongoing and iterative process. By involving users throughout the project's duration, the teams can father feedback, validate assumptions, and continuously improve the Energy Data Space and its associated services.

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Appendix B – Detailed reports of pilot activities

Portugal

Engagement progress use case 2A

Beyond the Living Energy engagement activities as mentioned above in chapter 3.1.4, for this use-case some additional engagement activities have been and will be executed:

Awareness and exploration

- Collect user insights about flexibility potential for grid operation.
- Explore habits of appliance usage

Design

- The forecasting use-case for TSOs will use data coming from the explorers that are part of Living Energy, we are in the phase of deciding regions and/or type of appliances more suitable for flexibility schemes.

Benefits for the TSO

Improving and assuring system stability and security, by:

- Improved net-load forecasting at the substation level (increase of grid observability)
- Improved operational and planning procedures
- Identification of opportunities for cross-sector synergies between electrical and gas demand at the consumer-level

Benefits for end-users

- By participating on the conceptualization and development of new products that take into accountability their personal social context and feedback, end-users are offered back products that are accessible and democratic, irrespective of their background.
- Learning about their own energy consumption, habits and the different ways energy consumption is fed back to the explorers: in kWh, euros, CO_2 reduction.

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Explorers can earn credits by sharing data. If they reach a given number of credits, they can redeem these credits for a gift card for e.g., IKEA, FNAC (technology related store), or 1 or 2 companies only for green products (bamboo, other green products).

Engagement progress use case 2B

Beyond the Living Energy engagement activities as mentioned above in chapter 3.1.4, for this use-case some additional engagement activities have been and will be executed:

Awareness and exploration

- Collect user insights about flexibility potential for grid operation.
- Explore habits of appliance usage
- Prosumers and Energy Poverty use-cases are being engaged with local stakeholders with whom they are normally working.

Design

- The Energy Poverty use-case is being designed and meters and sensors can be installed by 2/3 of the aimed for number of households. Actual implementation will depend on the willingness of the end-users and the available budget for metering equipment.

Benefits for the DSO

Improving and assuring system stability and security, by:

- Flexibility services
- Asset sharing

Benefits for end-users

- The ability to see their energy spendings, but even more important, to be able to act upon this data and improve their own lives – to be "smart". This leads to cost reduction in the energy bills of the explorers.
- By participating on the conceptualization and development of new products that take into accountability their personal social context, end-users are offered back products that are accessible and democratic, irrespective of their background.
- Increase their resilience to high electricity retail prices. Avoid high upfront capital costs associated to DER-based projects.
- Inclusion of vulnerable citizens in the community
- Learning about their own energy consumption, habits and the different ways energy consumption is fed back to the explorers: in kWh, euros, CO_2 reduction.

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- Explorers can earn credits by sharing data. If they reach a given number of credits, they can redeem these credits for a gift card for e.g., IKEA, FNAC (technology related store), or 1 or 2 companies only for green products (bamboo, other green products).

Engagement progress use case 2C-1: Seniors living alone

Beyond the Living Energy engagement activities as mentioned above in chapter 3.1.4, for this use-case some additional engagement activities have been and will be executed:

Awareness and exploration

- Contacted one association which provides support for elderly people living alone in the Lisbon area. The idea is to select around 5-8 households to perform the analysis. Additional recruitment of participants is required.
- The engagement and incentives are not yet defined, they will be decided together with the association.

Design

- Developing ways to engage and include elderly citizens that are not familiar with using technology or even the internet

Engagement progress use case 2C-2: Appliance maintenance

Beyond the Living Energy engagement activities as mentioned above in chapter 3.1.4, for this use-case some additional engagement activities have been and will be executed:

Awareness and exploration

- The Appliance maintenance use-case will be developed using the already engaged explorers from Living Energy. However, additional recruitment of participants is required.
- Defining the type of appliance which will be monitored and for which a service will be developed.

Benefits for the stakeholders involved:

- **SEL**

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- Develop additional energy services to sell to the explorers of Living Energy, leveraging on their energy metering data.

Use case 2C-1

- **Elderly people**
  - Help reduce morbidity, support the elderly's independence, and sustain a high quality of life, by prompting timely assistance in the event of a medical emergency.
- **Eldercare organization/family**
  - Monitor remotely the health status of the elderly living alone, allowing the caregivers/family to intervene when they need it the most.

Use case 2C-2

- **Domestic users**
  - Raise awareness on energy needs;
  - Save energy and costs through equipment malfunctioning diagnosis; and
  - Help on deciding whether it is worth repairing an appliance or better off purchasing a new one, considering parameters such as costs, age, and efficiency.

Benefits for end-users

- The ability to see their energy spendings, but even more important, to be able to act upon this data and improve their own lives – to be "smart". This leads to cost reduction in the energy bills of the explorers.
- By participating on the conceptualization and development of new products that take into accountability their personal social context, end-users are offered back products that are accessible and democratic, irrespective of their background.
- Increase their resilience to high electricity retail prices. Avoid high upfront capital costs associated to DER-based projects.
- Support for a senior citizen living alone by offering a digital service which monitors the health status of the explorer, and triggering an alarm if required. This provides support for:
  - independence and improvement of quality of life of the senior citizen living alone, by promoting timely assistance in the event of a medical emergency
  - family and/or caregivers by reassuring them on the senior citizen's safety.
- Learning about their own energy consumption and habits, in different ways the energy consumption is fed back to the explorers: in kWh, euros, CO_2 reduction.

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- Explorers can earn credits by sharing data. If they reach a number of credits, then they can access a certain voucher for e.g., IKEA, FNAC (technology related store), or 1 or 2 companies only for green products (bamboo, other green products). Participants can choose for which company they like to receive vouchers.

Concerns and considerations pilot 2

Getting to know the explorers

- Community dynamics
- Household characteristics
- Ways to better understand habits and needs from end-users and turn it into actionable insights. To provide an estimation of the amount of flexible loads potential for TSO services

Incentives

- Determine the willingness to pay for the services defined in the use-cases and how to produce value for end-users

Value of data

- Within ENERSHARE the real value of data will be explored, for the service end-user, for the data provider, and for external stakeholders. This understanding provides input for the data monetization process and profits sharing scheme.
- The project will provide information about the most interesting datapoints.
- Incentives: In the beginning the incentives must cover all types of data, but by the end of the project we should be able to incentivize mostly the type of data with biggest potential to create value inside the dataspace.

Keeping explorers engaged / enchanted

- Disenchantment of end-users: Due to their own particularities as people who understand the technicalities of the technologies presented to them, they can establish a baseline for what should be mandatory. Therefore, if the expectations are not met, this can lead to some disenchantment with the project/platform.
- There is the need for a meaningful engagement that raises awareness regarding what is an energy community. This awareness needs to be tackled from a “complexity” standpoint and dealt with by addressing all the parts that make up the interaction, mainly:

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- How to keep people engaged when the technology that provides them information about their own behaviour loses “novelty” or “edge” and becomes embedded on common sense or routine.
- How to keep people with different interests and behaviour profiles engaged and interested in energy transition issues when the matter seems to be difficult to understand or grasp and when it may not be top of mind when thinking about day-to-day needs.
- How to come up with a pace of product and service design development that is both relevant and engaging for both businesses and users.

Privacy and data security

- The need to share private data (energy consumption, socio-economic data) for community analytics, while maintaining privacy of data and secure ways of sharing and un-sharing data.
- Explorers are willing to share their data, as long as there is a commitment to avoid abuse (like selling identifiable information to third-parties). Basically, the data collection, storage, and sharing is and should be GDPR compliant and should offer a clear path for any user who wants to leave the platform and what will be done with their personal information (anonymized).
- How can be guaranteed that all explorer data that has been shared from the different parties / channels is retrieved from the whole chain if explorers want to stop their participation. There is no mechanism to GUARANTEE this.

Discovery needs and requirements Pilot 2

The following discovery needs have been identified from the Portugal pilot:

- Ways to better understand habits and needs from end-users
- Ways to better understand community dynamics
- How to determine the willingness to pay for the services defined in the use-cases and how to produce value for end-users
- How to keep people engaged when the technology that provides them information about their own behaviour loses “novelty” or “edge” and becomes embedded on common sense or routine.
- How to keep people with different interests and behaviour profiles engaged and interested in energy transition issues when the matter seems to be difficult to understand or grasp and when it may not be top of mind when thinking about day-to-day needs.
- How to come up with a pace of product and service design development that is both relevant and engaging for both businesses and users.

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- Growth strategy: Create community recipes for relatedness / engagement
- How to ensure inclusiveness /representativity of the members?
- How to communicate and ensure data privacy and security?
- Incentives for data sharing

The following requirements have been identified from the Portugal pilot:

- GDPR compliance
- Being able to guarantee that all explorer data can be retrieved from the whole chain if explorers want to stop their participation
- Staying in touch, having a feeling of the end-user needs and desires, keeping them engaged
- Determining community dynamics, household characteristics, habits and needs
- Determining the value of data for different stakeholders

Italy

Engagement activities and engagement plan use case 5A

Exploration and awareness phase

The apartment building consists of 100 apartments. All of them received information by a brochure on the energy community idea, goals and benefits: ability to monitor their own consumption, becoming more energy efficient, getting a smart meter for free, and the energy bill will not be affected. A consent form to participate was also provided. ASM Terni went door by door to collect the consent forms. 50 Households who provided informed consent and could be connected to the smart meters were selected to become part of the energy community. ASM Terni organized a meeting with the building manager and the selected households about the goals of the energy community. The 50 selected households only partly showed up. ASM Terni also distributed smart plugs to the participating households, in order to provide them a benefit and to be able to interact with the households. However, not many people accepted the smart plugs until now. Key Performance Indicators (KPIs) for the project have been established, but are defined by ASM Terni. They will be further explored later in the project from the household side.

The next step will be to organize awareness meetings to increase household awareness and the community feeling. A questionnaire will also be distributed soon to further identify socio-

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economic requirements from a household perspective and gain more insight into community values, drivers, barriers, gains and pains.

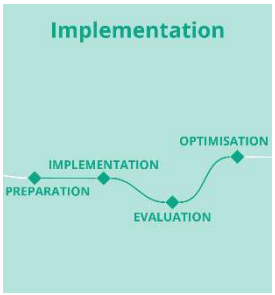
Design phase

The main goal is to collect user insights and to understand the lifestyle and perspectives of consumers after the awareness meetings. An android-based mobile application (Mobile Lab) has been developed to:

- Monitor real-time consumption data
- Provide historical data of consumption to customers (daily, weekly and monthly)
- Compare consumption to average consumption of participating households

In the future, the app will also be used for sending notifications in general on grid congestion, peak hours, and request households to switch off (around 1 notification per month, in order not to bother the people too much), and for connecting smart devices / smart plugs

The goal of the mobile app is to provide information and to create an energy community feeling. The app development requirements have been established by ASM Terni and the app developer. These requirements were: deployable, clean, interfaced and intuitive. The app has been developed for research purposes, and is not market-oriented. It is available through the Play Store, but you need credentials to be able to use it. The mobile application has been distributed in December 2022 to the households by means of a letter with app information and a mobile number and email-address for questions or additional information. Until now (February 2023) 10 households in the energy community have downloaded the mobile application. Meetings with the households, and meetings with the building manager will be organized to improve the app's uptake.



Implementation phase

If more households use the mobile app, it can be updated and improved upon, according to the needs of the use case, and the community feeling can grow. Other infrastructure can also be updated (smart meters, sensors for temperature, humidity etc.).

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Exploitation phase

Further development of ways to engage with energy communities by digitalizing services, and engage more people, beyond this energy community. In Terni, but also in other places in Italy and, if successful, in other parts of Europe.

Concerns and considerations use case 5A

Digitization

- Data security and privacy: End users in this use-case are willing to share their data under specified guidelines which does not violate their personal rights (e.g.; disclosing identifiable information to third-parties).
- Digitalization of utilities: consumers are more energy-savvy and environmentally conscious but the slow pace at which utilities are digitizing operations is limiting consumer participation and engagement to deliver the energy transition. There is need to increase the pace of digitalization and business transformation to keep pace with consumers' digitalization and demand for innovative services.
- One notification per month is enough, do not want to bother the people too much

Current state of technology / sustainability

- It is not only about heating, also about cooling
- The insulation of houses is not up to date, the boiler can be optimized (electricity instead of gas)
- Cannot guarantee a percentage of renewable energy, as ASM Terni does not know exactly where the energy comes from when.

Rules and regulations

- Price of renewable energy and of traditional energy is the same
- Host capacity of the grid prohibits infrastructure improvements: you have to ask permission to install PV, heat pump, etc.
- Wind turbines are forbidden in Umbria (due to the bird corridor)

Participation and engagement

- How to involve the people within the community? How to incentivize them?
    - The energy community consists of people from different countries and communities in the same apartment building.

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  - In Italy the people are more family-oriented than community-oriented. The 50 households do not act as one community (yet).
  - Awareness: Consumer engagement is particularly influenced by the level of knowledge amongst customers evidenced by the fact that educated and conscious consumers are more willing to invest time to assist energy community which leads to product or service development.
  - Lack of interest and time: people are usually busy with their personal lives and the participation in the energy community is not a full time job for them.
- How to keep people engaged, and not 'bother' them:
  - People may lose interest in participation if their expectations are not met.
  - End-users do not always like to share personal data in order to develop new services and products.
  - Uptake of mobile application: not many households in the energy community have downloaded the mobile application yet.
- Sharing energy / tools: what is the perception of the community on asset sharing?

Learning from others

- Not in contact with other Italian Energy Communities

Engagement activities and engagement plan use case 5B

Awareness and exploration phase

Key Performance Indicators (KPIs) for the project have been established, but are defined by eMOTION. They will be further explored later in the project from the household side.

In this phase, eMOTION has been organizing awareness meetings and is sharing news about the project in dissemination channels (website, Facebook, Twitter, LinkedIn). All news about the project is posted there.

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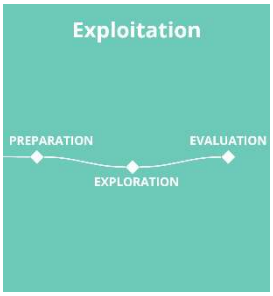
Design phase
Collecting user insights and understanding the lifestyle and perspectives of EV users after awareness meetings. And technical development mainly. Via direct discussions feedback / input is gathered from employees, developers and stakeholders. Stakeholders are kept up to date with information on the project, also the EV drivers, via the website, Facebook, Twitter, LinkedIn. Interested people can also request information, contact eMOTION, and exploit results.

A first demonstration will be organized with 10 eMOTION employees. They will use the 4 charging points located at ASM Terni. Based on the experiences of this demonstration group, the flexibility service / mobile application will be updated if required.

Implementation phase
In this phase, ways will be developed to engage EV drivers in Terni. Based on the experiences, needs, and wishes of the engaged EV drivers, the mobile application and the infrastructure will be improved and updated.



Exploitation phase
In this phase, the aim is to develop ways to engage EV drivers in Terni, Italy and beyond.

Concerns and considerations use case 5B

- Technological part - machine learning: eMOTION needs to find a way to have an accurate forecasting for the smart charging.
- Project implementation and exploitation: this set-up asks for a behavior change: citizens need to connect their electric vehicles at a particular charging station at a particular time of the day. Will the economic and environmental benefits be enough?
- It may not be easy for some users to be in the right place and time for work and/or personal commitments.

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Discovery needs and requirements pilot 5

The following discovery needs have been identified from the Terni pilot:

- How to incentivize EV drivers to charge at a particular charging station at a particular time of the day? Which tools, information, incentives do they need?
- The main question within use-case 5A is: How to "build" an engaged community? The Terni Energy Community is constructed top-down, and people in the apartment building are not well connected with each other. For the energy community to work well, this community feeling needs to be build. Then, energy paring and sharing can become an option.
- How to keep the community engaged in the long-term, and not 'bother' them? How to meet their expectations?
- Which incentives would work for which energy community members?
- Type and amount of notifications per month, do not want to bother the people too much
- How to incentivize end-users to behave 'green' even though a percentage of renewable energy cannot be guaranteed, and when the price of renewable energy and of traditional energy is the same
- How to involve the people within the community? How to incentivize them? When they are from different countries, focused more on family than on community, and started top-down?
- How to improve awareness and knowledge to improve willingness to invest time to assist the energy community while they are busy with their personal lives.

The following requirements have been identified from the Terni pilot:

- Identify habits, personal commitments, behavioral patterns for charging and flexibility services
- Identify current state of energy use and efficiency. Include cooling and insulation as well.
- Enable data sharing under specified guidelines which does not violate their personal rights (e.g.; disclosing identifiable information to third-parties).
- Digitalization of utilities to keep pace with consumers' digitalization and demand for innovative services.
- Identify rules, regulations, permissions
- Identify community sense, social relationships and community relationships, social background and other user characteristics.
- Ensure a certain level of awareness and knowledge

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- Identify the perception of the community on asset sharing
- Learning from others: not reinventing the wheel, but look at other communities and how they organize and engage their members.

Latvia

Engagement activities and engagement plan

Exploration and awareness phase

- State call on PV
  - Calls are always promoted through the website of the ministries, here they posts their regulations. Everyone can have a look and read and provide input for changes/modifications (within 2 weeks). That has been done for this call as well. The suggestions have been monitored and were all discussed within the Ministry after the 2 weeks passed. For this call the eligibility criteria have been modified.

- Financial support program and calculation tool development
  - All information about the financial support program and the tool development is published online.
  - Data gathering for the services development as input for the technical partners (6 months, now ongoing). Functionalities, possibilities are defined and data is transformed to what technical partners need: digitalizing the form of the energy audits to excel sheets. Not in direct communication with the households: the households have submitted an energy audit form when applying for sustainability improvements of their houses. This data is digitized.
  - Need identified for the development of a tool to support households to execute an initial energy audit, to deliver an approximate calculation for energy efficiency improvements in the households.

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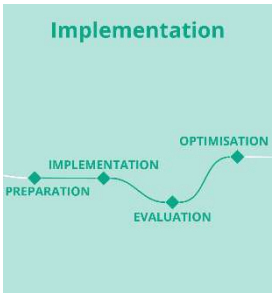
Design phase

- State call on PV
  - Development of a tool with feedback from energy experts and selected households.
  - Collecting feedback from the potential users on practical use, comprehensibility and credibility through a visual demonstration. Feedback on the service did not go well during covid times. A webinar was organized, but no feedback was provided. Via e-mail also no feedback was obtained. Next time a face-to-face meeting will be organized.
  - Collecting feedback about the calculation methods, and needs of any additional calculations.

- Financial support program and calculation tool development
  - Service development and regular testing with the households. A first version of the service is developed, which is a web portal for users to enter data for their households. House-owners can obtain information in return on savings (as a range, as accurate numbers cannot be provided and will change over time), and costs of new renewable assets (PV, heatpump, etc.) based on market prices. Perhaps workshops with end-users will be organized, depending on the time of development. This development will take 12 months approximately.
  - Testing and improving the service / tool is next. Here households can be involved (pilot households) to provide input on the functionalities and the 'looks' of the tool.

Implementation phase



- Information events will be organized for the households, including a presentation of the tool.
- Implementation of the tool for Latvian private households and house owners which helps to calculate the savings and to provide the right advice. The service must be used when joining the support program (hat is an obligation).
- Implementation with households:

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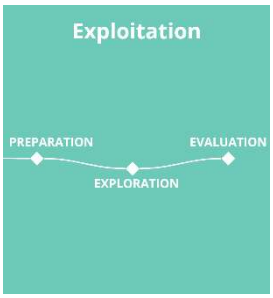
    - They will receive a web link to describe their household, and they will receive a calculation of energy efficiency improvement / savings
- There is a need to continuously check and update the data in the tool with data from the market (e.g., prices for the technologies)
- ALTUM institution (state support) and support program (EU support) assistance: people can go here for assistance. People can call them, write to them, or visit them.

Exploitation phase



- Optional: Implementation of the tool beyond Latvia (in consultation with technical partners). For example in the Baltic states via a Baltic state meeting.
- There is a need to continuously check and update the data in the tool with data from the market (e.g., prices for the technologies)

Concerns and considerations Pilot 7

The main developmental needs within this pilot are:

- Reliable calculation methods for REC's technology installation in the private households;
- Visual material demonstrating the differences between installed REC's technologies;
- Schedule for the long-term investment payback;
- Development of a loan calculator (To include or not include this, will be discussed, during the project implementation);
- Investigation of the potential to create an energy community

Concerns and considerations regarding these needs are:

- Calculation accuracy. It is important that the calculations are accurate and that all stakeholders trust the calculations. This is important for future investments. One lesson learned already is that no exact numbers should be provided, but ranges of costs.
- Make everyone understand where the energy community stakeholders are going, together. Now, valuable time was lost due to big misunderstandings. It has to be clear who is doing what.
- Bureaucracy, filling a lot of papers, many actions / activities are not appreciated by people.

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- Inclusivity:
    - people who are able to find the right instruments can apply, but these are mainly online and promoted by the ministries. Information from previous calls has spread rapidly, also by mouth-to-mouth. The institutions are known and have a good reputation. However, there is no check if everyone is aware of calls and is able to access and apply for subsidies.
    - It is not clear how many people are reached (% of private households).

Discovery needs and requirements Pilot 7

- Eligibility criteria for subsidies: who is excluded, and why?
- What makes an energy community? Can and should the households be united? Or treated as individuals?
- Engagement: how to get feedback on the service? How to obtain their input? What is the best way, also taking into account time of development.
    - Feedback on the service did not go well during covid times. A webinar was organized, but no feedback was provided. Via e-mail also no feedback was obtained. Next time a face-to-face meeting will be organized.
    - Perhaps workshops with end-users, depending on the time of development.

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Appendix C: Use Case Template and Miro Canvas

USE CASE TEMPLATE

The ENERSHARE project is co-founded by the EU's Horizon Europe innovation programme under grant agreement No 101069831

ener share

European commoN EneRgy dataSpace framework enabling data sHaring-driven Across- and beyond eneRgy sErvices

Use case survey for T2.2 Gap analysis on social innovation themes

Author(s): Annemarie Mink, Joke Kort

Enershare project summary

The ongoing energy system digitization is making available an enormous amount of data, paving the way for data sharing enabled cross-value chain services, which may contribute to system-level increased efficiency and hence facilitate the energy transition. However data sharing in the energy sector is lagging behind, mainly due to lack of trust, privacy breaches risk and business models immaturity. In that respect ENERSHARE will:
a) Deliver a Reference Architecture for a European Energy Data Space, which hybridizes SGAM with IDSA and GAIA-X architectures, by bringing data value chain perspective into the energy one;
b) Evolve interoperability, trust, data value and governance building blocks to TRL 6-7 IDSA-compliant ones, adapt them to energy sector, and deploy: 1) across-energy and cross-sector data enhancement technology enablers and standardizable interfaces and open APIs by leveraging on open Standards (e.g. ETSI Context Broker) and ontologies (e.g. SAREF); 2) trust-related connectors, to ensure privacy, confidentiality, cybersecurity-preserving trust, sovereignty and full control of data; 3) Blockchain/Smart contract-enriched marketplace for data versus energy assets/services coordination, sharing, exchange, and beyond financial compensation; 4) cross-value chain value-added services and Digital Twins, by leveraging on privacy-preserving federated learning
c) Integrate and deploy them within a Reference Implementation of a European Energy Data Space, which will be demonstrated along 7 pilots and 11 intra-electricity, intra-energy and beyond energy use cases
d) Co-design SSH-based consumer-centric business models for energy data sharing enabling data beyond-financial value creation and spreading along value chain
e) Prepare the ground for the European Energy Data Space setup, through alignment with EU-level relevant initiatives (GAIA-X, IDSA, BDVA, ETIP SNET, BRIDGE), contributing to Data Space standardization and boosting a level playing field for data sharing.

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Enershare use case survey T2.2 - Gap analysis on social innovation themes

Adopted Definitions

Citizen engagement: Citizen engagement refers to the inclusion of society in energy transition processes, designs, implementations, exploitations and outcomes, facilitated by decentralized governance. It is created by co-design of the (transition) process itself.

Consumer engagement: Consumer engagement refers to aspects of products and services (e.g. design) that improve usability and consumer experience, and thus facilitate and increase the adoption of these products and services by consumers. Consumers can be seen as a sub-group of citizens, whether individual, groups of individuals or organisation.

Energy prosumers:
Consumers who also produce energy, at times if not always

Energy prosumagers:
A prosumer who also owns and manages distributed energy storage.

Energy communities:
Energy communities are groups of energy consumers/prosumers/prosumagers (supported by a legal framework or are a legal entity), who organize collective energy actions around open, democratic participation and governance, share common interest and/or attitudes in energy services and activities (generation, storage, transport, consumption and sale of energy) as well as provision of costs and benefits.

Psychological human needs / values
Any need / value that is essential to mental health or that is otherwise not a biological necessity

Narratives
What occurs in the use case, when, why, with what expectation, and under what conditions - from a user point of view

Experiences
An event or occurrence which leaves an impression on someone

Objective

The aim of this survey is to identify needs and gaps in relation to social innovation themes. The needs and gaps in relation to social innovation themes serve as input for:
1) data driven value added service design and;
2) data sharing incentive design for consumers and local communities.

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Enershare use case survey T2.2 - Gap analysis on social innovation themes

ener share

1. General Information About the Use Case

1. ID (in the project)	
2. Name of use case	
3. Country	

4. Can you explain the scope and objectives of your use case in terms benefits and/or value delivered for the consumer or the community?

2. User Groups and Types

1. Which **energy communities** are involved in your use case? Please include a brief description of the energy communities (Please fill table 1 below)?

2. Which **user groups** are involved in your specific energy community, according to Figure 1 (Please fill table 1 below)?

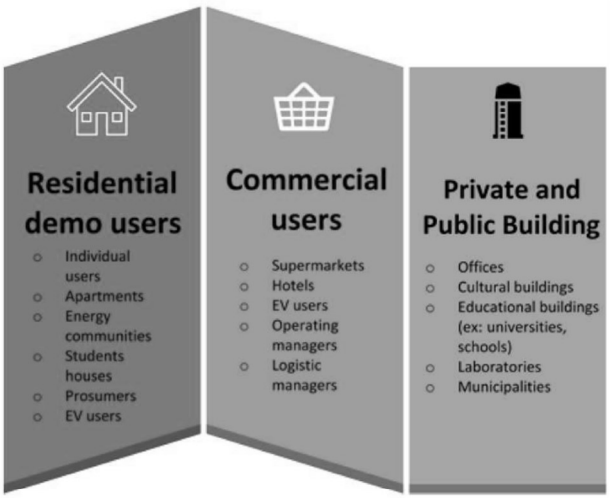

Figure 1: User groups and user types

3. Who are the **user types** involved in the user groups in your energy community and how many of each are involved? See the bullets mentioned in each user group in figure 1 (Please fill table 1 below).

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4. Are there any other user groups or user types that are missing and you would like to add? (please add a brief discription of the user group and user types) (Please fill table 1 below).

5. To which user group AND user types does the narrative of the use case (as described in chapter 1.4 of the IEC62559 Template) apply? Please complete table 1 below.

Table 1: Energy communities and their user groups and user types

Energy community No.	Energy community entity	Short description of energy community	User groups	User types and numbers	Description other user groups/ types	To which user group and types does the narrative apply?
1	(e.g. association, cooperative, partnership, non- profit organisation, small/medium-sized enterprise)	e.g., Location, no. of members, climate, assets available and envisioned, aims / focus, starting year, stage of development: leader / learner / listener, participation in projects, regulations that apply, infrastructure available.	See figure 1	See figure 1	Explain other user groups / types you are missing or would like to add	This applies to the narrative as described in chapter 1.4 of the IEC62559 Template
2						
3						

6. As a use case owner, what are your drivers to engage energy community members (e.g., increase financial benefits, increase environmental awareness, increase technological awareness/ use of new tools, others)? Please mention the drivers per user group or type, if applicable.

3. Narratives from citizen and community perspective

1. In chapter 1.4 of the IEC62559 Template you described the narratives of the use case. We would like to know which narratives are offered to the user groups and user types and which are envisioned. What products, services and activities are offered to the users and user groups and what are their gains and pains which will be addressed by these offerings? Please fill table 2 below.

Table 2: Narratives and offerings for user groups / types and their description in terms of customer jobs, gains and pains

Existing and envisioned narratives in which citizens or communities are involved						
Narrative number	Short description	Narrative offerings	Primary user-group and type (e.g. consumer, end-user group/type or community)	Customer jobs	Gains	Pains
1	Briefly describe the narrative (describe from a user point of view what occurs	Which products, services and community	Describe which interaction there is between a product / service	Describe which things your users are trying to get done within their work or in their life. The	Outcomes and benefits your customers want. Gains include	Anything that annoys your customers, before, during or

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Enershare use case survey T2.2 - Gap analysis on social innovation themes

	when, why, with what expectation, and under what conditions) together with the: **gain creators**[1] and **pain relievers**[2]. Also describe which Scenarios in chapter 4 of the IEC62559 Template are necessary in realizing this narrative.	activities[3] are offered to the user groups, user types and which are envisioned?	/ activity and the user groups and user types.	tasks they are trying to perform and complete, the problems they are trying to solve, the needs they are trying to satisfy. Not having an answer is okay, but we need to know if this is a gap.	functional utility, social gains, positive emotions, cost savings and contributions to human values / needs[4].	after getting a job done or prevents customers from getting a job done). Also risks related to getting a job done (negative consequences resulting from getting a job done.
2						
3						
4						

2. How willing are the end-users / the community to share data for analysis? Do you already collect data from end-users / the community? For what purpose? And under what conditions? What are current concerns, drivers, barriers for data sharing? What are you currently doing to incentivize consumers and communities to share data?

3. Please position end-users / the community in the use-case diagram you have developed in chapter 2 of the IEC62559 Template (The use-case diagram shows how actors interact within the Use Case).

[1] **Gain creators:** which gains are you creating for these user groups/ types with these products and services? And how?
[2] **Pain relievers:** which pains are you alleviating for these user groups / types with these products and services? And how?
[3] Community activities can be: **Community services:** Community services offered in your energy community (e.g., providing information/ advice about energy means and services, renting services for equipment); **(Collective) products or services:** products or services offered to buy or rent (collective) products or services in your energy community (e.g., collective solar panels or other technologies for electricity production or storage); **Collective energy infrastructure:** infrastructure offered to own, operate and manage a collective energy infrastructure such as a smart grid; **Energy supply, exchange and sale:** Energy supplies, exchanges and selling options offered in your energy community (e.g., peer to peer (P2P) exchanges); **Demand-side flexibility:** Demand-side flexibility or demand-response mechanisms that are offered to stimulate local energy production, storage and consumption, and to maintain a balance to prevent overload of the electricity grid; **Additional value:** Additional value created through services such as (e)car sharing, (e)bike sharing, etc.; **Other activities, products and services:** Other activities, products and services provided in your energy community.
[4] **Autonomy and independence** (e.g. consumers becoming more independent of external energy suppliers or external energy sources by generating and storing their own energy); **Competence** (e.g. something complex is made easy to understand, adopt and use for consumers, such as advice on energy savings, being able to use monitoring services, jointly purchase or lease energy assets without having to invest too much time and effort in it as a consumer, purchase and get energy saving means installed as 'easy' packages); **Relatedness and connectedness** (e.g. consumers feel related, connected, share a (community) identify by shared ownership, shared independence, shared decision-making processes/governance, shared profits, shared value creation, shared goals, shared problems and challenges to tackle); **Feeling of influence** (e.g. consumers have a feeling of influence, their knowledge and contributions are being valued, appreciated through for example participating in community governance or contributing to energy generation and making it available to others. A consumer can work for the community as energy coach, employee, have a say in tariffs, also having a larger say in relation to collaborations with other stakeholders); **Pleasure and stimulation** (e.g. foreseen (cross-domain) services that add to the experience of increased pleasure and stimulation in life such as greener neighbourhoods, (free) mobility services, more enjoyable housing conditions and living environments, cleaner air, realised with community revenues or through community actions); **Sense of safety and control** (e.g. being more autonomous and in charge of funding own projects with revenues earned and with a governance structure depending on members can contribute to the safety and control of its members in the long terms such as by supporting or fund local facilities that are needed such as a supermarket or local informal care organization, more control over budgeting tariffs, etc); **Physical well-being** (e.g. improving indoor climate or living conditions and thereby affecting health and physical comfort but also reducing mental problems such as stress related to energy poverty); **Self-actualization and meaning** (e.g. The feeling that you get the best out of yourself, in terms of contributing to a better sustainable and livable world for this generation and the next, helping others); **Self-realization** (e.g. Feeling valuable as a person and in the contributions that you make to the energy transition, sustainability, the world as a person, not feeling inferior to others because you cannot keep up); **Financial services and security** (e.g., having access to financial support (loans) and subsidies; cheaper products/ services, energy costs through joined purchases or ownership; getting financially reimbursed for providing services such as flexibility).

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4. The narratives placed in the Enershare service development cycle

1. What are your main needs or questions in terms of support for practicing citizen / consumer engagement when it comes to product or service development for your energy community?

2. The process of developing services and incentives for citizens / energy communities consists of four phases: the exploration and awareness phase, the design phase, the implementation phase and the exploitation phase. In which phase of development would you place your citizen narratives, products and services (as numbered by yourself in table 2 above)? Describe the concrete actions currently ongoing or already taken in table 3, based on the actions within each phase as described in the table.

Table 3: Placement of narratives in the development cycle and the actions undertaken

Exploration and awareness Phase	
The objective of this phase is to create awareness for (the importance of) (local) energy communities and products and services applied in Enershare use-cases.	
Actions • Giving information to consumers and communities about the importance and benefits of narratives applied in Enershare use cases. • Getting insights into consumer and community values, drivers, barriers, gains and pains. • Defining socio-(economic) requirements from a consumer/community perspective. • Defining socio-(economic) KPI's from a consumer/community perspective. • Perform design research and design interventions and community action to create awareness about narratives applied in Enershare use cases. • Implementing interventions and communications to create awareness about narratives applied in Enershare use cases. • Evaluating the interventions and communications in practice, with consumers and/or communities.	
Narrative no. (no. as in table 2)	**Actions** Describe the concrete actions currently ongoing or already taken based on the pointers given above:

Design phase	
The objective of this phase is to design service and incentive concepts for Enershare use-cases based on consumer and community values, drivers, barriers, gains and pains as well as social-economic KPI's.	
Actions • Defining values and requirements of consumers and/or communities to be addressed in the narratives of Enershare use cases (based on the data collected in the exploration and awareness phase). • Defining the consumer and community experiences you want to realize with services of Enershare use cases (based on the data collected in the exploration and awareness phase). • Designing value-added services and data sharing incentive concepts that addresses consumers' and community's values, drivers and barriers, gains, pains and desired experiences for Enershare use cases. • Prototyping the services and incentives (preferably with input from consumers or communities) of narratives of Enershare use cases. • Evaluating the service and incentive concepts and narratives on the consumer and community values, requirements and experiences for Enershare use cases. • Designing the final service and incentive concepts for implementation.	
Narrative no. (no. as in table 2)	**Actions** Describe the concrete actions currently ongoing or already taken based on the pointers given above:

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Implementation phase
The objective of the implementation phase is implementing and evaluating the service and incentive concepts for Enershare use cases in practice with the help of consumers and communities.
Actions • Preparing the plan for implementation of the service and incentive designs at the consumer and community end. • Defining roles and responsibilites of all stakeholders involved to implement the service and incentive designs in the Enershare use case. • Implementation of the service and incentive designs in the Enershare use case. • Evaluating the Enershare service and incentive designs in practice with consumers and communities, on the consumer and community values, requirements and experiences for the Enershare use case. • Fine-tuning the Enershare service and incentive designs based on the outcomes of the above evaluations.

Narrative no. (no. as in table 2)	**Actions** Describe the concrete actions currently ongoing or already taken based on the pointers given above:

Exploitation phase
The objective of the exploitation phase is to assess the success of the implemented Enershare service and incentive designs via the continued consumer and community engagement (acceptance and adoption).
Actions • Preparation of exploitation and maintenance (e.g. contracts, maintenance plan, setting-up/finalizing the businesscase, etc). • Defining roles and responsibilites of all stakeholders involved in the exploitation of the service and incentive designs in the Enershare use case. • Exploitation and maintenance of the service and incentive designs in the Enershare use case. • Evaluating the socio-(economic) KPI's defined for the Enershare use case.

Narrative no. (no. as in table 2)	**Actions** Describe the concrete actions currently ongoing or already taken based on the pointers given above:

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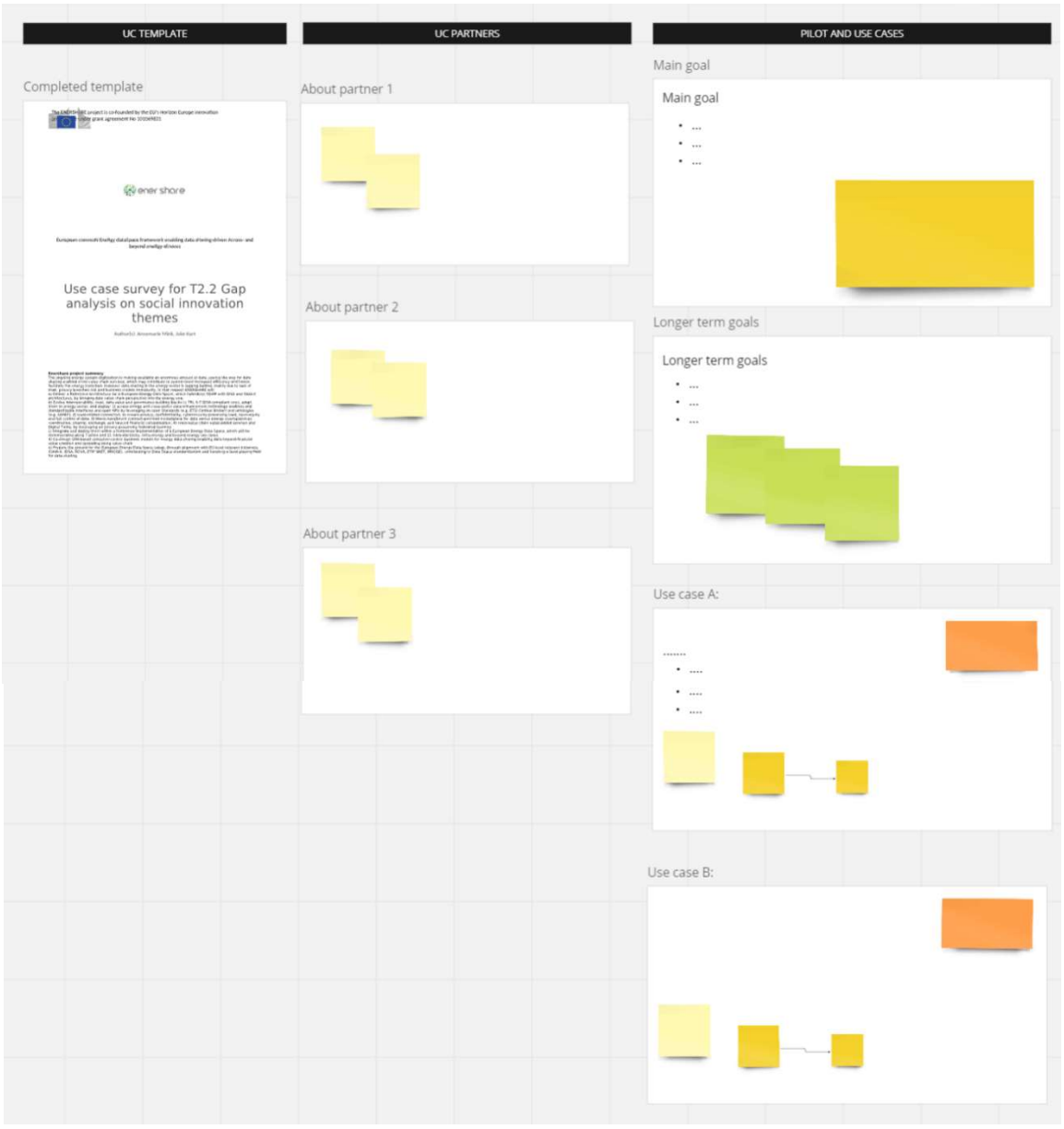
MIRO CANVAS

Part - 1



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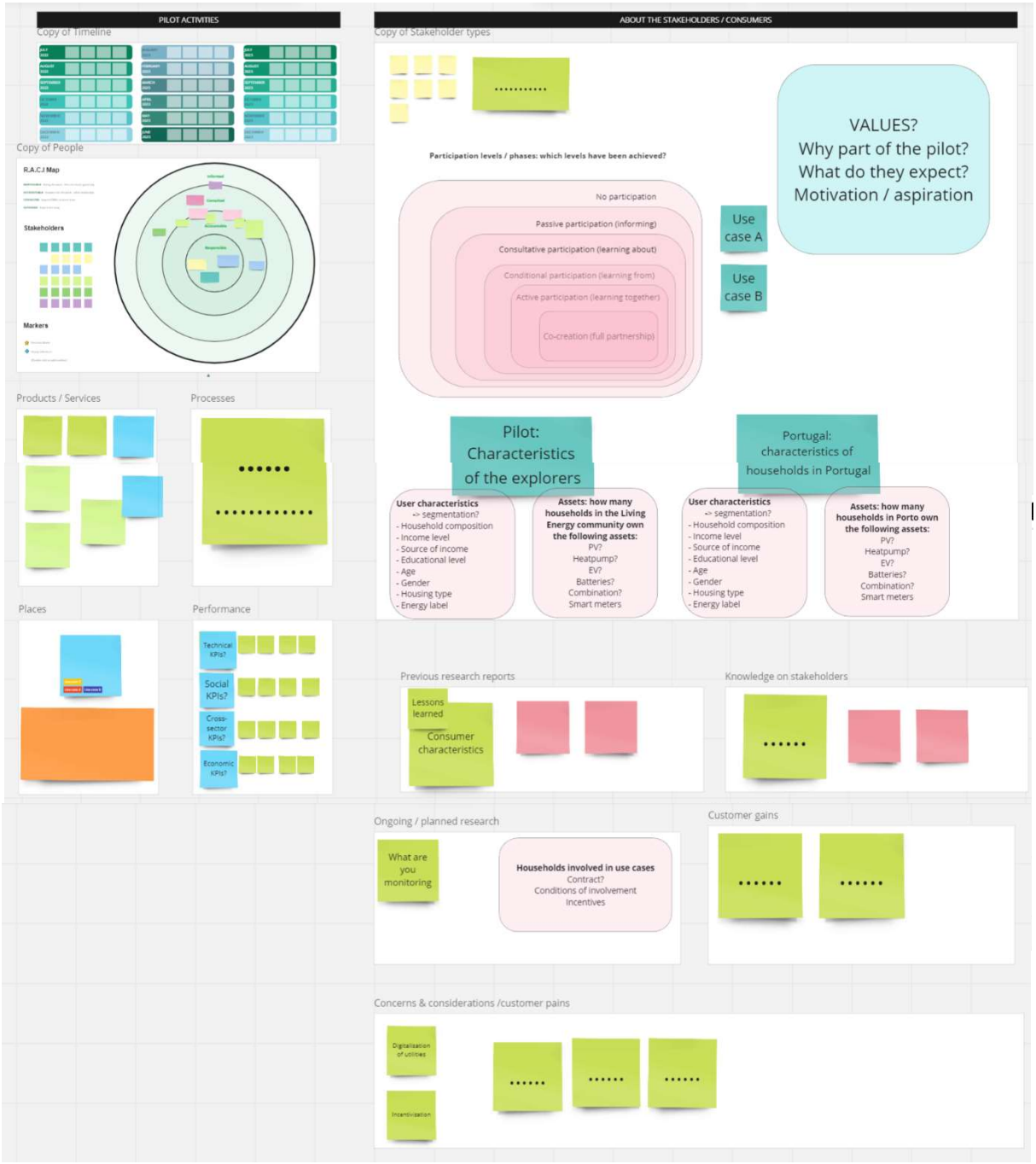
Part – 2



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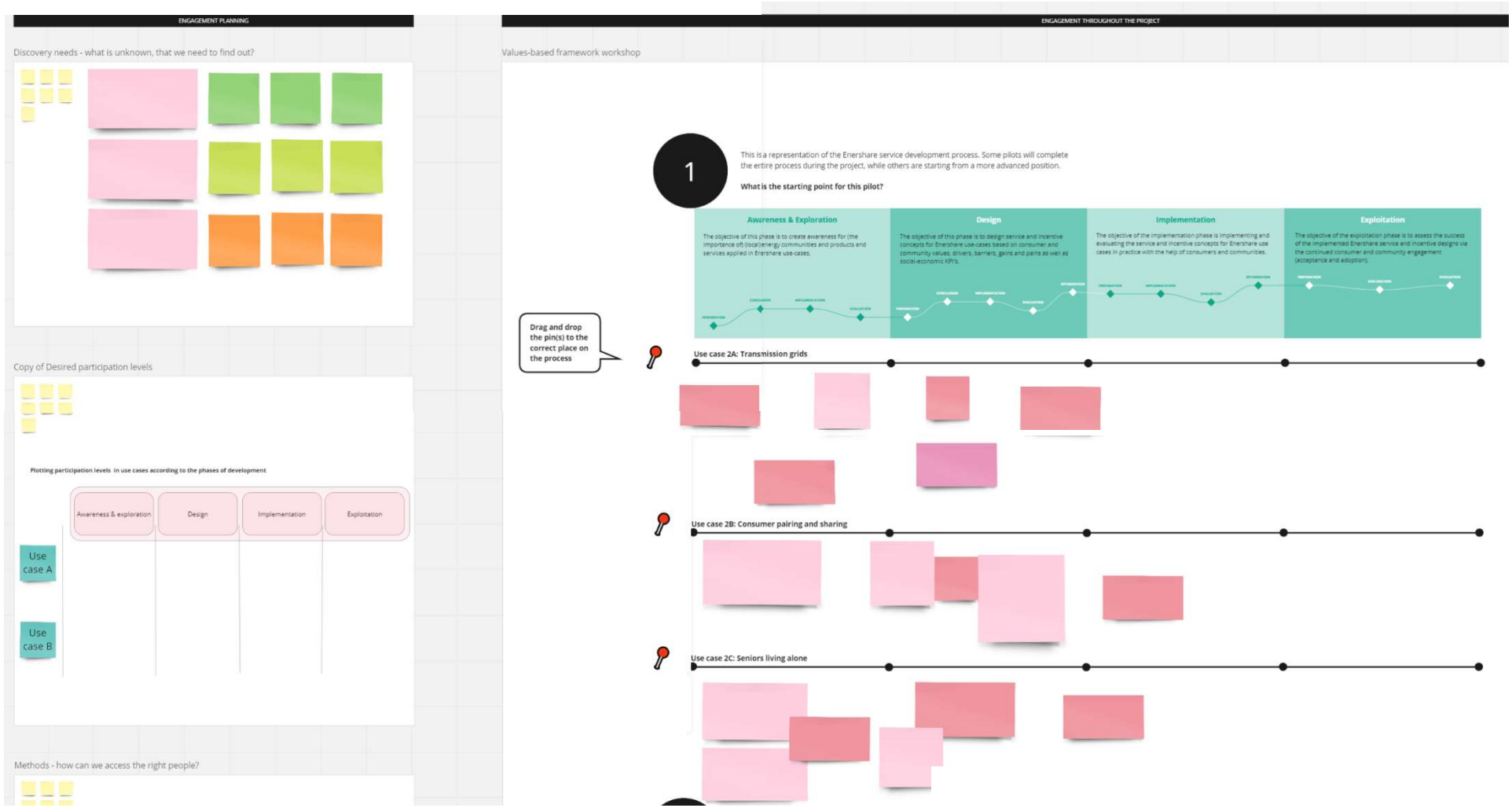
Part - 3



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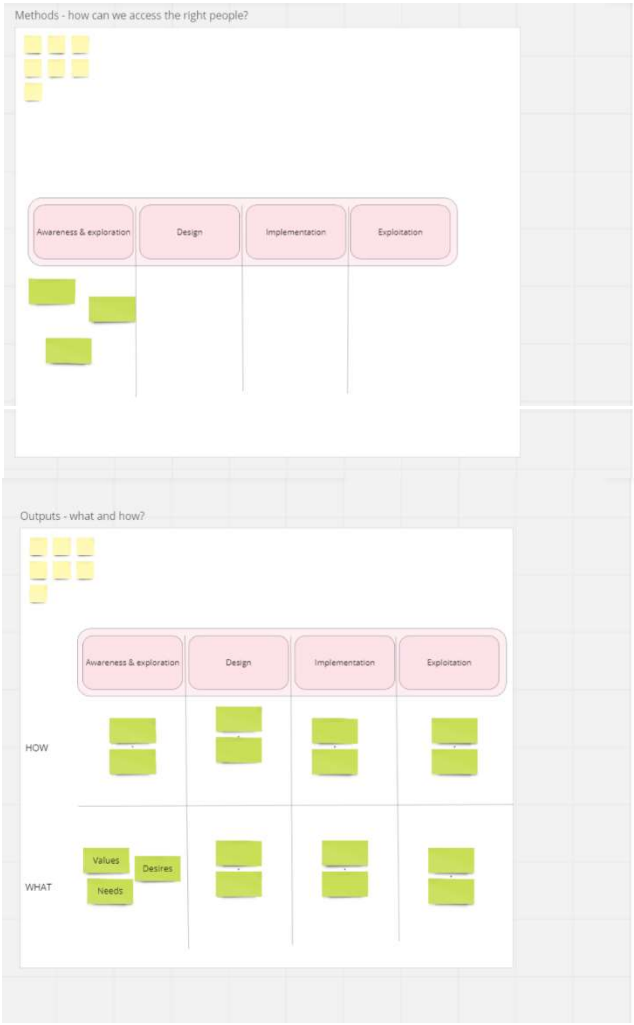
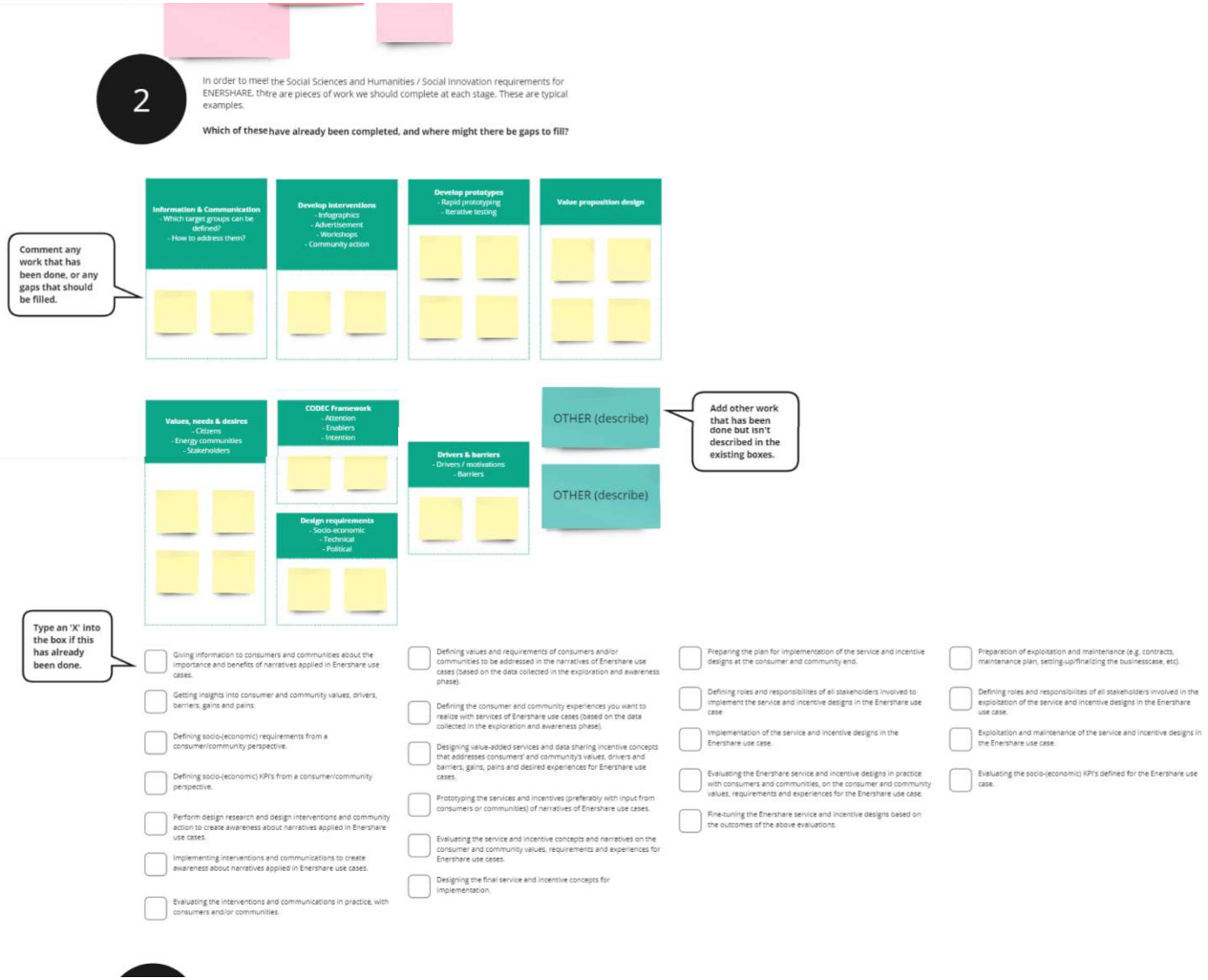
Part - 4





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Part - 5

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Filled MIRO canvas

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