



D5.1 - Implementation & Monitoring plan and knowledge transfer framework



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Executive summary

This is a document which gives an overview of how management and coordination activities of pilot sites are handled. The implementation plan lists and describes already performed activities and the major planned actions until the end of the project. Moreover, the main challenges and risks for each pilot site are also represented in the document. Actions that are necessary for successful implementation and demonstration of COMMUNITAS technical tools defined in WP2 to WP4, and UCs and KPIs outlined in WP1 in each pilot site are defined in the document. These actions are necessary to ensure good coordination between technical implementation of new assets and upgrade of existing assets in each pilot site on one hand and the development and especially implementation of COMMUNITAS tools in pilot sites on the other hand. An UC/KPI/Pilot Site matrix, which connects “D1.3 Use Cases: requirements, specifications, and KPIs” with demonstration activities in this work package (WP5), was prepared to provide all partners of COMMUNITAS project with a simple overview on all planned demonstrations in pilot sites.

A list and status of activities in pilot sites are here presented and must be regularly updated by pilot site leaders. This process will not change until the end of COMMUNITAS project. The focus of the pilot sites during the first months was on technical deployment of new assets, upgrading existing assets, and analysing and integrating existing systems, to enable demonstration of COMMUNITAS project goals. Timely execution of planned activities was achieved through quick intervention, good communication of all involved partners and appropriate replan of actions.

The main challenges can differ from pilot site to pilot site, however integration and operational issues (being able to promptly solve real problems) can be found in all pilot sites. Future activities in pilot sites will mainly focus on the integration of COMMUNITAS tools with the existing IT infrastructure in pilot sites and testing of developed COMMUNITAS tools in pilot locations.

A monitoring plan is also developed and presented here to ensure proper data quality. This requires a prior data collection harmonisation and pre-processing process to enable the pilot site technical partners to meet the requirements to integrate the energy profile baselines generated and stored in the CCP time series database.

Finally, the framework for the collaboration and knowledge transfer among pilot sites, where the synergies between Leaders, Learners and Listeners are established, is found in this file. This framework covers the exchange of information, lessons learnt and pilots’ experiences, and capitalizes on the to-be-expanded network of COMMUNITAS’ supporting entities.

1.Introduction

1.1. Scope and objectives of the deliverable and relevance in the COMMUNITAS framework

This document aims to summarize a detailed plan of activities, to define main risks and also the main challenges for all the pilot sites. It also presents the monitoring plan and knowledge transfer framework between the different pilot sites participating in the COMMUNITAS project.

The pilot sites detailed implementation and monitoring plan contains, from one side, all the relevant information to facilitate control of different activities in pilot sites and it enables pilot site leaders, work package leaders and the coordinator of COMMUNITAS project to meet all the requirements from the Description of the Action (DoA) and to supervise start and finish of the activities according to the project plan. One of the purposes of this document is, therefore, to provide a detailed overview of all main activities (past, present and future) in pilot sites which are part of COMMUNITAS project in order to ensure proper and effective exchange of information between all partners and especially between pilot site leaders and the developers of the technical tools.

On the other hand, the monitoring plan is based on several pre-monitoring activities which ensure accurate KPI estimation. These activities are divided into four subtasks: Data Identification and Collection; Data Analysis and Baselines; Risk Assessment for Data Acquisition; and Testing Criteria, which sets project-level KPI goals, defined in D1.3 – Use Cases: requirements, specifications, and KPIs [1]. Regarding this last subtask, the KPIs defined in T1.3 have been refined and adapted to the project goals as necessary. Benchmarks, acceptable thresholds and constraints have been considered in order to well define the established KPIs, including formulas, prerequisites for estimation, units of measurement and target values, in order to ensure the secure and timely integration of all the project equipment and services.

The Deliverable 5.1 is produced within Work Package 5 (WP5: Planning, deployment & monitoring of COMMUNITAS' solutions and ECs) to provide an overview of the actions and technical assets implemented at each pilot sites and to define main challenges each pilot site is facing, which serves to the team leaders within each organisation, researchers and administrative responsible to have at any moment a clear vision of what and when WP objectives are to be achieved. At the same time the document compiles a prior data collection, harmonization and pre-processing, ensuring the project proper data quality.

All the necessary templates, requirement tables and test cases instructions are also provided in this deliverable, in order for technical developers to correctly define the test cases for each one of the project UCs. This will serve as a basis to test and well implement and deploy the different project tools in each one of the pilot sites.

Finally, the document provides the knowledge transfer framework developed during the project which serves as a basis for learners and listeners pilots for the optimum replication of all the implementation and monitoring activities carried out in the leader pilots.

1.2. Structure of the deliverable

After the executive summary, eight sections are found in this deliverable:



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- **Section 1** provides a general description of the scope and objectives of the deliverable.
- **Section 2** contains a brief description of the pilot's context, a list of preparatory and technical activities, key risks log per pilot site and the GANTT Charts for Leader and Learner pilots.
- **Section 3** includes a table listing all common pilot risks along with their impact, likelihood, risk owner and clearly defined proposed mitigation and contingency plans.
- **Section 4** presents the templates, tables and terminology for defining the test cases for validating the project tools and solutions.
- **Section 5** provides the monitoring framework, within a detailed risk assessment and all the project level KPIs definition, formulas, prerequisites for estimation, unit of measurement, etc.
- **Section 6** describes the knowledge transfer framework.
- **Section 7** shows the main conclusions of the deliverable.
- **Section 8** contains the list of acronyms and **section 9** the references and **section 10** the annexes where the pre-monitoring data and project KPIs description are presented.

1.3. Relation to other tasks

Deliverable D5.1, in line with Tasks T5.1, serves as a detailed guideline to be followed for the implementation and deployment of all COMMUNITAS project tools and solutions (WP3), as well as for the monitoring of this tools and the collection of baseline data in order to validate and evaluate this implementation (T5.2).

It synthesizes the necessary activities and timelines for the implementation of the different tools in each of the pilot sites with respect to the requirements and test cases defined for each use case (detailed in T1.3), ensuring the correct deployment of the COMMUNITAS innovative solutions (WP3) and their good functioning and integration in the interoperable and secure COMMUNITAS Core Platform (T2.1, T2.2, T2.5). This deliverable is intended to be the basis for the demonstration and replication activities in T5.3, T5.4 and T5.5, guiding the implementation and deployment activities, the monitoring strategy, the validation of the COMMUNITAS tools both individually and running all in one platform, and the knowledge transfer between the different project pilot sites.

In summary, it acts as a guiding document to ensure that each of the tools developed by the project in WP3, which comprise the common project platform developed in WP2, are well implemented, replicated and adapted to the capabilities and needs of the pilot sites.



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2. Demonstration activities in pilot sites

As described in the following chapters, in general all pilot sites are following the same process of implementation. The first part of implementation process is overseeing the installation of new assets (e.g. smart plugs, smart meters) and upgrades of already installed assets (e.g. PVs, power meters). The second part of the activities monitors the installation of measuring equipment and integrating the data collection process into existing monitoring systems with the aim to ensure availability of needed data for the integration and demonstration of COMMUNITAS tools which will be implemented in pilot sites in the second half of the project.

2.1. Pilot Site: Crevillent

2.1.1. Context

Crevillent is a Spanish municipality of 30,000 inhabitants located in the south of the province of Alicante in the Valencia Region. Enercoop Group is a local electric cooperative organization located in Crevillent owned by 11,000 members and the first energy community in Spain which is already operating 7 PV collective self-consumption installations which are roof-mounted in public buildings, with a total of 600 kW installed (Picture 1).

The cooperative has presence in the entire value chain of the electricity sector: production of 100% renewable energy, distribution to the municipality of Crevillent, electricity supplier within and outside the municipality, representative agent in the electricity market for renewable production facilities and group of energy purchases for other electricity supplier companies.

The grid of the municipality is managed and owned by Enercoop which manages 14,315 consumers (13,047 households and 1,268 companies) in the low voltage network; and 30 consumers in medium voltage network (mainly industrial and service sector companies). The local energy grid is fed through a 40 MVA substation. Energy is distributed to final consumers through more than 150 transformers 20/0.4 kV. All the energy meters in the households of Crevillent are of type “smart meters”, which facilitates data collection of electricity consumption.

One of the collective self-consumption installations of the energy community is integrated with a lithium-ion energy storage system (240 kWh), which is shared between 65 consumers. Furthermore, an EV charging network is also integrated in the energy community (6x50kW and 4x22kW). It is possible to assess the energy flows at the grid interconnection point of the energy community, which means that the pilot enables the study of advanced and novel operation strategies for the energy community. The energy community will also start the operation of a new 3 MW PV plant connected to the Enercoop MV network at the end of 2024.

Technologies already in place:

- 7 PV collective self-consumption installations (600kW)
- Smart meters at all electricity supply points.
- 1 lithium-ion energy storage system with 242 kWh and 100kW.
- EV charging network (6x50kW and 4x22kW).

Technologies and processes foreseen:

- 10 individual energy meters per household for electrical appliances household participating in UC7 (10 households).



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- 1 energy meter to collect overall consumption per household participating in UC7 (10 households).
- 7 advanced energy meters to collect real-time data for the collective PV installations.
- Analysing feasibility of upgrading and integrating public EV charging points with a dedicated API for interoperability with other management platforms.
- Data collection and communication from existing household's smart metering data towards tools.
- 3 MW PV plant in operation before 2025.

Building typology and number:

- 79 households at the Mas Magro Elementary School area.
- 134 households at the Municipal Sports Centre area.
- 134 households at the Enrique Miralles Football Stadium area.
- 16 households at the Museum area.
- 100 households at the PV Parking area.
- 80 households at the Elderly House area.
- 60 households at El Realengo Park (PV canopy) area.

***Picture 1. Crevillent pilot areas for the COMMUNITAS tools deployment.
a) Sports Centre; b) Museum; c) El Realengo Park; d) Elderly House***



The pilot site will demonstrate the various COMMUNITAS tools, corresponding to the following UCs:

- **UC1 – Knowledge base.** This will serve as a knowledge repository for the members of the community to be informed and to improve engagement as well as for prospective energy communities to serve as an accurate reference.
- **UC3 – Energy community management platform.** This tool will allow for an acceleration in the development and management of the energy community through the use of advanced monitoring and operation strategies.



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- **UC4 – Investment advisor tool.** Growth of energy communities can sometimes be a challenge for different reasons, this tool will facilitate the growing of the community and the decision-making processes towards new investments.
- **UC5 – Community-scale energy management: real-time optimization of DERs (OptiMEMS).** Optimisation of community assets is always a challenge, accordingly a tool that automatically manages the assets would be of great value for ECs.
- **UC6 – Real-time multi-energy state estimation for energy communities for DER optimisation (MultiFASE).** This will provide state-estimation of the distribution network for an optimisation of the connection and operation of community DER assets.
- **UC7 – Demand response and optimal market position.** DR systems can serve as an additional revenue stream for energy communities as well as a flexibility provision to the needs of distribution networks in the future.
- **UC8– Non energy services.** It will facilitate the engagement and the perception of the benefits for the energy community members.
- **UC9 – P2P energy markets.** A new energy transaction system can be tested to identify the potential of new technologies to improve the actual electricity retail system and allow for a more local transaction-based system that can result in a more active consumer participation in the energy market.
- **UC 11– Guarantees of origin marketplace.** Facilitates an additional revenue stream for energy communities.

2.1.2. Activities

The following table (Table 1) outlines the main activities involved in both the preparation phase and the technical installation phase in Crevillent. Those activities marked with an 'R' represents technical installation tasks. Each activity is listed with its planned deadline and current status, providing a clear timeline and progress update for the implementation of the project.

Table 1. Preparation and Technical installation Activities in Crevillent

Activity	Planned Deadline	Status
Identification of the users for installing smart plugs.	February 2024	Completed
Identification of users to participate in demand response activities.	February 2024	Completed
R1: Smart plugs installation and integration with IT systems.	March 2024	Completed
R2: Integration of EV charging stations.	September 2024	Ongoing
R4: Integration of communications with smart metering data for 600 households.	May 2024	Completed

2.1.3. Challenges



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Due to the maturity of the pilot site, with most of the required installations already operative, only minor challenges with low probability have been identified, these are:

- **Households lack of interest towards the installation of new devices at their premises.** This challenge is limited due to the size of the community and the expected number of households that require this type of installation (10 households).
- **Integration with communication systems.** Households' communications systems might have low performance and the access to the data might not be completely stable.

2.1.4. Risk Log

Table 2 details the risk management plan for the Crevillent pilot site. It identifies potential risks, assesses their likelihood and impact, and describes the mitigation measures in place to address each one of the identified risks. This risk log ensures that all foreseeable challenges are considered and managed to minimise their impact on the success of the COMMUNITAS tools implementation.

Table 2. Risk Log for Crevillent

Description of risk	Likelihood	Impact	Mitigation Measure
Delays in equipment delivery.	LOW	MEDIUM	Fast delivery options will be included for all the equipment purchases in order to accelerate the deliveries and try to avoid delays.
Technical issues with metering equipment and communication system failures.	LOW	HIGH	The equipment selected for the communications has been used for previous installations and its operation is known.
Measurement data gathered at pilot sites is unreliable, corrupted and evaluation is not possible.	LOW	MEDIUM	Different data sources can be available at the demo sites that will help to verify the reliability of the data.
Installation of the equipment is not suitable for all the locations	LOW	HIGH	Visits to the households will be performed in order to identify the types of meters required. Different meters will be installed according to the necessities of individual households.
Households deciding to not participate after installation	LOW	HIGH	Specific sessions will be held with the participants to resolve any possible doubt they might have. If the case arises, the devices will be uninstalled and reinstalled at a different household.



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2.2. Pilot Site: Primiero Valley

2.2.1. Context

Primiero Valley is located in the province of Trento in northern Italy. The region is characterized by a humid continental climate with a hot summer, a climate common to cities and towns in the Alpine region and Eastern and Northern Europe. Within the perimeter of the Primiero Valley, **many types of utilities are represented, such as homes, public buildings, hotels, commercial buildings, and offices.** In total, there are about 8000 people. The Valley offers an interesting mix of renewable productions interacting in a well-defined mountainous area (Picture 2).

The main RES are **hydropower, solar PV, and biomass.** Biomass is used to provide heat through a district heating network, where **biomass accounts for 90% of the energy used. Hydropower and solar photovoltaic energy can provide 100% of the electricity needs** of the Primiero Valley.

The previous regulatory framework in Italy **did not allow the effective operation of Energy Communities** until the transposition of the European RED II.

With the Italian transposition of RED II on Energy Communities, a **Ministerial Decree on Energy Communities** in Italy has entered into force in January 2024.

The Primiero Valley Energy Community includes different types of users: **residential, commercial, and tertiary.** In terms of stakeholders involved in Primiero Valley, there are many both at the local level, and the national level. At the local level, **ACSM, the local DSO,** will be the facilitator for the development of the Energy Community, providing data and interacting with local stakeholders; in addition, the three municipalities of Primiero Valley will act as promoters of the Energy Community. Finally, there are **national bodies** that will regulate the future Energy Community, such as the **GSE (Energy Systems Management Body)** to regulate incentives at national level, the **GME (Energy Market Management Body), ARERA (Regulator)** to regulate energy tariffs, and the **MASE (Ministry)** for decrees on Energy Communities.

Technologies already in place:

- MV and LV network of over 400 km.
- 100 MV/LV transformers, with over 10,000 electricity supply points.
- PV plants (1 MW of peak power).
- Hydro power (two plants: 13 MW; 85 MW of peak power).
- Biomass (District Heating DH network of 60 km supplied by biomass for 90% and, when not possible, oil products for 10%).
- 1st Generation Power meters (third party metering system), gradually moving to 2nd generation meters.
- EV chargers (20 items for an installed power of 121 kW).
- Energy storage capacity (24 MW connected to DH).

Technologies and processes foreseen:

- Smart Plugs - 10 Smart Plugs/household.
- 2nd Generation Power meters (2G meters for real time energy tracking) – 1 Power Meter per household.

Building typology and number:

- 37 apartment buildings.
- 14 individual dwellings.
- 1 Professional institute (school for industry and handicrafts).



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- 1 building for services to private households.
- 1 for cultivation of non-perennial agricultural crops.
- 1 for collection, treatment and supply of water.
- 1 Service for the road network.

Picture 2. Primiero Valley pilot areas for the COMMUNITAS tools deployment.



The pilot site will demonstrate the various COMMUNITAS tools, corresponding to the following UCs:

- **UC1 – Knowledge base.** To create a repository of knowledge for all members but also for citizens to serve as a reference for all information and definitions related to energy communities to also provide a model for engagement and knowledge on the topic.
- **UC2 – Energy communities planning tool.** To help define what the possible sizes of various renewable energy sources can be to increase self-consumption on site.
- **UC3 – Energy communities management platform.** Helps with the management and monitoring of energy communities.
- **UC4 – Investment advisor tool.** Helps in the development of energy communities toward new investments in the sector.
- **UC5 – Community-scale energy management: real time optimization of DERs (OptiMEMS).** Helps with local grid modelling to manage various assets by optimizing the system.
- **UC6 – Real-time multi-energy state estimation for energy communities for DER optimisation (MultiFASE).** Helps monitor and evaluate the energy system in real time.
- **UC7 – Demand response and optimal market position tool employing NILM.** Helps to optimize the DR and thus the flexibility of the system and thus the distribution network.



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- **UC8 – Non-energy services: health, wellbeing and sustainable finance.** Creates additional non-monetary and non-energy aspects of involvement that can be benefits for members.
- **UC11 – Guarantees of Origin Marketplace.** Although difficult to apply, its model could result in additional possible revenue streams for ECs.

These UCs were chosen because the inputs are manageable items and the data that can be provided are considered reliable.

2.2.2. Activities

The following table (Table 3) outlines the main activities involved in both the preparation phase and the technical installation phase in Primiero. Those activities marked with an 'R' represents technical installation tasks. Each activity is listed with its planned deadline and current status, providing a clear timeline and progress update for the implementation of the project.

Table 3. Preparation and Technical Installation Activities in Primiero Valley

Activity	Planned Deadline	Status
Favourable opinion for the project from municipality received	December 2023	Completed
Conceptual design (for acquisition of design conditions) was made.	February 2024	Completed
R1: Identification of the users for installing smart plugs.	March 2024	Completed
R2: Identification of users to participate in demand response activities.	March 2024	Completed
R3: Evaluation phase for Smart plugs installation (choice of the proper buildings)	March 2024	Completed
R4: Purchase of necessary equipment (Shelly smart plugs and energy meters)	April 2024	Completed
R5: Delivery of necessary equipment (Shelly smart plugs and energy meters)	May 2024	Completed
R6: Installation of Shelly smart plugs and energy meters in 10 proper buildings (for UC7)	July 2024	Ongoing
R7: Integration with IT systems	July 2024	Ongoing
R8: 2 nd generation Smart meters installation (61 %) within Primiero Valley	December 2024	Ongoing
R9: 2 nd generation Smart meter installation (100 %) within Primiero Valley	December 2025	Planned

2.2.3. Challenges



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The main identified challenges for pilot site Primiero Valley are:

- **Getting people to realize the benefits** of the energy community.
- **Uncertainty of the regulatory and normative framework** on the topic.
- **Engagement of participants.**

2.2.4. Risk Log

Table 4 details the risk management plan for the Primiero Valley pilot site. It identifies potential risks, assesses their likelihood and impact, and describes the mitigation measures in place to address each one of the identified risks. This risk log ensures that all foreseeable challenges are considered and managed to minimise their impact on the success of the COMMUNITAS tools implementation.

Table 4. Risk Log for Primiero

Description of risk	Likelihood	Impact	Mitigation Measure
Delays in equipment delivery	LOW	MEDIUM	To start the purchase of the devices as soon as possible and identify other possible equipment distributors.
Inadequate equipment and facilities to perform all Uses cases for location.	LOW	HIGH	Previous identification of possible gaps between the required equipment or facilities and what is currently available at the location.
Equipment, technical issues and communication system failures.	LOW	HIGH	Develop a detailed emergency response plan outlining procedures to follow in the event of equipment failures or communication system outages.
Insufficient interest of residents in the neighbourhood to participate	MEDIUM	HIGH	Creation of a good and adaptable communication and engagement strategy.
Measurement data gathered at pilot sites is unreliable, corrupted and evaluation is not possible.	LOW	MEDIUM	Early diagnostics and intervention of the tool developers and high support from pilot partners in order to fix the measurements errors.
Demonstration tasks are limited due to constraints of infrastructure availability, market operations and regulatory framework.	LOW	MEDIUM	The regulatory framework could challenge the development of various UCs (such as that of Guarantees of Origin), however, work is being done on models and the application of these, with information and data submission.

Technologies already in place in Selwerd West:

- Smart meters in most houses.
- PV plants (kW not known, scans and inventories still need to be done).

Technologies already in place in De Larix:

- Heat net connection. The heat needs are account 16.000 GJ annually.
- Smart meters.
- PV plants.

Technologies and processes foreseen:

- Smart Plugs – 10 Shelly Smart Plugs per monitored household (10 households) in De Larix.
- 100 Dongles – 10 installed in De Larix (part of the pilot connected to a local heat net) + 90 installed in Selwerd West (in a diverse range of buildings and households). This will allow to see changes and have data to compare among De Larix (new situation) and Selwerd West (old situation).
- Expansion district heating infrastructure (roll-out is in progress).
- Diversification of heat sources and potentially on or more decentral heat source for either base load or peak load (for day and season heat storage).
- PV or PVT on all buildings in Selwerd West.
- Own community electricity distribution network (to be considered), to feed local heat source stations or heat storage (small or large below ground reservoirs for covering heat provisioning over days, seasons, and store excess electricity production) → See blue and red lines in **Picture 3**.
- Charging stations and batteries.

Building typology and number:

- **Residential: 375 terraced houses (approx.) and 125 apartments (approx.).** 100 of these households will be monitored through dongles and smart plugs. The dongles are needed as in the Netherlands, energy communities such as Grunneger Power, do not have access to smart meter data and electricity consumption on a neighbourhood level through transformer units.

The pilot site will demonstrate the various COMMUNITAS tools, corresponding to the following UCs:

- **UC1 – Knowledge base:** Grunneger Power would like to contribute to the knowledge base with information that has already been disseminated in the past together with the engagement, value proposition design and business case outcomes and results of the application of specific tools. In addition, information within the knowledge base will be disseminated to community members when deemed relevant and useful within the Grunneger Power collective.
- **UC3 – Energy communities management platform:** Advanced monitoring and operation strategies will help to manage and plan the energy system implemented in the pilot as a whole and its functioning in the future. To prevent grid congestion, access to storage of PV production, management of collective PV and distribution network (electricity).
- **UC4 – Investment advisor tool:** Being able to see how different implementation scenarios will work for the energy system in the specific pilot in order to choose the best solution. Not only in terms of implementation costs and return on investment, but also in terms of environmental and other impacts, and consequences for operation in a changing context (e.g. legal and regulatory, such as net metering, which is being phased out in the Netherlands).
- **UC6 – Real-time multi-energy state estimation for energy communities for DER optimisation (MultiFASE):** Will assist in the management of the Energy Community in terms of fine-tuning the operation of the local energy system.



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- **UC7 – Demand response and optimal market position tool employing NILM:** Same as UC6, will help in the real time management of the energy community and the local energy system.
- **UC8 – Non-energy services: health, wellbeing and sustainable finance:** ECs have non-financial (often not-for-profit) objectives alongside their financial objectives. For example, providing credit to community members, supporting other projects/activities related to well-being and its enhancement at the local level, inclusion and equal access to services for all citizens, and sustainability goals. Non-energy services can support these other values that ECs seek to support and facilitate.
- **UC9 – Peer 2 peer energy market:** P2P energy services are part of the changing role of consumers in the new energy system and market, so it can bring benefits to EC members as well as to the EC itself at an organizational level.
- **UC10 - Peer 2 peer tokens marketplace:** The benefits of the Groningen pilot are not yet fully clear. These will have to be explored in more detail in the future, depending on the value proposition that the EC and its members have created at local level.
- **UC11 – Guarantees of Origin Marketplace:** Can facilitate the revenue streams for energy communities.

Some of the use cases as UC12 – USE, require further research on the feasibility of implementation.

2.3.2. Activities

The following table (Table 5) outlines the main activities involved in both the preparation phase and the technical installation phase in Groningen. Those activities marked with an 'R' represents technical installation tasks. Each activity is listed with its planned deadline and current status, providing a clear timeline and progress update for the implementation of the project.

Table 5. Preparation and Technical Installation Activities in Groningen

Activity	Planned Deadline	Status
Conceptual design (for acquisition of design conditions).	May 2024	Ongoing
Favourable opinion for the project from municipality.	Dec 2023	Completed
Favourable opinion for the project from the public heating company.	Dec 2023	Completed
Engagement strategy for participants	September 2024	Ongoing
Recruitment of participants for use cases	July 2024	Ongoing
Information about heating system and electricity system gathered	March 2024	Ongoing
R1: Electrical installations	September 2024	Ongoing

2.3.3. Challenges

The main identified challenges for pilot site Groningen are:

- **Implementation of electricity and engagement of participants.** Citizens need to agree to the installation of PV or PVT in the roofs of Selwerd West as cooperative asset and community building has not finished in this respect, so this issue still needs a lot of attention.
- **Good communication** and expectation management of participants given the multitude of innovative solutions and additional requests from the project (e.g. social and policy labs).
- **Engagement of other stakeholders** in the neighbourhood (e.g. for a decentralized heat source and the stakeholders Warmtestad (heating company and municipality), DSO who's maintaining and exploiting the local grid).
- **Access to financial resources** to create a decentralized heat source, PV(T) on all roofs and a local electricity grid when this seems to provide additional value to the proposition(s).
- **Timely roll-out of the district heating network** in the areas where implementation has not taken place yet.

2.3.4. Risk Log

Table 6 details the risk management plan for the Groningen pilot site. It identifies potential risks, assesses their likelihood and impact, and describes the mitigation measures in place to address each one of the identified risks. This risk log ensures that all foreseeable challenges are considered and managed to minimise their impact on the success of the COMMUNITAS tools implementation.

Table 6. Risk Log for Groningen

Description of risk	Likelihood	Impact	Mitigation Measures
Delays in monitoring equipment delivery.	MEDIUM	MEDIUM	Equipment has been selected and ordered but unsure of provider can provide equipment soon.
All necessary permits (land use agreements, environmental permits, construction permit...) not received.	LOW	HIGH	Looking for alternative location where permit can be obtained, or adaptation of the use case implementation.
Inadequate equipment and facilities to perform all Uses cases for location.	MEDIUM	HIGH	Design strategy including alternatives.
Equipment, technical issues and communication system failures.	LOW	HIGH	Early diagnostics and fast response protocols.
Demonstration tasks are limited due to constraints of infrastructure availability, market operations and regulatory framework.	MEDIUM	MEDIUM	Adapting the implementation plan of the use case to reach the most optimal outcome so that communitas outcomes are secured.



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Measurement data gathered at pilot sites is unreliable, corrupted and evaluation is not possible.	LOW	MEDIUM	Early diagnostics and intervention of developer of innovative solution.
Insufficient interest of residents in the neighbourhood to participate	MEDIUM	HIGH	Creating a good and adaptable communication and engagement strategy for community building.
Insufficient commitment of external stakeholders required for access to data or other resources.	HIGH	HIGH	In the Netherlands getting access to the data needed for monitoring is very difficult or impossible. Some data is not available and to some access is prohibited according to current regulation and measures to gain access take time to implement and realize. Measures taken are installing own data gathering means and trying to get access to data to other parties working in the neighborhood.

A quick overview of which UCs are going to be implemented in each one of the Leader Pilots is presented in **Table 7**:

Table 7. Overview of Ucs implemented in each Leader Pilot

UCs/Pilots	Crevillent	Primiero	Groningen
UC1 – Knowledge Base	x	x	x
UC2 – Planning Tool		x	x
UC3 – EC Management	x	x	x
UC4 – Investment Advisor	x	x	x
UC5 – Real-time optimization of DERs (OptiMEMS)	x	x	
UC6 – Real – time multi-Energy state estimation (MultiFASE)	x	x	x
UC7 – DR and optimal market position through NILM	x	x	x
UC8 – Non-energy	x	x	x
UC9 – P2P Energy markets	x		x
UC10 – P2P NFT and Fungible Tokens			x
UC11 - GoOs	x	x	x



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UC12 – USE			Considering
UC13 - VERIFY			



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2.4. GANTT Diagram of the Leader Pilot Activities

	Year 2024												Year 2025												Year 2026					
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36	M37	M38	M39	M40	M41	M42
Devices purchase																														
Identification of users for devices installation																														
Installation of devices																														
Engagement of stakeholders and citizens																														
Integration of devices with IT systems																														
Social and Policy Labs																														
Test cases testing																														
Test cases execution and coupling with CCP																														
Final solutions validation and implementation																														

2.5. Pilot Site: Halkidiki Thessaloniki

2.5.1. Context

The Halkidiki pilot is located in the Halkidiki peninsula, near Thessaloniki, in Greece. The region has hot-summer Mediterranean climate (Csa) near shore, but also a cold semi-arid climate (BSk) inland. The pilot is constituted by **50 residential buildings and some retail/commercial buildings**. The pilot was set up in 2018, having participated in H2020 enCOMPASS [2] and inteGRIDy [3] as a demonstration site, with **highly engaged consumers**. The main motivation for the integration of this demonstrator is aligned with the creation of an EC and DR schemes including eMob (a DR scheme for eMob utilising PV over car sheds with Battery Energy Storage Systems to foster EV charging stations).

Greece aims to encourage demand-side participation through the application of **reserves and long-term capacity compensation schemes**. Consumers connected to the electricity transmission grid can offer to the **TSO flexibility services** by participating in auctions. The TSO has then the right to temporarily decrease, up to a pre-agreed value, the active power of counterparties, who are financially compensated for their services. Additionally, residential customers can sign contracts offering **lower tariffs for night consumption**. The latter motives are included in the commercial packages/tariff schemes of the supplies to the customers (**implicit DR**), and they do not concern participation in the wholesale electricity market (**explicit DR**). The Flexibility Market participation (demand side management, DR, storage, and PPAs) is currently being reviewed by the Regular Authority for Energy, following the Greek Market Reform Plan and would be integrated into the Balancing Market from September 2022.

The **pilot stores act as the main broadcaster** for moving the consumers mindset towards the adoption of ECs. The demo site uses **OCP communication protocols, to monitor and control Electric Vehicle Supply Equipment** to support the maximization and response to DSR signals from Distribution System Operators for congestion management purposes.

Technologies already in place:

- 5 PV panels (22 kW in total)
- Electricity meters
- Humidity and temperature sensors monitoring the indoor residential comfort.
- 2 smart electricity meters with live energy consumption data in the large commercial facility
- Environmental sensors, energy monitoring equipment, occupation sensors.
- 2 EV charging stations (22kW each).

Technologies and processes foreseen:

- Installation of monitoring devices (lighting, HVAC, PCs...)
- 10 Shelly Smart Plugs per household (10 households).
- 1 Shelly Pro EM – 50 EM per household (10 households).
- Solar PV energy with battery storage to power EV chargers (4-6 kWp)
- PV to be installed in a car park roof of the commercial facility (4-6 kWp).
- Battery Energy Storage System (BESS).
- BMS monitoring and load monitoring devices for the battery.
- Algorithms for estimating available flexibility and for evaluating the optimal alteration of the charging cycles based on a dynamic-programming-based optimization engine solving an adjusted unit commitment problem for different cases.



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Building typology and number (households that will be monitored):

- 50 households in the Residential buildings area in Nea Moudania – Chalkidiki Community.
- 3 Energy Retail Stores.
- 1 Electrical Commercial Facility (Picture 4).

Picture 4. Haldikiki pilot Electrical Commercial Facility for the COMMUNITAS tools deployment.



The pilot site will demonstrate the various COMMUNITAS tools, corresponding to the following UCs:

- **UC1 - Knowledge Base:** centralizing and simplifying access to critical information on ECs, enhances the efficiency and effectiveness of developing and managing ECs, wider community participation and support.
- **UC2 – Energy Communities planning tool:** determining the optimal sizes for Renewable Energy Source (RES) plants, heating/cooling units, and E-mobility charging stations.
- **UC3 - Energy Communities management platform:** monitoring and management of energy production and consumption for members.
- **UC4 - Investment Advisor Tool:** enabling data-driven, sustainable investment decisions tailored to the unique needs and ambitions of the energy community.
- **UC5 - Community-scale energy management:** real-time optimization of DERs (cost minimization, maximization of renewable energy sources (RES) integration, self-dependency, and extension of equipment lifecycle.
- **UC7 - Demand Response and optimal market position tool employing NILM:** monitoring of energy consumption without the need for invasive installations in homes and stores.
- **UC8 - Non-energy services – health, well-being, and sustainable finance:** fostering a supportive ecosystem that benefits all community members by improving indoor environmental quality (IEQ) and promoting activities that enhance social connectedness, adoption of sustainable practices and financial stability.
- **UC12 - Uniform Smart community Evaluation tool:** measuring the success of its interventions against specific targets, sustainability goals, and broader community needs.

2.5.2. Activities



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The following table (Table 8) outlines the main activities involved in both the preparation phase and the technical installation phase in Halkidiki. Those activities marked with an 'R' represents technical installation tasks. Each activity is listed with its planned deadline and current status, providing a clear timeline and progress update for the implementation of the project.

Table 8. Preparation and Technical Installation Activities in Halkidiki

Activity	Planned Deadline	Status
Engagement of residential, retail and commercial users	December 2025	Ongoing
R1: Sensor installation in residential, retail and commercial users	December 2024	Planned
R2: BESS, PV, and power lines installation in commercial facility	September 2024	Ongoing

2.5.3. Challenges

The main identified challenges for pilot site Halkidiki are:

- **Not a clear framework** in the Greek Legislation for ECs' permitted activities.
- **Large number of residential users.**
- **Strong seasonal influence** of consumption due to the touristic nature of Halkidiki.

2.5.4. Risk Log

Table 9 details the risk management plan for the Halkidiki pilot site. It identifies potential risks, assesses their likelihood and impact, and describes the mitigation measures in place to address each one of the identified risks. This risk log ensures that all foreseeable challenges are considered and managed to minimise their impact on the success of the COMMUNITAS tools implementation.

Table 9. Risk Log for Halkidiki

Description of risk	Likelihood	Impact	Mitigation Measures
Delays in equipment delivery.	LOW	MEDIUM	Some equipment is already installed. Make sure the rest is ordered in time to allow for installation.
Insufficient interest of residents in the neighbourhood to participate	MEDIUM	HIGH	Taking all necessary measures to support and engage participant. If not possible to avoid, to find other participants to take their place.

Pilot participants withdrawing from project pilot activities	LOW	HIGH	Communicate regularly with pilot participants to avoid withdrawals from the project. If withdrawals do occur, identify new participants to replace those who have withdrawn.
Equipment, technical issues and communication system failures.	LOW	HIGH	Regular communication with both technical partners as well as pilot participants.
Demonstration tasks are limited due to constraints of infrastructure availability, market operations and regulatory framework.	LOW	MEDIUM	Close monitoring of evolving legislation. Communicate regularly with both technical partners and pilot participants. Be flexible and adapt to possible restrictions.
Measurement data gathered at pilot sites is unreliable, corrupted and evaluation is not possible.	LOW	MEDIUM	Regular communication with both technical partners and pilot participants. Be flexible and adapt to possible constraints.

2.6. Pilot Site: Hyllegaard Høje

2.6.1. Context

The Danish pilot case in the countryside Hyllegaard Høje will have around 200 housing units divided into 6 housing groups. The first housing group, **Sjællands Muld** with **35 housing units** (Picture 6) is now under construction to be finalized within 2024. The COMMUNITAS project will be connected to this first housing group with measurement and testing activities. In addition to renewable energy sources, Hyllegaard Høje Storbofællesskab has a connection to the electricity grid, where both provides and receives electricity. Next to this first group, there are a number of smaller energy communities in the countryside. This is because the current legislation **does not allow for sharing solar power across buildings**, which means that **the individual terraced houses will act as small energy communities** (

Picture 7). The terraced houses, which consist of 4-6 homes, **share the solar power** that is produced on their roofs. The terraced houses' **other household electricity consumption is covered by the public electricity grid**. In Hyllegaard Høje, there is a requirement that **all buildings are only heated by the thermogrid** to ensure that the heat supply is profitable. In the establishment phase of Hyllegaard High Energy Community, Hyllegaard Udvikling is responsible for establishing the thermogrid. It is the developer who is responsible for the individual housing clusters being connected to the overall thermal grid and complying with the requirements in the design manual.

Technologies being established in 2024:

- PV panels (3,000 kWh/y for 60 m² residential building).
- Heat pumps.
- Thermogrid cold heat distribution system and geothermal heat source (Picture 5).



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- Electricity grids for heat pumps - EV chargers

Picture 5. Geothermal heat system extracting ground heat (under construction).



Technologies and processes foreseen:

- 10 Smart Plugs/household.
- 1 Power Meter per household.
- Monitoring equipment.
- Smart management system – to be defined.

Building typology and number (households that will be monitored):

- **Residential 35 low energy buildings** initially with yearly energy consumption of 50 kWh/m² to be covered with a similar amount of 50 kW PV-production of 3,000 kWh/year per building.

Picture 6. Hyllegard Pilotsite 6 housing groups map. Sjællands Muld (in red) is the area for the deployment of the COMMUNITAS tools.



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Picture 7. Sjællands Muld housing cluster buildings.

The pilot site will demonstrate the various COMMUNITAS tools, corresponding to the following UCs:

- **UC1 – Knowledge Base.** Good for new energy communities as Hyllegaard Høje.
- **UC2 – Energy Communities planning tool.** Good for communities that are planning to expand.
- **UC3 – Energy Communities Management Platform.** Tracks the production and consumption within the community and introduces some elements of gamification.
- **UC4 – Investment Advisor Tool.** Provides good insights for the members of the community.
- **UC7 – Demand Response and optimal market position tool employing NILM.** Ability to determine the potential for the use of flexibility using the DR tool and provide advice to users.
- **UC8 – Non-energy services – health, well-being, and sustainable finance.** Does not require dynamic data and provides valuable information.
- **UC12 – Uniform Smart community Evaluation tool.** Framework for evaluation based on KPI's.
- **UC13 – Multisector static and real time LCA/LCC service for Energy Communities.** Provides an overview of the impact to the planet caused by the community and an idea of costs to maintain that infrastructure. It could be used in order to minimize negative impacts and identify the areas that could be improved.

2.6.2. Activities

The following table (Table 10) outlines the main activities involved in both the preparation phase and the technical installation phase in Hyllegaard. Those activities marked with an 'R' represents technical installation tasks. Each activity is listed with its planned deadline and current status, providing a clear timeline and progress update for the implementation of the project.

Table 10. Preparation and Technical Installation Activities in Hyllegaard

Activity	Planned Deadline	Status
Planning how Use cases measurements and testing can be integrated into the operation of the energy system of Hyllegaard Høje's first housing group. Engagement of citizens.	May 2024	Ongoing



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R1: Eventual electric installations of smart plugs, smart meters and other devices needed.	Jan 2025	Planned
R2: Carrying out use case measurements and tests from the beginning of 2025	Jun 2026	Planned

2.6.3. Challenges

The main identified challenges for pilot site Hyllegaard are:

- The inhabitants living in the first housing group **will not accept the extra work connected to carrying out Use cases tests/activities.**
- The inhabitants living in the **first housing group don't see any benefits** related to testing the use cases.
- Hyllegaard Udvikling as **the developer doesn't see any benefits** related to testing the use cases.
- The use case **tools don't provide benefits** for the DK pilot project and/or its partners.

2.6.4. Risk Log

Table 11 details the risk management plan for the Hyllegaard pilot site. It identifies potential risks, assesses their likelihood and impact, and describes the mitigation measures in place to address each one of the identified risks. This risk log ensures that all foreseeable challenges are considered and managed to minimise their impact on the success of the COMMUNITAS tools implementation.

Table 11. Risk Log for Hyllegaard

Description of risk	Likelihood	Impact	Mitigation Measures
Delays in equipment delivery.	LOW	MEDIUM	EGC will ensure an early order of the devices and will follow up if there are delays in equipment.
Inadequate equipment and facilities to perform all Uses cases for location.	LOW	HIGH	Early communication with the Hyllegaard Høje building stakeholders and Use Case responsible in order to be able to perform all Use Cases.
Equipment, technical issues and communication system failures.	LOW	HIGH	Close communication with stakeholders and continuous monitoring of the equipment and its performance.
Demonstration tasks are limited due to constraints of infrastructure availability, market operations and regulatory framework.	LOW	MEDIUM	Before demonstration activities have a close dialogue with the demonstration stakeholders to ensure are no constraint to demonstration due to infrastructure availability, market operations and regulatory framework.



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Measurement data gathered at pilot sites is unreliable, corrupted and evaluation is not possible.	LOW	MEDIUM	EGC will follow measurement data gathering closely and perform maintenance processes to secure data is reliable and not corrupted.
Insufficient interest of residents in the neighbourhood to participate	MEDIUM	HIGH	Creating a good and adaptable communication and engagement strategy.

2.7. Pilot Site: Cascais

2.7.1. Context

The Cascais pilot project is in the municipality of Cascais, Portugal, a town situated just west of Lisbon. Cascais is home to approximately 210,000 residents, and the pilot specifically involves **60 households along with several schools and public municipal buildings (Picture 8)**. This initiative's primary goal is to harness renewable energy sources (RES) for a social neighbourhood. The plan includes utilizing the **rooftops of local schools and sports facilities to install photovoltaic (PV) systems**. The energy generated will be distributed equitably among the Energy Community (EC) members, focusing on reducing energy bills for vulnerable families. In the context of the COMMUNITAS project, Cascais aims to develop additional tools for the community under development, facilitating its management and encouraging collaboration among members. In terms of regulations, the Portuguese legislative framework for Renewable Energy Communities (RECs) has been established through DL 162/2019 and further updated by DL 15/2022. These regulations align with the legal regime set by Directive 2018/2001. The legal definitions encompass concepts such as **self-consumption, collective self-consumption, and the introduction of Collective Energy Communities (CEC)**. Citizens are permitted to collectively own renewable energy assets, with a specific model for energy distribution among members. The EC manager is a new market player introduced to oversee the operation of each EC and coordinate with the grid operator. However, challenges persist, including the unclear differentiation between concepts and governance models necessary for implementation.

Picture 8. Cascais pilot area for the COMMUNITAS tools deployment.



The pilot site will demonstrate the various COMMUNITAS tools, corresponding to the following UCs:



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- **UC1 – Knowledge base.** Enhances the understanding of stakeholders, including residents, private stakeholders and local authorities, fostering informed decision-making.
- **UC2 – Energy communities planning tool.** Facilitates the planning phase of the Cascais project, ensuring optimized utilization of available resources and promoting sustainable energy practices.
- **UC3 – Energy communities management platform.** Enables efficient management of the renewable energy system, ensuring equitable distribution of energy and promoting community collaboration.
- **UC4 – Investment advisor tool.** Supports the Cascais pilot in making sound financial decisions, optimizing investments, and ensuring the long-term sustainability of the energy community.
- **UC5 – Community-scale energy management: real time optimization of DERs.** Enhances the overall energy efficiency, contributing to cost savings and reduced environmental impact.
- **UC6 – Real-time multi-energy state estimation for energy communities for DER optimisation.** Maximizes the efficiency of renewable energy generation and utilization, contributing to the overall success.
- **UC7 – Demand response and optimal market position tool employing NILM.** Increases the flexibility of the Cascais energy system, allowing it to respond dynamically to demand fluctuations and market conditions.
- **UC8 – Non-energy services: health, wellbeing and sustainable finance.** Broadens the impact of the project beyond energy, promoting holistic community well-being and financial sustainability.
- **UC11 – Guarantees of Origin Marketplace.** Improves the transparency and traceability of renewable energy within the Cascais energy community.

Technologies already in place:

- PV panels (<7kWh)
- Wind turbine (one wind turbine <1kWh)
- Smart meters
- EV charging (8 EV charging spots)

Technologies and processes foreseen:

- 10 Smart Plugs/household
- 1 Power Meter per household.
- Building Management System (BMS)

Building typology and number (households that will be monitored):

- 60 Residential buildings.
- 20 Public buildings.
- 2 Schools.

2.7.2. Activities

The following table (Table 12) outlines the main activities involved in both the preparation phase and the technical installation phase in Cascais. Those activities marked with an 'R' represents technical installation tasks. Each activity is listed with its planned deadline and current status, providing a clear timeline and progress update for the implementation of the project.

Table 12. Preparation and Technical Installation Activities in Cascais

Activity	Planned Deadline	Status
Conceptual design (for acquisition of design conditions)	March 2024	Completed
Favourable opinion for the project from municipality received	Sept 2024	Ongoing
R1: Electrical installations	Oct 2024	Planned
R2: Data collection for energy consumption in buildings and households	Oct 2024	Partially completed

2.7.3. Challenges

The main identified challenges for pilot site Cascais are:

- **Ambiguities in the regulatory framework**, particularly in the **differentiation between RECs** (Renewable Energy Communities) **and CECs** (Citizens Energy Communities), create uncertainty and may impede the widespread adoption of Energy Communities.

2.7.4. Risk Log

Table 13 details the risk management plan for the Cascais pilot site. It identifies potential risks, assesses their likelihood and impact, and describes the mitigation measures in place to address each one of the identified risks. This risk log ensures that all foreseeable challenges are considered and managed to minimise their impact on the success of the COMMUNITAS tools implementation.

Table 13. Risk Log for Cascais

Description of risk	Likelihood	Impact	Measures taken
Delays in equipment delivery.	LOW	MEDIUM	Consult with potential solution providers (alternative)
All necessary permits (land use agreements, environmental permits, construction permit...) not received.	LOW	HIGH	Ensure swift communication with town hall departments responsible for the licensing processes
Equipment, technical issues and communication system failures.	LOW	HIGH	Prepare data communication procurement under project budget



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Demonstration tasks are limited due to constraints of infrastructure availability, market operations and regulatory framework.	LOW	MEDIUM	Consider the usage of different digital metering systems from the start
Measurement data gathered at pilot sites is unreliable, corrupted and evaluation is not possible.	LOW	MEDIUM	Consider the usage of different digital metering systems from the start
Insufficient interest of residents in the neighbourhood to participate	MEDIUM	HIGH	Creating a good and adaptable communication and engagement strategy.

A quick overview of which UCs are going to be implemented in each one of the Leader Pilots is presented in **Table 14**:

Table 14. Overview of Ucs implemented in each Learner Pilot

UCs/Pilots	Haldikiki	Hyllegaard Høje	Cascais
UC1 – Knowledge Base	x	x	x
UC2 – Planning Tool	x	x	x
UC3 – EC Management	x	x	x
UC4 – Investment Advisor	x	x	x
UC5 – Real-time optimization of DERs (OptiMEMS)	x		x
UC6 – Real – time multi-Energy state estimation (MultiFASE)			x
UC7 – DR and optimal market position through NILM	x	x	x
UC8 – Non-energy	x	x	x
UC9 – P2P Energy markets			
UC10 – P2P NFT and Fungible Tokens			
UC11 - GoOs			x
UC12 – USE	x	x	
UC13 - VERIFY		x	

2.8. GANTT Diagram of the Learners Pilot Activities

	Year 2024				Year 2025												Year 2026					
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
	M21	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36	M37	M38	M39	M40	M41	M42
Devices purchase																						
Identification of users for devices installation																						
Installation of devices																						
Engagement of stakeholders and citizens																						
Integration of devices with IT systems																						
Social and Policy Labs																						
Test cases testing																						
Test cases execution and coupling with CCP																						
Final solutions validation and implementation																						

The following table (Table 15) summarises all the necessary equipment/devices that Leader and Learner pilot sites need to install, depending on the tool, in order to collect data and manage the household monitoring.

Table 15. Equipment needed for the households' monitoring

UCs/Tools	Description
UC3 – EC Management Platform	100 P1 Dongles + 100 NRG Monitor + 100 USB-C cable (only for the 100 users from Grunneger Power pilot as they are not using the Shelly meters)
UC5 – Real-time optimization of DERs (OptiMEMS)	Controller to dispatch the control signals (sent by CERTH to the pilots).
UC6 – Real-time multi-Energy state estimation (MultiFASE)	Devices measuring variables of main grid assets are needed but too expensive. The solution will be implemented in areas that already have these devices installed.
UC7 – DR and optimal market position through NILM	10 Shelly Smart Plugs/household + 1 Shelly Pro EM – 50 EM/household* Own controller for water boilers.

**10 households to be monitored, so 10 Shelly Pro EM + 100 Shelly Smart Plugs are needed per pilot. Smart plugs can be installed by anyone, however a certified electrician is needed in order to install the meters*



3. Risk Management Plan

As can be seen from the various risk logs included in all pilot sections, most of the identified risks are common to all lead and learner pilots, so they have all been compiled and presented in the following Risk Management Plan table (Table 16), together with some detailed mitigation measures and contingency plans.

Table 16. Pilots Risk Management Plan.

Description of risk	Likelihood	Impact	Proposed mitigation measure	Contingency Plan	Risk Owner
Delays in equipment delivery can significantly impact project timelines, leading to potential cost overruns.	LOW	MEDIUM	- Regular communication with suppliers to receive updates on schedules and shipping timelines to early identify any possible delays or issues. - Diversification of suppliers. - Ensure that essential components are ordered and installed early to minimize the impact of potential delays on project milestones.	Identify alternative suppliers or vendors. Reallocate resources or adjust project schedules to accommodate the delayed delivery and minimize its impact on overall project timelines.	Pilot sites
Technical issues with metering equipment and communication system failures can disrupt data collection, monitoring, and control processes critical for project performance and compliance.	LOW	HIGH	- Conduct a thorough assessment of the reliability and performance of metering equipment and communication systems. - Prioritize equipment that has been successfully deployed in previous installations and has demonstrated compatibility with existing infrastructure and operational requirements. - Previous testing and validation of sensors and communication processes before the deployment to identify interoperability issues or performance limitations.	- Activate backup systems, alternative metering equipment and communication channels to maintain essential functions and data integrity. - Engage technical support from equipment vendors or service providers.	ETRA, CERTH, E@W, RINA

Description of risk	Likelihood	Impact	Proposed mitigation measure	Contingency Plan	Risk Owner
			Establish a maintenance program to ensure the ongoing reliability and performance of the devices.		
Measurement data gathered at pilot sites is unreliable, corrupted and evaluation is not possible. This can lead to a loss of valuable insight into the performance and effectiveness of the demonstrated solutions.	LOW	MEDIUM	- Regular calibration and maintenance of measurement equipment to ensure accuracy, precision, and reliability of data collected at pilot sites. - Maintain comprehensive documentation of data collection procedures, devices configurations, calibration and data processing to facilitate transparency, reproducibility and auditability of measurement data. - Provide clear and concise explanations of data uncertainties, limitations, and assumptions to ensure accurate interpretation and informed decision-making by stakeholders.	Implement procedures for data validation, error detection, and correction to identify and rectify anomalies or discrepancies in measurement data. Seek alternative data sources or supplementary measurements to complement or replace unreliable data.	E@W, RINA, CERTH, Pilot sites
Installation of the equipment is not suitable for all the locations, leading to inefficiencies, inaccuracies, or failures in data	LOW	MEDIUM	- Perform household visits or user consultations to gather firsthand information about site conditions, infrastructure availability and user preferences. - Engage with residents or stakeholders to understand their needs, expectations and concerns regarding equipment installation and operation.	- Conduct assessments of affected sites to identify issues in equipment installation and implement corrective measures. Plan for the reinstallation or retrofitting of equipment at problematic locations to ensure compatibility, functionality, and user satisfaction.	Pilot sites, ETRA, CERTH,



Description of risk	Likelihood	Impact	Proposed mitigation measure	Contingency Plan	Risk Owner
collection and monitoring			Conduct pilot tests or small-scale deployments to validate the suitability and effectiveness of equipment installations in the considered locations.	Communicate transparently with affected stakeholders, including residents, and regulatory authorities, regarding the challenges encountered.	
Insufficient interest of residents in the neighbourhood to participate that could limit data collection efforts and impact the overall success and effectiveness of the project	MEDIUM	HIGH	- Develop a comprehensive community engagement strategy that emphasizes the importance of resident participation, highlights the benefits and value proposition of the project and addresses potential concerns or misconceptions. - Utilize a mix of communication channels, including community meetings, newsletters, social media, etc. to reach residents. - Highlight success stories, testimonials, or case studies from similar projects or initiatives to illustrate the positive outcomes. - Organize events, community workshops, or neighbourhood forums to engage directly with residents, address their questions, and facilitate interactive discussions around project goals, activities, and potential benefits.	- Evaluate and adjust the community engagement strategy to identify new outreach channels, messages, or incentives that may be more effective for residents and stimulate participation. Launch targeted outreach campaigns in the neighbourhoods to address participation gaps and increase awareness and interest in the project. Strategic partnerships with local organizations, businesses, or institutions to co-host events, distribute promotional materials, or leverage existing community networks and channels.	Pilot sites, EDP, CERTH
Insufficient commitment of stakeholders required for access to data or other	LOW	HIGH	Develop a comprehensive stakeholder engagement strategy that identifies key stakeholders, clarifies their roles and responsibilities, and outlines strategies for securing their commitment and support.	Identify alternative data sources or repositories that can be accessed or leveraged to fulfil the project's data requirements if primary stakeholders	Pilot sites

Description of risk	Likelihood	Impact	Proposed mitigation measure	Contingency Plan	Risk Owner
resources. Without adequate support and cooperation from stakeholders the project may face delays, limitations or challenges in accessing the necessary resources to fulfil its objectives.			Align the project's value proposition with the strategic priorities, goals, and interests of key stakeholders to demonstrate the tangible benefits and positive outcomes associated with their participation and support.	are unable or unwilling to provide support. Expand the project's network of stakeholders.	
Households deciding not to participate after installation due to privacy concerns, users' dissatisfaction or changes in household circumstances.	LOW	HIGH	- Conduct outreach and education campaigns to inform households about the purpose, benefits, and implications of participating in the program. - Offer flexibility in the installation process to accommodate participants' preferences, ensuring minimal disruption and inconvenience. - Offer benefits or incentives such as discounts on utility bills, access to exclusive services, or participation in community events to enhance the perceived value of participation.	- Conduct interviews or surveys with non-participating households to understand the reasons for their decision and gather feedback on their experience. - Develop protocols and procedures for uninstalling equipment from non-participating households and reinstalling it at alternative locations. - Implement strategies for recruiting new participants. Intensify efforts to engage and retain current participants through enhanced communication, support services, and incentives to maintain overall participation levels.	Pilot sites

Description of risk	Likelihood	Impact	Proposed mitigation measure	Contingency Plan	Risk Owner
Demonstration tasks are limited due to constraints of infrastructure availability, market operations and regulatory framework that may challenge the development and implementation of various use cases.	LOW	MEDIUM	- Conduct a comprehensive assessment of regulatory requirements, market regulations, and operational constraints relevant to the demonstration tasks and proposed use cases. - Prioritize demonstration tasks and use cases based on their alignment with regulatory priorities, market demand, technical feasibility, and potential impact on project outcomes and stakeholder interests.	Explore alternative demonstration scenarios that are more aligned with existing infrastructure capabilities, market conditions, or regulatory requirements. Conduct pilot tests or small-scale trials to validate the feasibility, effectiveness, and regulatory compliance of selected UCs in real-world settings before scaling up deployment efforts. Seek temporary permits from regulatory authorities to relax certain requirements or restrictions.	Pilot sites, EDP, Tool developers
All necessary permits (land use agreements, environmental permits, construction permit...) not received , leading to project delays, legal complications or even suspension of activities.	LOW	HIGH	- Initiate early engagement with regulatory authorities and relevant stakeholders to understand permit requirements, expedite the application process, and address any concerns or requirements proactively. - Explore alternative permitting paths, expedited review procedures, or regulatory exemptions that may be available for specific project components or circumstances to accelerate permit issuance.	Engage in negotiation or mediation with regulatory authorities, affected parties, or community stakeholders to address concerns, resolve disputes, or explore compromise solutions that facilitate permit issuance. Consider modifying site layouts, or relocating activities to alternative locations that may have more favorable permitting conditions or fewer regulatory obstacles.	Pilot sites



4. Test Case specification

After the requirements definition during T2.1 Architecture design and specification's identification (see D2.1 COMMUNITAS Core Platform architecture and specifications), it is necessary to create a set of test cases to assess these requirements. Although each test case defines the way in which a requirement is validated, two points need to be clarified. Firstly, depending on the complexity of the requirement to be probed, more than one test case may be defined for the same requirement. Secondly, although the most common situation is for a test case to be related to a single requirement, it is worth mentioning that if a requirement is dependent on another, the same test case can be defined for both related test cases.

The test cases are defined following the format shown in Table 17. This table contains several pieces of information, including how to execute the test case, the dependencies with other test cases, the steps to follow, the expected results and the criteria to indicate the success or failure of the test case.

Table 17. Test cases template

Name	<i>The test case code and name, which are unique to the COMMUNITAS project.</i>		
Module under test	<i>The devices or systems under test</i>	Resp.	<i>The main partner responsible for the test</i>
Module requirement	<i>The requirement, use case, or certification rule which is validated by the test case</i>		
Test environment	<i>The list of elements needed for the test execution</i>		
Features to be tested	<i>The list of features in software to be tested</i>		
Features not to be tested	<i>Optional</i>		
Preparation	<i>Short list of steps needed for preparing the test environment for test execution</i>		
Dependencies	<i>(Optional) List of test case codes defining test cases which need to be passed before the test case at hand can be started</i>		
Steps	<i>Testing procedures</i>		
Pass criteria	<i>Expected (measurable) results, allowing to unambiguously judge if the test is passed or not passed (i.e. the product requirement was validated or not validated)</i>		
Suspension criteria	<i>(Optional) Conditions under which continuation of the test is considered pointless because testing results would be invalid</i>		
Results	<i>(Optional) Short list of results (system status after the execution or action done)</i>		

4.1. Lab-testing approach

In order to define the test cases in an optimum way, a lab-testing approach is presented in this document and will be followed for the integrated lab-testing activities. The followed methodology has been proven to be successful and sufficient for this kind of activities in previous project as TwinERGY [4] and NOBEL GRID [5].

The test cases reflect the validation to be done over the use cases defined during task T1.3. Therefore, for each tool, the developer is also responsible to test and evaluate the interoperability of their tool with the others (regarding hardware requirements in a lab environment).

The approach described proposes a set of definitions that are presented in the following table (Table 18) These definitions were developed considering the state of the art in software, smart grid, and system integration testing, especially with respect to the IEEE 829 Standard [6] for software test documentation.

Table 18. Definition of terms.

Term	Definition
Device under test	a product or software which is verified by a certain test case. It is part of the test environment
Expected results	a description of the status of the test environment after a test case was carried out and pass criteria have been met
Features (not) to tested	a list of product requirements or specifications which are (not) covered by a certain test case
Pass/fail criteria	a definition of how to judge or measure if a product under test conforms to specifications and requirements that shall be validated by a certain test case
Retesting	re-execution of a test case that previously returned a “fail” result, to evaluate the effectiveness of intervening correction actions
Subsystem acceptance criteria	conditions to be fulfilled by a subsystem for including it into the system integration test. Conditions should include the availability of testing protocols for standalone subsystem tests. Also, subsystems should have similar level of maturity
Suspension criteria	a description of conditions which indicate that the test was carried out incorrectly or that any situation was produced which renders the testing results unusable, making test continuation pointless and requiring the test to be halted and restarted
System integration test	a test designed to verify that a system made up of two or more interacting products (subsystems) conforms to system-wide specifications and requirements. The device under test is the system itself. It is specially designed for finding inconsistencies which emerge only through the subsystem interaction. The system integration test plan may define partial system integration tests which allow for adding subsystems subsequently
(System integration test) Level	The number of system layers which are included in a system integration test case minus one
System layer	a group of one or more subsystems which is defined prior to the system integration test. According to group definition for a given system should be used for all system integration test cases
Testing	set of activities conducted to facilitate discovery, validation and/or evaluation of properties of one or more test COMMUNITAS components
Test analysis	elaboration about why a test result emerged. It may also include a conclusion about what the test result implies for the future work
Test case	a collection of features (not) to be tested, testing procedures, and pass/fail criteria used for testing a system or device under test. Test cases may refer to specific



	types of product requirements, e.g. the function, reliability, stability, safety, or vulnerability.
Test case code	an identifier for a test case which is unique throughout the project.
Test specification	documentation of one or more test cases
Test coverage	a list of product requirements or specifications which are verified by a test plan
Test data	data created or selected which is needed for executing one or more test cases. It may be defined in the test case specification
Test environment	a list of all elements (software, hardware, information, external conditions) needed to carry out a test case, including the device or system under test and all elements needed to judge the test outcome
Test environment set-up process	a list of actions needed for establishing and maintaining a required test environment
Test execution	the actions needed to carry out the testing procedures for a given test case
Test group	a collection of test cases which share at least one defined criterium. E.g. all test cases which relate to cybersecurity testing might be defined to make up a test group
Test method	a general definition of testing procedures and test environment for a test plan
Test plan	a strategy or list of tasks used to verify that a product conforms to design specifications and product requirements
Test preparation	a definition of steps which are needed to prepare a test environment for test execution
Testing procedures	a specific list of steps which are needed to carry out a test case
Test protocol	a summary of the test results of all test cases defined in a test plan. It may also contain the test analysis for said test cases
Test requirements	a definition stating the status of the test environment which is needed for carrying out a specific test case or a test group. Ideally, it is also stated how it can be checked if the test environment is ready for test execution
Test responsibilities	a definition stating which persons or organizations are needed for the test. It may also include an assignment of tasks to those persons or organizations
Test result	an indication of whether a specific test case has passed or failed. May also include any data that has been obtained through execution of the test case

4.2. Test plan

To provide a common framework for all involved partners, the testing activities are all based on the following test plan:

1. Review the project requirements from architecture:

This step consists of the review of integration requirements that need to be probed, using the architecture specified during WP2 as a starting point (see D2.1 – COMMUNITAS Architecture [7]). Since the architecture status is in its integration phase, requirements are not related to the internal working of each component, but to the communication among components.

Another aspect to be considered is that, during the implementation of each module and the final architecture of COMMUNITAS platform, some variations can appear in the architecture and have to be considered in order to define the most appropriated testing. Each module has to be described and its requirements exposed. These requirements are defined following the standard RFC 2119 [8], in which one can find:

- The identifier of the requirement.
- The affected asset: component or use case.
- The responsible partner.



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- A detailed description of the requirement.
- A priority, being 1 the lowest and 5 the highest one.

Just as a summary of that standard, the description of the requirement and the priority are closely related. The description has to follow this schema: “Asset + AUXILIAR VERB + verb + action”, being AUXILIAR VERB: “MUST”, “SHALL”, “HAVE TO”, “SHOULD”, “RECOMMENDED”, “MAY”, “OPTIONAL”, etc. Depending on the auxiliary verb that is used in the requirement sentence, the priority will change. For instance, “Energy and environmental sensors HAVE TO send data to Home & Tertiary Energy Management Module” corresponds with priority 5/4 (the highest one).

The first step is to identify the assets involved in each of the project's UC processes. According to Table 19, each component is categorised by type, distinguishing between physical assets, applications, etc. Physical assets include energy smart plugs, smart sensors, PV panels, etc., which play a crucial role in the physical infrastructure of the project. COMMUNITAS platforms, such as the core data management platform and various modules, support data management and operational processes. This categorisation helps to clarify the roles and functions of each component within the different UCs.

Table 19. Assets actuating during UCx processes

Asset	Asset Type
Energy smart plugs	Physical asset
Smart sensors	Physical asset
PV Panel	Physical asset
Core Data Management Platform	COMMUNITAS application
Modules from UCx	COMMUNITAS application
.	.
.	.
.	.
etc	etc

Based on the assets list, the requirements must be presented in the format of Table 20. These requirements need to be validated during the testing phase.

Table 20. Integration requirements related to UCx

Req. Identifier	Asset	Responsible partner	Description	Priority
R01.001	Energy sensors		Smart sensors <i>HAVE TO</i> send data to the Energy Management Tool	5
R01.002	Smart plugs		The Energy Management Tool <i>HAS TO</i> show the logged user its appliances' telemetries data referring to the last 7 days	5
.	.			
.	.			
.	.			
etc	etc			



2. Define the features of the tool that need to be tested - Focusing on laboratory integration and interoperability features.

In the previous step, partners must define the requirements representing the characteristics related to the integration that need to be tested. In this step, partners classify the requirements in some categories, that can be exposed in the next table (Table 21):

Table 21. Requirements classification criteria.

Test group	Common criteria
Visualisation and analysis	The feature under test provides visualization and/or analysis of the data collected.
Control	The feature under test provides control of assets.
Compliance	The feature under test relates to compliance of the tool with the Universal Smart Energy Framework (USEF) standard [9] or other standards.
Functionality	The feature under test is a complex function provided by a combination of software and communication between multiple COMMUNITAS subsystems.
Communication	The feature under test is basic data transmission between two communication endpoints, one being the tool.
Robustness and stability	The feature under test is related to fault tolerance and stability.
Cyber Security	The feature under test mitigates vulnerabilities of the software or malicious attacks aimed at it.

Hereafter, Table 22 will summarize the classification of all requirements presented in types indicated in Table 21.

Table 22. Requirements classification.

Req. Identifier	Description	Test group
R01.001	Energy and environmental sensors HAVE TO send data to Energy Management Module	Communication
R01.002	Energy Management Module web application HAS TO show the logged user its appliances' telemetries data referring to the last 7 days	Communication
.	.	.
.	.	.
etc	etc	etc

These two steps will support the correct definition of the detailed test cases for the validation of the defined features of each one of the tools.



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4.3. Execution of the test cases – Tools Deployment

Once the test cases are defined and detailedly described by filling Table 17, as well as first tested under lab conditions, they will be executed in order to detect if any unexpected problems appear during this process. If that is the case, partners should find a solution/alternative to the issue or redefine the test case to get a proper deployment of the project tools and solutions, achieving the expected results. Since this testing is done in a lab environment, some of the test cases that are referred to physical assets are executed using a simulated asset or a limited situation where the asset to be accessed is limited.

4.4. Testing and Implementation results

The results of both the lab-testing and the execution of each test case will be presented in the form of a table (Table 23) with the following detailed information:

- The related component or UC
- The Test case identifier
- The responsible partner
- The result of the execution, namely:
 - Success: the test case finishes in its defined pass criteria
 - Fail: the test case finished in its defined suspension criteria
 - Pending: the test case is blocked, or it could not be executed due some external causes or unexpected event.

Table 23. Result of execution of test cases

Related asset/HLUC	Test case ID	Responsible	Results
CCP (COMMUNITAS Core Platform)	TCCP01	E@W	Success
	TCCP02	E@W	Fail
	TCCP03	E@W	Success
UC1	TC01.001		Success
	TC01.002		Fail
	TC01.003		Pending

It is worth mentioning that the results from the testing and execution together with all the related tables presented in this section will be fully completed and presented with all the required information in further deliverables (D5.2, D5.3 and D5.4)

5. Monitoring Framework

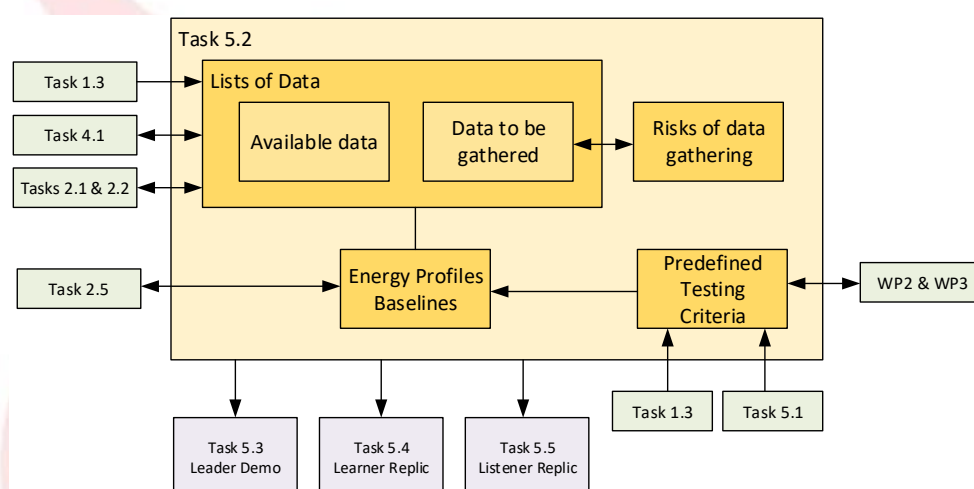
Several pre-monitoring activities were foreseen during T5.2 to set up the project monitoring framework to ensure proper initiation of monitoring activities and successful estimation of KPIs. The pre-monitoring activities can be divided into four different subtasks with different outcomes based on the Task 5.2 description. These subtasks are:



- **Data Identification and Collection:** Creation of several lists of data sources and identification methods. This ensures the identification of available data per pilot, fosters communication with pilot leaders for data updates, and creates data availability collection sheets. Historic data requests for demand and production metrics will be managed, alongside initiation processes for emission, cost, and curtailment estimation.
- **Data Analysis and Baselines:** Selection of energy profile baselines from available data, identifying missing data for platform and use cases per pilot. This sub-task along with the previous one leads to the collection of historical data from the pilots, the creation/selection of baselines and finally, the population of the related data to the COMMUNITAS Database.
- **Potentially relevant risks that will hinder the data acquisition process:** Risk assessment and mitigation measures for data gathering. This process helps to identify and assess all sources of risks and also proposes mitigation measures for all the identified risk sources related to data collection.
- **Testing Criteria:** Setting the goals with demo leaders for the COMMUNITAS project-level KPIs in order to provide the methods, equations, and goals for estimating the project-level KPIs.

In general, the above tasks are related to many other tasks and work packages, which are presented here as a general overview (Picture 9).

Picture 9. Task 5.2 Interrelation with other tasks and WPs



5.1. Data Identification and Collection along with Data analysis and Baselines

In the context of T5.2 an important data identification sub-task took place. Based on the proposal and other project deliverables, it was possible to scan the COMMUNITAS tools and use cases for data requirements. The results of this scan are presented in Section 10 - Annexes (Table 36). In general, data can be classified in four categories:

- Historical Data / Time series** collected prior the start of COMMUNITAS project.
- Data / Time series** collected in the context of COMMUNITAS project and will be used for various purposes and/or will become historical data.
- Static Data** that do not change over time, or they change at a very low rate, such as the electrical grid topology.

d) **Real-Time Data** collected from sensors and meters.

Category 'd' is outside the scope of this task. Similarly, no data will be collected for category 'b' during the monitoring process as this data is currently being collected in the context of the project. However, based on the overall data collection process, category 'b' data has been identified based on the overall availability and responses received from the pilot leaders.

For the pilot leader sites, specific data were requested based on specific characteristics such as energy production systems. Time series data were requested for a minimum of one year and for granularities of 15 min (preferred) or 1 hour. The data collection was divided into two phases. Phase A mainly refers to category "a", while phase B of the data collection refers to category "c".

Baselines are selected after data collection, based on availability and other factors such as environmental conditions. The definition of data models is based on the identified lists of data to be stored in the database. The baseline time series will be subject to various tests to verify their completeness and quality (outliers, empty values, etc.).

5.1.1. Data Collection Phase A

Aggregated consumption and production data time series have been requested for electricity and district heating together with outdoor temperature time series. Historical data was specifically requested for the houses where Shelly plugs are installed. In addition, for these houses, if specific energy consumption data is available for HVAC or other appliances, it is also requested. Finally, other assets such as battery state of charge or EV charger consumption (time series).

For the Spanish pilot (Crevillent) the data requested are presented in [Table 24](#).

Table 24: Data Requested (Phase A) – Spanish Pilot

Crevillent		
Entity	Step	Comments
Total Electricity Energy Consumption	15min or 1h	Aggregated for the Community (or the part of the community that will be considered for COMMUNITAS pilot)
PV Generation	15min or 1h	Aggregated for the community (or the part of the community that will be considered for COMMUNITAS pilot)
Community outdoor temperature	15 min	
Battery Stage of Charge	15 min	For each battery operating under the community
Electricity Consumption	15min or 1h	For the 10 consumers with shelly plugs
HVAC Consumption *	15min or 1h	For the 10 consumers with shelly plugs
DHW heater energy consumption *	15min or 1h	For the 10 consumers with shelly plugs
Kitchen appliances energy consumption *	15min or 1h	For the 10 consumers with shelly plugs
Other Consumption from community assets/meters such as EV chargers	15 min	Per asset/meter



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For the Italian pilot (Primiero Valley) the data requested are presented in [Table 25](#).

Table 25: Data Requested (Phase A) – Italian Pilot

Primiero Valley		
Entity	Step	Comments
Total Electricity Energy Consumption	15 min	Aggregated for the Community (Or the part of the community that will be considered for COMMUNITAS pilot)
Total DH Thermal Consumption	15 min	Aggregated for the community (or the part of the community that will be considered for COMMUNITAS pilot)
Electricity production	15 min	Per asset for centralized unit
Electricity production	15 min	Aggregated for decentralized units
DH thermal production	15 min	Per asset
Community outdoor temperature	15 min	
Electricity Consumption	15min or hourly	For the 10 consumers with shelly plugs
HVAC Consumption *	15min or hourly	For the 10 consumers with shelly plugs
DHW heater energy consumption *	15min or hourly	For the 10 consumers with shelly plugs
Kitchen appliances energy consumption *	15min or hourly	For the 10 consumers with shelly plugs
Other Consumption from community assets/meters such as EV chargers	15 min	Per asset/meter
Battery Stage of Charge	15 min	For each battery operating under the community

For the Dutch pilot (Groningen) the data requested are presented in [Table 26](#).

Table 26: Data Requested (Phase A) – Dutch Pilot

Groningen		
Entity	Step	Comments
Total Electricity Energy Consumption	15 min	Aggregated for the Community (or the part of the community that will be considered for COMMUNITAS pilot)
Total Energy Consumption	15 min	Aggregated for the Community (Or the part of the community that will be considered for COMMUNITAS pilot)
Total DH Thermal Consumption	15 min	Aggregated for the community (or the part of the community that



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		will be considered for COMMUNITAS pilot)
PV Generation	15 min	Aggregated for the community (or the part of the community that will be considered for COMMUNITAS pilot)
Community outdoor temperature	15 min	
Electricity Consumption	15min or hourly	For the 10 consumers with shelly plugs
HVAC Consumption *	15min or hourly	For the 10 consumers with shelly plugs
DHW heater energy consumption *	15min or hourly	For the 10 consumers with shelly plugs
Kitchen appliances energy consumption *	15min or hourly	For the 10 consumers with shelly plugs
Other Consumption from community assets/meters such as EV chargers	15 min	Per asset/meter

Each one of the above time series should be accompanied by an explanatory metadata file that will be available in the database (as a property) for easy and correct retrieval.

In general, the metadata for historical RE and BESS time series are presented in Table 27. Metadata for electric energy/heat consumption is given in Table 28 and for ambient temperature in

Table 29.

Table 27: Metadata for Historic RES and BESS

Metadata for Historic RES	Metadata for Historic Battery TS
Pilot Name	Pilot Name
Region/Neighborhood (Optional)	Region/Neighborhood (Optional)
Plant Name	Plant Name
Rating Power of Installation	Rating Power of Installation (kW)
Starting Date of Measurements	Rating Energy of Installation (kWh)
End Date of Measurements	Starting Date of Measurements
Granularity (minutes)	End Date of Measurements
Columns → Entities	Granularity (minutes)
	Columns → Entities

Table 28: Metadata for Consumption

Metadata for Electric/Heat Consumption	Electric Consumption
Pilot Name	Domestic Appliances



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Region/Neighborhood (Optional)	Lighting
Name of Consumption	EV + Mobility
Number of Prosumers/Consumers	Hot Water
Starting Date of Measurements	
End Date of Measurements	
Granularity (minutes)	
Columns → Entities and Units	

Table 29: Metadata for Ambient temperature

Metadata for Temperature
Pilot Name
Region/Neighborhood (Optional)
Exact Position (Longitude and Latitude)
Altitude (AMSL)
Starting Date of Measurements
End Date of Measurements
Rows → Entities and Units

5.1.2. Data Collection Phase B

For the Phase B data collection, data were requested for electricity and district heating. While annual averages are acceptable, time series of specific units may be available and have also been requested.

For the electricity system, the following data have been requested for each Lead Project

- Emission factor of the national grid of your country (gCO₂e/kWh) from 2020 to 2023
- Prosumer billing from 2020 to 2023
 - Description of billing options
 - Description of dynamic pricing (if available)
- Estimated annual savings per unit of production (kWh).
- Average production cost of the Energy Community (Euro/kWh) from 2020 to 2023
- The first three entities, time series might be available.

For the district heating system, the following data have been requested for the Italian and Dutch pilots.

- Emission factor of district heating networks
- Consumers' billing method
 - Description of billing options
 - Description of dynamic pricing (if any)
- Energy production costs of heat for the DH consumers (euro/kWh)

For the first two entities time series might be available.

5.2. Potentially relevant risks that hinder the data acquisition process

In complex ecosystems such as the COMMUNITAS tools and use cases spanning over different energy communities and vectors, each one having its own systems, regulations, standards and practices, data collection is a challenging process and one of the activities that have many inherited risks. For this reason, one of the subtasks of T5.2 is to identify the risks that are related to the data acquisition process. This work applies to all data acquisition processes but in this case, special care has been provided to the specific technologies and processes that are going to be used in COMMUNITAS and specifically between the meters and sensors and the database/platform.

Risk assessment in the context of data acquisition involves identifying potential risks associated with data acquisition, collection, storage, and overall process, as well as implementing strategies to manage and mitigate these risks. The risk analysis will be developed in the following steps:

- Identification of the potential category of risks and main risks that can negatively affect the data acquisition process through a desk research process. Preliminary identification of mitigation measures
- Identification of the technologies and architecture that are used in each of the leader pilots and the technologies that will be used in the COMMUNITAS platform.
- Identification and verification of the risks by the leader pilots and technical providers.
- Clarification and consolidation of the identified risks.
- Creation of the Risk Matrix for the risk assessment and distribution to partners and tech providers.
- Assessment of each identified risk by leader pilots and tech providers in terms of impact and possibility of occurrence.
- Identification, verification, and consolidation of the mitigation measures by the pilot leaders and the tech providers.
- Assessment of the risk after the application of the identification mitigation measures by leader pilots and tech providers.
- Final risk and mitigation evaluation (Aggregation) and reporting.

The above steps are presented in the following picture (Picture 10).

Picture 10. Data acquisition risk assessment process



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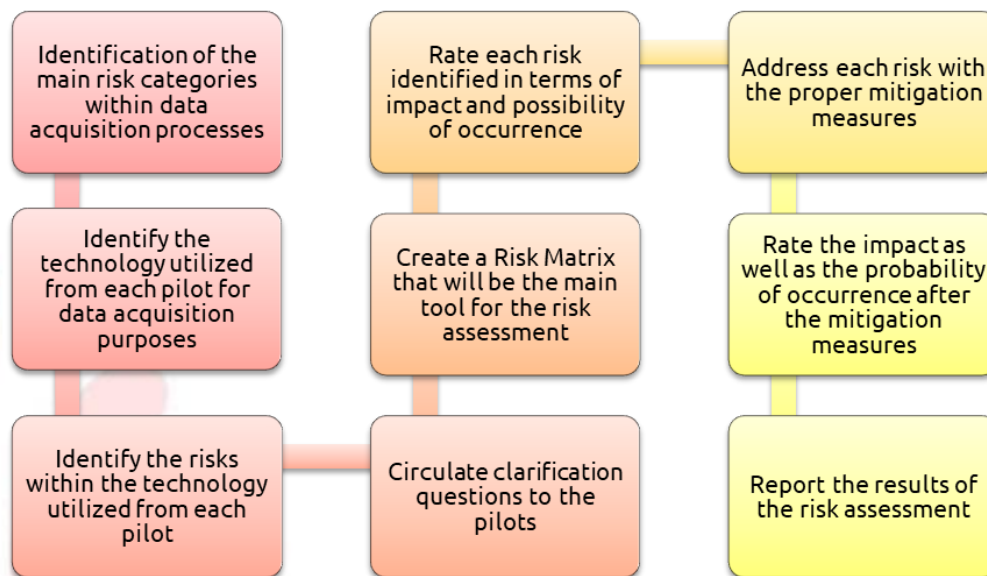
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In the next paragraphs, the most important aspects of the risk assessment process are presented as follows:

a) Identification of the Risk Categories

The main risk categories that have been identified regarding the data gathering are:

- Administrative & Regulatory
- Operational
- Data
- End-Users
- Security
- Compatibility
- Third-Party
- Environmental
- Political & Social

Whoever, these are subject to change after the feedback from leader pilots and tech providers.

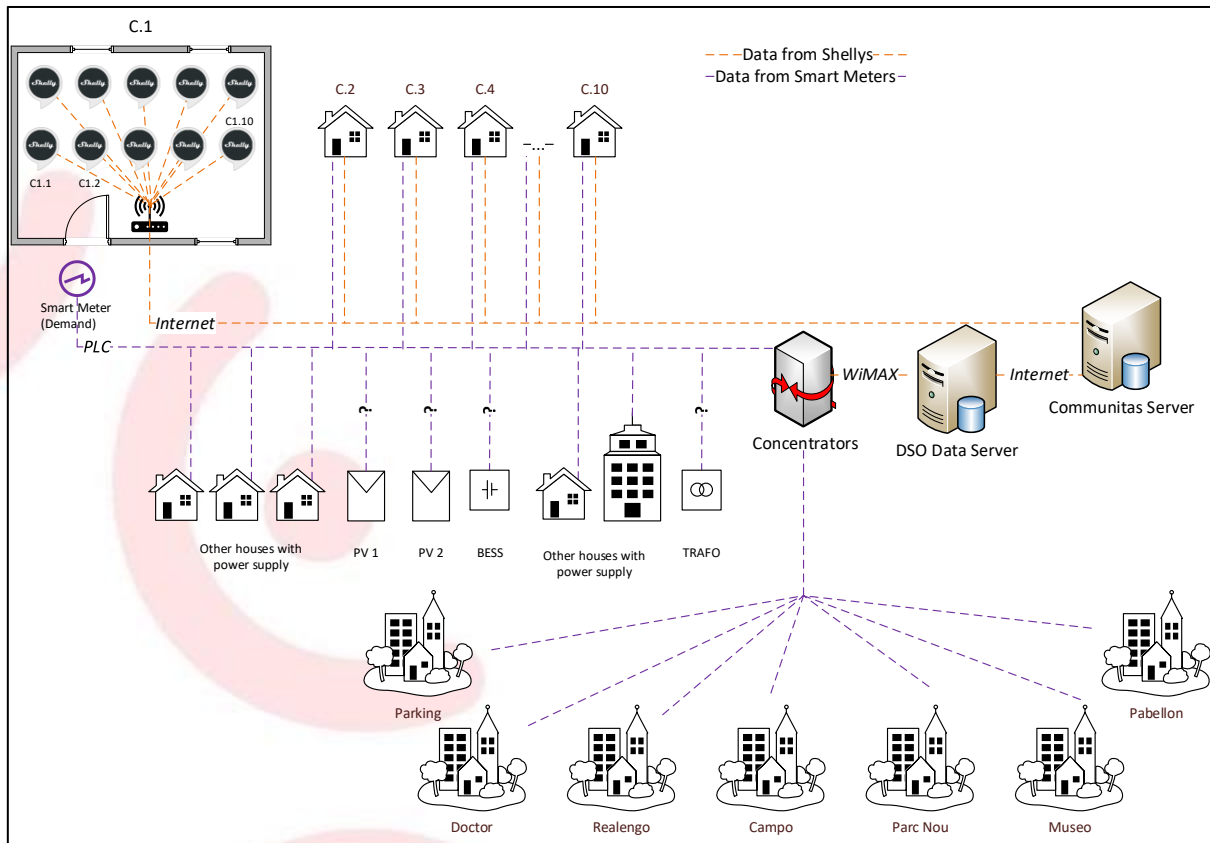
b) Architecture of data collection for each leader pilot and COMMUNITAS

For effective risk identification, the architecture of the data collection system had to be identified, in terms of assets, data streams and networking technologies.

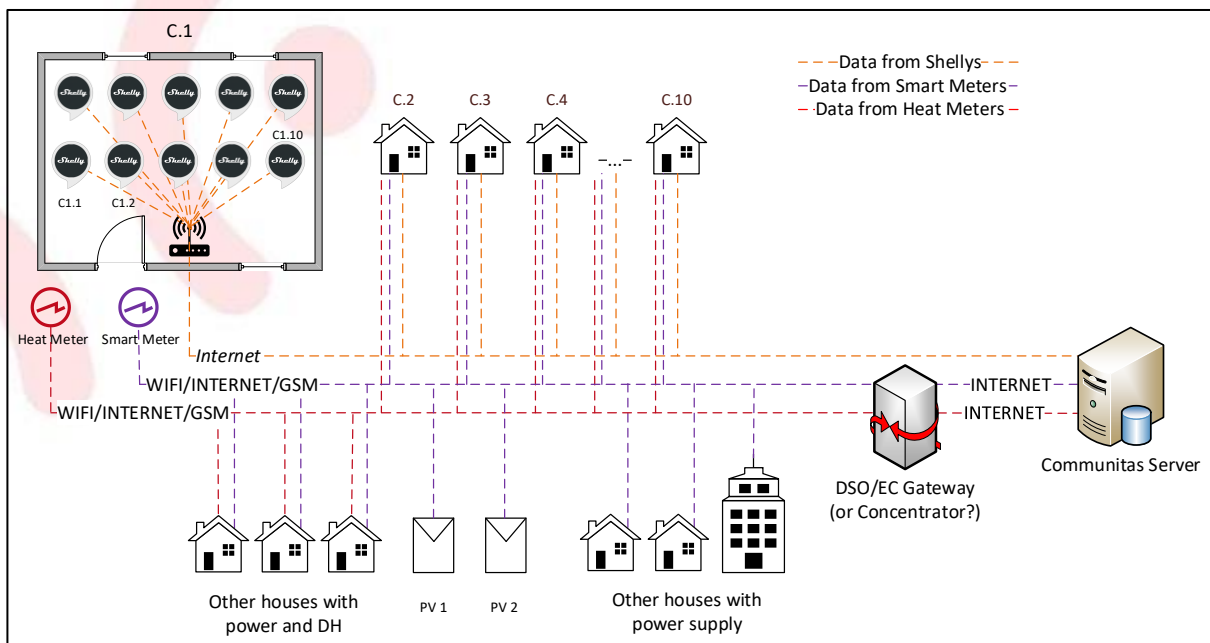
After preliminary discussions with the pilot leaders and the various descriptions collected, single-line diagrams regarding the data streams have been drafted. These are presented in

Picture 11, Picture 12 and Picture 13 for the Spanish, Italian and Dutch pilots respectively. In general, a house with a shelly smart meter EM50 (C.1) that has 10 shelly plugs (C1.1 to C1.10) is depicted. The houses C.2 to C.10 are the other nine houses with shelly plugs. Additionally, in each community, there are other houses and prosumers, other assets such as PVs and BESS, transformers and EV chargers. The main data streams are data from the shelly plugs, and data from smart meters (1st or 2nd gen) for electricity and data from smart meters for the district heating network.

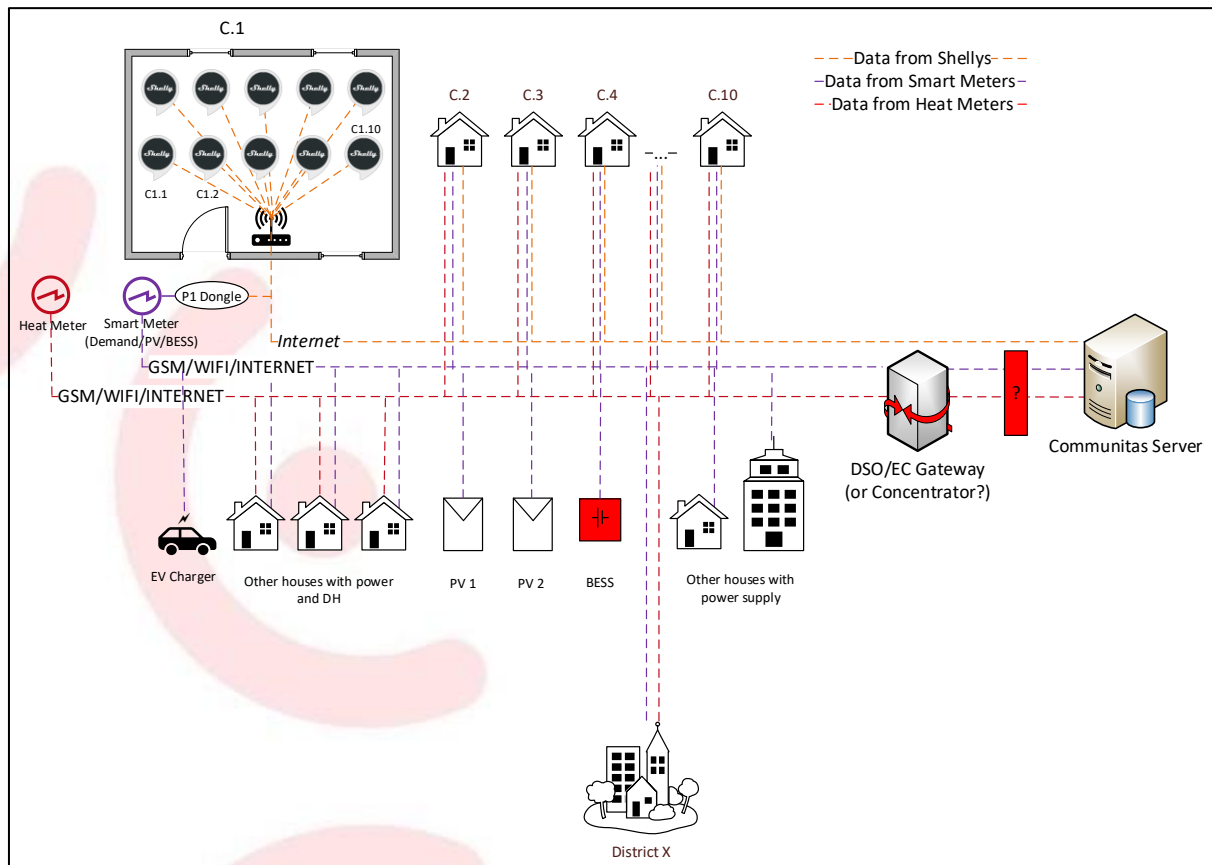
Picture 11. Data collection architecture for the Spanish pilot



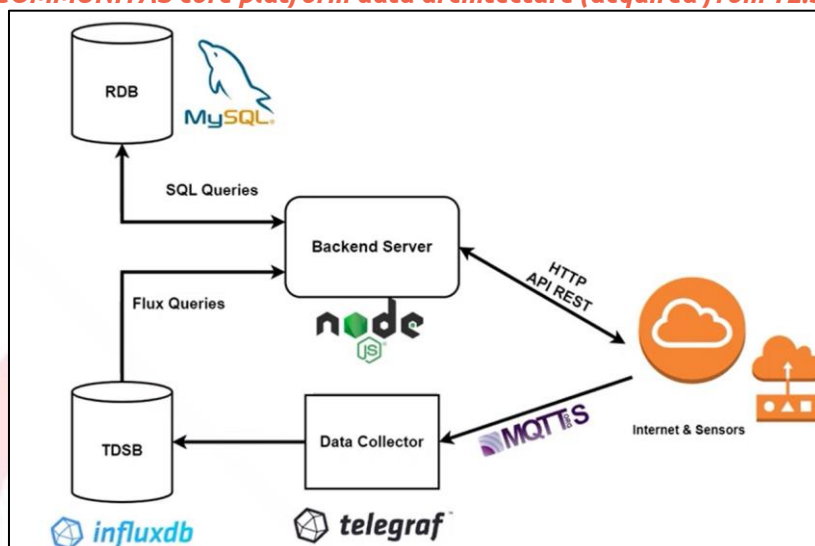
Picture 12. Data collection architecture for the Italian pilot



Picture 13. Data collection architecture for the Dutch pilot



On the other side, the COMMUNITAS Core platform development will be based on node.js supported from two databases, one MySQL relational database, and a TimeSeries database on influxDB. Data collection from the Shelly plugs, meters and sensors will be based on MQTT technology. An MQTT broker will send data to a data collector based on Telegraf, while other data transfers from meters and other servers will be based on HTTP and REST API to the backend server based on node.js. A core platform data communication graph was created in the context of Task 2.3.1 and is presented in Picture 14.

Picture 14. COMMUNITAS core platform data architecture (acquired from T2.3.1 activities).

c) Risk Assessment method

For each identified risk, the assessment will take place by pilot leaders and technology providers for the impact of the risk and for the possibility of the risk to occur.

Additionally, the assessment will be requested for the risk impact and possibility after the application of the proposed mitigation measures. Risk value is the multiplication of Impact and Probability¹.

For the selection values there are 6 options which are presented in Table 30 along with their corresponding arithmetic value. Usually, Zero is not a value for risk assessments, as it makes the identified risk non-existent. In this approach, it means that (from a Leader Pilot point of view) this risk is not applicable in the specific case.

Table 30: Selection options for Risk Impact and Probability to occur

Options for Impact and Probability	Arithmetic Value
Zero	0.00
Low	0.20
Medium - Low	0.40
Medium	0.60
Medium - High	0.80
High	1.00

An application example regarding the selection of one partner is presented in Table 31.

¹ http://wiki.doing-projects.org/index.php/Impact_and_Probability_in_Risk_Assessment

Table 31: Risk assessment application example

Risk Name	Risk Impact	Risk Probability	(...)	Risk Impact After Mitigation	Risk Probability After Mitigation	(...)
Risk XXX	Low	Medium-Low	(...)	Low	Low	(...)

Based on the above values, the risk value is $0.2 \times 0.4 = 0.08$ while the risk after the mitigation is the $0.2 \times 0.2 = 0.04$, which is the lowest possible.

d) Aggregation of Risk

As it was mentioned, in the risk assessment technical providers and pilot leaders are participating and are here presented in [Table 32](#).

Table 32: COMMUNITAS partners participating in risk assessment

Pilot Leaders	Technology Providers
ENERCOOP	E@W
ACSM (and FBK)	EDP
GRUNNEGER POWER (and TNO)	ETRA
	RINA
	UNINOVA
	CERTH/ITI
	CERTH/CPERI

The risk values are estimated per pilot leader. For this reason, the pilot leader's value has a higher weight (0.5) in the aggregation. The final value of risk X (before or after mitigation) for the Pilot_j IS estimated by the following equation:

$$\text{Risk XXX Value}_{\text{Pilot}_j} = 0.5 * \text{PilotleaderRiskXValue}_j + \sum_i \frac{1}{14} * \text{TechProviderRiskXValue}_i$$

The 1/14 is the weight for each tech provider (seven tech providers). Thus, the sum of the weights is 1. However, if the risk value from the pilot leaders is zero, it means that the risk is not applicable and thus the aggregated risk value is zero, without considering the option of the tech providers.

5.3. Testing Criteria

In order to assess the project success and smooth running of the project, a set of project KPIs, previously defined in D1.3 – Use Cases: requirements, specifications, and KPIs [1], have been appropriately redefined, merged or modified during the execution of T5.1 and T5.2, considering the project needs and expectations. As can be seen in the following table ([Table 33](#)) each one of the KPIs target values and responsible partners for their measurement have also been defined for each one of the KPIs.

Table 33. Project KPIs, target values and responsible partners for their measurement.

ID	Key Objective/ Expected Outcome	KPI Description	Target Value	Responsible Partner
P1	EO1 KO1	Total number of ECs involved (already operational, under development and under planning) in COMMUNITAS	10	EDP
P2		Citizen-oriented co-creation sessions to demonstrate COMMUNITAS solutions	20	TNO
P3		Total number of tools to be developed, demonstrated and seamlessly integrated with the CCP	12	EDP
P4		Number of concurrent sensors connected to the COMMUNITAS Core Platform	60	RINA
P5	EO2 KO2	Leader pilots' citizens satisfaction with the new incentive and pricing mechanisms	85 %	ASM
P6		Percentage of vulnerable people involved in EC pilots reached by COMMUNITAS services	100 %	EDP
P7		ECs with low-income families that benefit from access to locally produced energy	2	EDP
P8		Citizens directly involved in pilot actions of any kind	11,000	EDP
P9		Number of PhD theses based on innovative incentive and pricing mechanisms and/or innovative EC tools	2	UNINOVA & UNL
P10		Number of drivers and rules beyond marginal pricing	7	EDP
P11	EO3 KO3	Number of regulators engaged throughout the project's social and policy labs	6	UNINOVA
P12		Number of regulatory sandboxes created in pilots	3	UNINOVA (+TNO)
P13		Number of organized knowledge transfer workshops on progressive market frameworks for DR-based products	5	EDP
P14		Number of entities that adopt the role of EC manager, offering DR schemes and ECs' management platform to its clients, via COMMUNITAS Replication Academy (T6.2)	8	EDP & UNINOVA
P15		Participation of Leaders' EC managers in different energy markets throughout project	3	ETRA
P16	EO4	Number of solutions enabling automatic participation	4	ETRA
P17		Number of pilots testing automated participation-	4	ETRA
P18		Percentage of automated market participation events and transaction fulfilled	75 %	EDP
P19		Average consumer satisfaction ratio due to automation technology and real-time information	90 %	ASM
P20		Average number of participants per workshop	10	TNO
P21		Number of insights for innovative solutions inputted by citizens' Design Thinking moments	40	TNO
P22		Number of stakeholders engaged during application of the methodology for citizen and consumer engagement (tools and Knowledge Base);	100	ASM
P23	EO6	Guidelines and best practices on P2P and DR incentives	1	UNINOVA & TNO



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ID	Key Objective/ Expected Outcome	KPI Description	Target Value	Responsible Partner
P24		Submission of peer-reviewed scientific work of the drivers and rules identified as results achieved in COMMUNITAS	1	UNINOVA & UNL
P25		Policy recommendations for the involved COMMUNITAS demonstrators	1	TNO
P26	EO7 KO6	Number of new ECs to be created due to COMMUNITAS	5	EDP
P27		Number of asset planning simulations performed using COMMUNITAS tool	100	RINA
P28		Increase in renewable energy generated on-site in COMMUNITAS demos	30 GWh/year	CERTH
P29		Increase in overall RES capacity in COMMUNITAS demos	30 MWp	CERTH
P30		Reduction of CO ₂ eq due to increase RES energy penetration	6900 tCO ₂ equiv	CERTH
P31		Number of citizens involved in capacity building programs	5500	UNINOVA
P32		All ECs to expand pool of members or number of services	10 %	TNO and/or EDP
P33		Overall TRL for COMMUNITAS' outcomes	TRL: 7-8	RINA
P34		Business models to be elaborated	8	RINA
P35		Business model focusing on energy poverty alleviation per Leader and Learner pilots	1	RINA
P36	KO7	Innovative financing mechanisms proposed	2	CERTH
P37	EO1	Average reduction in electricity costs	up to 20%	CERTH
P38	EO1	Increase in self-consumption	up to 15%	CERTH
P39	EO3 KO2	Increase of system reliability capacity	5%	UNINOVA
P40	EO7	Investment triggered in RES	30 M€	CERTH
P41	EO7	Jobs created during the project period	315	EDP
P42	EO5	Types of consumers and buildings involved	>9	EDP
P43	EO2	Number of new incentive mechanisms for consumer engagement in energy markets	≥7	ETRA
P44	EO5	Number of pilots demonstrating KER2, KER4 and KER5	≥5	ETRA
P45	EO3 or EO4	Number of P2P and/or GoOs pilots	≥4	ETRA
P46	EO4 KO2	Number of EC members using automated participation	>1000	ETRA
P47	EO5 KO2	Number of pilots demonstrating DR and flexibility tools (KER6 and KER7)	>5	ETRA
P48	EO7	Exploitation workshops	2	RINA

The template presented below (Table 34) has been provided to the responsible partners to enable them to provide a complete and thorough description of each of the above KPIs, including the objectives and outcomes of each KPI, its formula and assumptions for estimation, unit of measurement, associated UCs, delivery date and target value.



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Table 34. Template for KPIs description and formula definition for its measurement.

Project Level KPI ID	Project level KPI number		
Objective Group	Key objectives and Expected outcomes related to KPI		
Name	Name of the KPI as given in D1.3		
Short Description	Provide a short description of the KPI		
Full Description (objective, what we're calculating, outcomes from KPI)	Provide a full description of the KPI and describe the method of estimation. Provide the means of verification/proof for the result. Indicate related WP and Task. Use literature references or past projects if needed using footnotes		
Formula	Provide a formula for the KPI estimation if applicable.		
Prerequisites for estimation	Please provide the prerequisites for the KPI estimations and explain the formula inputs.		
Responsible of the measurement	The responsible(s) for providing the KPI value, the prerequisites and means of verification.		
Unit of measurement	Unit of measurement of the KPI. If physical number use #, If percentage use %, if Likert write "Likert 1-5"		
Related UCs	Indicate if this KPI is relate to one or more UC(s)	Related UCs KPIs	Indicate if project level KPI derives from a specific UC KPI (as defined in D1.3)
Delivery Date	Expected delivery date of the KPI (e.g. M42).		
Target Value	Write the expected target value.		

The hole list of KPIs with their full description can be found in the Annexes (10.2 Section), which will serve as the testing criteria to be considered by the project partners and other relevant stakeholders in order to know whether the tools and solutions are performing optimally and the project objectives are being achieved.



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6. Knowledge Transfer Framework

The main goal of the conceptual knowledge transfer framework is to define the peer learning and knowledge transfer process of the leaders, learners, and listener pilots as a bottom-up process.

This framework and its implementation should enable the different pilots to organise learning and knowledge exchange events independently and demand driven.

The following concepts are used for the purpose of setting up the pilots learning processes within the context of the COMMUNITAS project (Table 35).

Table 35. Knowledge Transfer Framework Concepts.

Bottom-up decision process	Decisions about the planning and the way to share knowledge among pilots should be in the hands of the pilots themselves. WP5 has a facilitation role, but should not lead any decision about topic, tool and timing.
Peer (pilots)	Peers are persons who have the same or a similar status in a certain context. In the perspective of activities within WP5, peers are the Leaders, the Learners, and the Listeners pilots. It can be as well the Leaders/Learners/Listeners together, when sharing their experience with other ECs.
Learning process	In the perspective of COMMUNITAS, the learning process is based on knowledge sharing, and an interaction between reflection and narrative development of the own experiences and learning about and reflecting on to the experiences of peers related to the same topic.
Knowledge transfer	Knowledge transfer in COMMUNITAS context is any occasion for the pilot peers to increase their skills and ability about how to set up and boost their activities. The main tools and channels are formal and informal conversations, physical or distance meetings, formal physical or distance events, learning sessions, participatory workshops, videos, and other communication media. Knowledge transfer can also be considered as an occasion to any third party outside the consortium to gain or upgrade skills and ability about how to develop strategies and activities related to the deployment and implementation of the different project tools and solutions in the context of Energy Communities. The main tools and channels are public deliverables, public online seminars, videos, reports, scientific papers, and other communication outputs disseminated through COMMUNITAS webpage or through social media.
Peer (pilots) learning	The objectives of peer learning are the knowledge sharing, and the acquisition of skills from the leader pilots to the learner pilots and from these two to the listener pilots.
Participatory Processes	Participatory Processes (PP), in this context, are specific methods employed to achieve active participation by the peers. The approach can be used for most issues and should give equal opportunities to every peer. Peer learning in the COMMUNITAS project is based on participatory processes.
Knowledge Tool	To this document, a tool is a way of knowledge sharing in a peer learning process. It may be a physical meeting, distance meeting, public online seminar, participatory online discussion, video, webpage, etc.



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6.1. Conceptual Framework

The conceptual framework (Picture 15) shows the levels of knowledge sharing and transfer, in the form of peer learning and dissemination, as well as the tools, contents, and channels. There are three levels of learning:

- 1) Peer learning within and between the Leader and Learner pilots.
- 2) Peer learning within and between the Leader, Learner, and Listener pilots.
- 3) Knowledge transfer and dissemination beyond COMMUNITAS.

The different themes of interest (shown in orange boxes in Picture 15) reflect the main interests of the pilots in the content of the peer learning. They depend on the interests of the pilots and the project consortium and can range from "how to reduce unjustified regulatory and administrative barriers" to "how to empower citizens as full-fledged energy market actors" to "how to demonstrate COMMUNITAS innovative tools in ECs in different real-life pilot sites", etc. Taken together, they form the knowledge base from which energy community system change can be launched. The COMMUNITAS project is intended to be a catalyst for system change in ECs. Supporting community-driven initiatives and innovators in the city regions should help them to scale up and inspire other communities to adapt them to different contexts. Community capacity and competence should be built and strengthened in all aspects that support the initiation, development, testing, implementation and scaling up of innovative processes, tools and services that serve the transformation of the ECs system towards greater sustainability. This covers a wide range of management and technical skills. The peer learning tools (shown in the brown boxes in Picture 15) can be diverse and can result in different outputs that capture the acquired knowledge and enable its transfer beyond COMMUNITAS. From public reports and deliverables presenting the guidelines and frameworks followed, to recorded live events that can be posted on the COMMUNITAS website, to online seminars resulting in a fact sheet, etc. Knowledge transfer and dissemination beyond the COMMUNITAS consortium should activate other city networks to take up the ideas and experiences developed in the project and share them with their members. The final objective is to reach the public through outputs (shown in grey boxes in Picture 15) published on the COMMUNITAS website.



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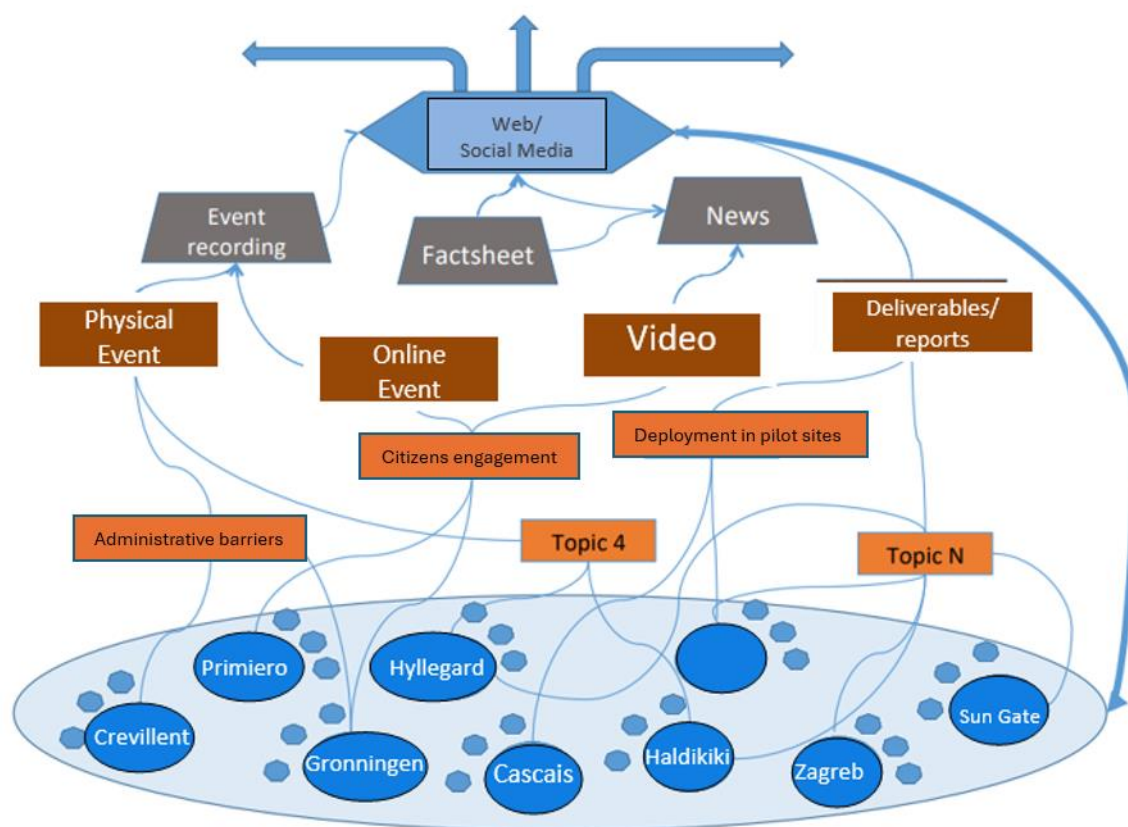
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Picture 15. Conceptual Framework of Knowledge Sharing and Transfer.

As an overview, the following steps should be taken to establish a workable framework for knowledge transfer:

1. **Develop a central repository/knowledge platform** to facilitate the exchange of information, lessons learned and experience between pilot sites. Ensure accessibility and usability to encourage participation by all citizens. This central repository will be developed as part of **T2.4 – Implementation and running of COMMUNITAS Knowledge Base**, which will be available through the COMMUNITAS Core Platform and will contain technical, financial, administrative, social and legal information for use by pilot sites and other stakeholders interested in the project.
2. **Establish regular communication channels** via email or online meetings to keep all partners informed of ongoing activities, progress, and achievements. **Organise learning events** (e.g. workshops, webinars, knowledge-sharing sessions) where pilot sites can share their experiences challenges, and best practices among pilots but also with citizens and other stakeholders in order to encourage open dialogue and feedback mechanisms to promote continuous improvement. All these channels, activities and events will take place within **T4.2. Citizen-oriented Social & Policy Labs** which aims to support pilot sites in setting up, running and expanding their ECs and energy market participation.
3. **Create a structured network** of pilot sites, based on their respective expertise, experience and willingness to share knowledge. Define roles and responsibilities for each category to ensure clarity of communication and expectations. The pilots' network and knowledge sharing will be reflected in



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the COMMUNITAS *Replication Academy (T6.2)*, which aims to support citizens and other stakeholders interested in setting up ECs by acting as a hub for newcomers and potential listener pilots and provide energy learning opportunities, skills engagement and capacity building.

4. Establish **mechanisms for monitoring and evaluating the effectiveness of the knowledge transfer framework**, including feedback loops from pilot sites, citizens, and stakeholders. Use lessons learned from evaluations to refine and improve the framework iteratively over time, ensuring that the transfer framework is inclusive and adaptable to different contexts. These mechanisms are being established under **T4.1. COMMUNITAS methodology for citizen and consumer engagement design in ECs and evaluation plan**, which includes the definition of an evaluation plan for the developed engagement methodology that will be used and executed in the Social and Policy Labs (T4.2) and through the Usability, User Experience and Behavioural Testing (T4.5).

7. Conclusions

In order to manage the deployment and implementation of the different tools and solutions of the COMMUNITAS project, this deliverable has been developed to serve as a comprehensive guide not only for the Leader, Learner and Listener pilots, but also for the technical developers and other related partners, so that they can understand the current and future status of the pilots, what their main barriers and limitations are, what the timelines within the project are, and how the solutions need to be tested and validated in each pilot site. As a result, this deliverable outlines a detailed implementation plan for the pilot sites, including the integration of data collection processes and the installation of new equipment to collect data from the monitored households, in particular for the EC management tool (UC3), the OptiMEMS (UC5) and MultiFASE (UC6) tools and the DR and optimal market positioning through the NILM algorithm (UC7). In this deliverable a lab-testing approach is proposed together with the test case templates and instructions for their definition. This methodology is crucial for the good deployment and subsequent validation of the COMMUNITAS tools, as the test cases definition and further execution ensures that each tool meets the necessary requirements and functions correctly within the pilot sites and the COMMUNITAS Core Platform.

On the other hand, the presented risk management plan identifies potential common risks for the leader and learner pilots and proposes mitigation strategies to anticipate the challenges they may face, as well as contingency plans to avoid a negative impact on the overall success and effectiveness of the project. Although a risk log is presented individually for each one of the pilots, most of the identified risks are common to all of them, being the 'lack of citizen engagement' risk the most alarming in terms of likelihood (medium). In order to avoid this risk, the project partners quickly started to prepare and implement several awareness-raising campaigns to explain to citizens and end-users the operation, benefits and added value of the tools in the pilot sites.

Regarding the monitoring framework, several data from each one of the leader pilots has already been identified, collected, and analysed in order to start creating the baselines. Also, a risk assessment methodology has been established so different data collection risks can be identified and properly avoided or mitigated. Lastly, all the project-level KPIs presented in D1.3 [1] were revised, adapted, or changed to KPIs that better fit the project and meet the current needs and objectives of COMMUNITAS. Subsequently, the formulas of the KPIs and the prerequisites for their calculation were defined and are presented in this deliverable, so that the partners know how the effectiveness of the implementation of the solutions will be assessed.

Finally, the knowledge transfer framework emphasizes the importance of a structured network for knowledge sharing and properly establish the partners roles, sharing platforms, communication channels, and events, fostering a collaborative environment where best practices and lessons learned are shared among pilot sites, citizens and stakeholders, as well as encourages the replication and exploitation of the project activities in current or future Energy Communities outside the project.

In conclusion, this deliverable acts as a “repository” that documents and highlights key information and activities, leading to accessible, searchable, and regularly updated valuable knowledge. All this, ensures that each pilot site is well equipped and prepared to demonstrate the COMMUNITAS tools contributing to the project’s success and making a huge emphasis on continuous improvement and collaboration, that sets a strong foundation for the effective roll-out of energy communities and the empowerment of consumers across the EU.

8. Glossary

Acronym	Full name
BMS	Building Management System
CAS	Cascais
CCP	Common Core Platform
CEC	Citizens Energy Community
CRE	Crevillent
DER	Distributed Energy Resources
DH	District Heating
DoA	Description of Action
DR	Demand Response
DSO	Distribution System Operator
EC	Energy Community
EM	Energy Meter
GoOs	Guarantees of Origin
GRO	Groningen
HAL	Haldikiki
HYL	Hyllegaard Høje
KPI	Key Performance Indicator
kW	Kilowatts
LV	Low Voltage
MV	Megavolt
MVA	Megavolt-amperes
NILM	Non-Intrusive Load Monitoring
P2P	Peer to Peer
PP	Participatory Processes
PRI	Primiero Valley



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PV	Photovoltaic
REC	Renewable Energy Community
RES	Renewable Energy Source
UC	Use Case
USE	Uniform Smart community Evaluation Tool
WP	Work Package

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10. Annexes

10.1. Data Needs per Use Case

Table 36: Identification of Data Needs per Use CaseUCs

	A/ A	Group	Attribute	Entity	End Use	Level	Data Type	Granularity	Units	Data Received from	Ref
UC3 EC Management Tool	1	Energy Consumption - Production	Smart meter data	Energy consumption and production data	Adequate billing	District, Building	Text, Numeric	TBD according to the pilots, preferably at least 15-minute data		Smart meters for households and production assets	D2.1. p121
	2	Energy Consumption - Production	Local RES generation	Local RES generation data	Data-driven decision-making /adaptation to changing requirements	District	Object	TBD		Generation metering system	D2.1. p124
UC4 Investment Advisor Tool	3	Energy Consumption - Production	Energy consumption	Energy consumption data	Data-driven decision-making /adaptation to changing requirements		Object	TBD		Smart meters	D2.1. p124
	4	Energy Consumption - Production	Load Forecast	Electric load forecast time series	Lightning and applications	Building	List of floats	15 min	kWh	House smart meters	D2.1. p126
UC5 OptiMEMS	5	Energy Consumption - Production	RES forecast	RES (PV, wind etc.) forecast time series	Optimization		List of floats	15 min	kWh	RES metering equipment	D2.1. p126
	6	Grid	Grid State	Grid state estimation	-	District	TBD	TBD	TBD	TBD	D2.1. p126

	A/ A	Group	Attribute	Entity	End Use	Level	Data Type	Granularity	Units	Data Received from	Ref
				from multiFASE							
UC6 MultiFASE	7	Grid	Voltage magnitude and angle at each electrical node		real-time optimization	District	Floats	1 min		Smart meters for households and production assets	D2.1. p127
	8	Grid	Temperature/specific enthalpy at each thermal node		Real-time optimization	District	Floats	1 min		Smart meters for households and production assets	D2.1. p128
	9	Grid	Mass flow rate at each thermofluidic node		Real-time optimization	District	Floats	1 min		Smart meters for households and production assets	D2.1. p129
	10	Grid	stream direction at each thermofluidic node		Real-time optimization	District	Floats	1 min		Smart meters for households and production assets	D2.1. p130
	11	Grid	pressure at each thermo-fluid node		Real-time optimization	District	Floats	1 min		Smart meters for households and production assets	D2.1. p130
UC7 NILM		Demand response	houseMetering	Electrical parameters measured in the house	Lightning and applications	Building	Object	Same as metering frequency		House smart meters or COMMUNITAS common database	D2.1. p132
	13	Demand response	houseMetering	Start timestamp	Lightning and applications	Building	String	-		House smart meters	D2.1. p133

	A/A	Group	Attribute	Entity	End Use	Level	Data Type	Granularity	Units	Data Received from	Ref
	14	Demand response	houseMetering	End timestamp	Lightning and applications	Building	String	-		House smart meters	D2.1. p133
	15	Demand response	houseMetering	House identifier	Lightning and applications	Building	String	-		house smart meters	D2.1. p133
UC11 GoO Marketplace	16	Energy Consumption - Production	productionUnit Metering	Information about energy generated in one production unit	Lightning and applications	Building	Object	Same as metering frequency		Generation metering system	D2.1. p143
	17	Energy Consumption - Production	houseConsumption	Information about energy consumed in a house	Lightning and applications	Building	Object	Same as metering frequency		House smart meters	D2.1. p143
UC13 VERIFY	18	Energy Consumption - Production		Total Electrical Production		Building		1h basis & annual basis	kWh	RES sensors	D2.1. p164
	19	Energy Consumption - Production		Total Electrical Consumption		Building		1h basis & annual basis	kWh	Sensor measurements	D2.1. p164
	20	Thermal - Cooling Consumption		Indoor Temperature	Heating -Cooling	Building		1h	°C	Temperature sensors	D2.1. p163
	21	Thermal - Cooling Consumption		Outdoor Temperature	Heating -Cooling	Building		1h	°C	Temperature sensors	D2.1. p163
	22	Thermal - Cooling Consumption		Heating infrastructure consumption	Heating -Cooling	Building		1h	kw, liter		D2.1. p163



	A/ A	Group	Attribute	Entity	End Use	Level	Data Type	Granularity	Units	Data Received from	Ref
	23	Thermal - Cooling Consumptions		Heat pump consumption - Heating current	Heating - Cooling	Building		1h	kW		D2.1. p163
	24	Thermal - Cooling Consumptions		Heat pump consumption - Cooling current	Heating - Cooling	Building		1h	kW		D2.1. p163
	25	Energy Consumption - Production		Annual Electrical Demand		Building		annual basis	kWh		D2.1. p164
	26	Energy Consumption - Production		Annual Electrical Generation		Building		annual basis	kWh		D2.1. p164



10.2. COMMUNITAS project KPIs Description

Project Level KPI ID	P1		
Objective Group	EO1/KO1		
Name	Total number of ECs involved (already operational, under development and under planning) in COMMUNITAS		
Short Description	Number of ECs involved in project activities		
Full Description (objective, what we're calculating, outcomes from KPI)	Number of ECs involved through social and policy labs activities, or project dissemination events		
Formula	N/A		
Prerequisites for estimation	N/A		
Responsible of the measurement	EDP		
Unit of measurement	#		
Related UCs		Related UCs KPIs	
Delivery Date	M42		
Target Value	10		

Project Level KPI ID	P2		
Objective Group	EO1/KO1		
Name	Citizen-oriented co-creation sessions to demonstrate COMMUNITAS solutions		
Short Description	All workshops where pilot stakeholders get together to discuss end-user related perspectives on COMMUNITAS solutions.		
Full Description (objective, what we're calculating, outcomes from KPI)	Citizen-oriented co-creation sessions to demonstrate COMMUNITAS solutions Including workshops for Leader and Learner sites, as Design Thinking, energy literacy or evaluation moments with COMMUNITAS' users		
Formula	Pilots communicate to TNO through the action plan how many workshops they will execute. T4.2 verifies and documents.		
Prerequisites for estimation	N/A		
Responsible of the measurement	TNO		
Unit of measurement	# (Nº Of Workshops)		
Related UCs		Related UCs KPIs	



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Delivery Date	M42
Target Value	20

Project Level KPI ID	P3		
Objective Group	EO1/KO1		
Name	Total number of tools to be developed, demonstrated and seamlessly integrated with the CCP		
Short Description	This KPI measures the total number of the developed COMMUNITAS tools that have been successfully integrated with the CCP and are properly running.		
Full Description (objective, what we're calculating, outcomes from KPI)	The tools to be developed include the Core Platform, Energy Communities Management Platform, Investment Advisor Platform, Planning Tool, Multifase Tool, Demand Response and optimal market position, P2P Energy Markets, NFT & Fungible Token Solution for P2P, Guarantees of Origin Marketplace, Telemetry Data Anomaly Detection Toolkit, VERIFY, and USE.		
Formula	N/A		
Prerequisites for estimation	N/A		
Responsible of the measurement	EDP		
Unit of measurement	#		
Related UCs	UC2-UC13	Related UCs KPIs	U3-U15, U17, U19, U20
Delivery Date	M36		
Target Value	12		

Project Level KPI ID	P4		
Objective Group	EO1/KO1		
Name	Number of concurrent sensors connected to the COMMUNITAS Core Platform		
Short Description	This KPI will track and measure the capability of the platform to process and receive data from sensors geographically dispersed throughout Europe.		
Full Description (objective, what we're calculating, outcomes from KPI)	The aim of this KPI is to identify from how many sensors the platform will be able to gather data at the same time. Having such estimated will allow to monitor the overall performance of the platform ensuring its scalability and readiness for future adoption and extension		
Formula	N/A		
Prerequisites for estimation	COMMUNITAS Core Platform developed, and sensors deployed.		
Responsible of the measurement	RINA		
Unit of measurement	#		
Related UCs		Related UCs KPIs	



Delivery Date	M36
Target Value	60

Project Level KPI ID	P5		
Objective Group	EO2/KO2		
Name	Leader pilots' citizens satisfaction with the new incentive and pricing mechanisms		
Short Description	This KPI measures the satisfaction level of citizens led by pilot leaders regarding the new incentive and pricing mechanisms implemented		
Full Description (objective, what we're calculating, outcomes from KPI)	The primary objective of this KPI is to evaluate the effectiveness and acceptance of new incentive and pricing mechanisms among citizens of leader pilots. This evaluation helps in understanding citizen feedback, identifying areas for improvement, and ensuring that the mechanisms meet their intended goals. We are calculating the average satisfaction level of citizens with the newly implemented incentive and pricing mechanisms. This involves collecting feedback from citizens through surveys and quantifying their satisfaction on a standardized scale. Outcomes: • Insights into citizen satisfaction and acceptance levels. • Identification of potential areas for improvement in the incentive and pricing mechanisms. • Enhanced decision-making for further adjustments and enhancements to the mechanisms. • Overall assessment of the leader pilots' effectiveness in implementing and communicating the new mechanisms.		
Formula	Average Satisfaction Score (Satisfaction score/Number of respondents)		
Prerequisites for estimation	1) Survey Design 2) Identification of Pilot 3) Citizens' engagement 4) Data collection 5) Data analysis		
Responsible of the measurement	ASM		
Unit of measurement	% Likert Scale (1 to 5): 1 - Very Dissatisfied 2 - Dissatisfied 3 - Neutral 4 - Satisfied 5 - Very Satisfied		
Related UCs	UC9	Related UCs KPIs	U6, U9, U14, U17



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D5.1 Implementation & Monitoring plan and knowledge transfer framework

Delivery Date	M42
Target Value	85% (4.25 in Likert Scale)

Project Level KPI ID	P6		
Objective Group	EO2/KO2		
Name	Percentage of vulnerable people involved in EC pilots reached by COMMUNITAS services		
Short Description	Percentage of vulnerable people involved in EC pilots reached by COMMUNITAS services		
Full Description (objective, what we're calculating, outcomes from KPI)	Percentage of vulnerable people within the ECs that will be reached throughout project activities and platforms		
Formula	$(\text{Number of vulnerable people reached} / \text{Number of vulnerable people in ECs}) * 100$		
Prerequisites for estimation	Presence of vulnerable people in the EC (Crevillent and Cascais)		
Responsible of the measurement	EDP		
Unit of measurement	%		
Related UCs		Related UCs KPIs	
Delivery Date	M42		
Target Value	100%		

Project Level KPI ID	P7		
Objective Group	EO2/KO2		
Name	ECs with low-income families that benefit from access to locally produced energy		
Short Description			
Full Description (objective, what we're calculating, outcomes from KPI)	Number of ECs with low-income families that benefit from access to locally produced energy owned by the EC		
Formula	N/A		
Prerequisites for estimation	Number of ECs with low-income families (Crevillent and Cascais) with local energy generation		
Responsible of the measurement	EDP		
Unit of measurement	#		
Related UCs		Related UCs KPIs	
Delivery Date	M42		
Target Value	2		



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Project Level KPI ID	P8		
Objective Group	EO2/KO2		
Name	Citizens directly involved in pilot actions of any kind		
Short Description			
Full Description (objective, what we're calculating, outcomes from KPI)	Number of citizens in and around pilot sites that engage in any of the activities or use any of the services. Includes the citizens involved throughout project activities, such as the Social and Policy Labs (number of people attending), Demonstrations of Tools (number of unique accesses), and Dissemination Events		
Formula	N/A		
Prerequisites for estimation	-		
Responsible of the measurement	EDP, TNO and ASM		
Unit of measurement	#		
Related UCs	All	Related UCs KPIs	All
Delivery Date	M42		
Target Value	11,000		

Project Level KPI ID	P9		
Objective Group	EO2/KO2		
Name	Number of PhD theses based on innovative incentive and pricing mechanisms and/or innovative EC tools		
Short Description	This KPI aims to assess whether the number of PhD theses proposed in the Grant agreement is reached.		
Full Description (objective, what we're calculating, outcomes from KPI)	One of the goals of COMMUNITAS is to facilitate the completion of two PhD programs. To this end, there will be the opportunity for students to study innovative incentives and pricing mechanisms and/or to study or develop innovative EC tools. This KPI aims to assess whether the number proposed in the Grant agreement is reached.		
Formula	N/A		
Prerequisites for estimation	N/A		
Responsible of the measurement	UNINOVA & UNL		
Unit of measurement	#		
Related UCs		Related UCs KPIs	
Delivery Date	M42		
Target Value	2		



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Project Level KPI ID	P10		
Objective Group	EO2/KO2		
Name	Number of drivers and rules beyond marginal pricing		
Short Description			
Full Description (objective, what we're calculating, outcomes from KPI)	To find out what motivates participants to use Demand Response and P2P Tools, the number of drivers and rules beyond marginal pricing co-created and defined within the project will be calculated making use of a small survey.		
Formula	N/A		
Prerequisites for estimation	Demand Response and P2P Tools working in the pilots		
Responsible of the measurement	EDP		
Unit of measurement	#		
Related UCs	UC7 and UC9	Related UCs KPIs	U6-U14, U17, U20
Delivery Date	M36		
Target Value	7		

Project Level KPI ID	P11		
Objective Group	EO3/KO3		
Name	Number of regulators engaged throughout the project's social and policy labs		
Short Description	This KPI tracks the number of regulatory authorities engaged in the project through the social and policy labs.		
Full Description (objective, what we're calculating, outcomes from KPI)	This KPI tracks the number of regulatory authorities engaged in the project through the social and policy labs. These regulatory authorities will be engaged through means of invitation (and expected participation) to workshops to be performed in the policy track of the social and policy labs. A two-step approach will be considered, by first involving the regulatory authorities associated with the leader pilots and in the second stage those associated with the follower pilots and external stakeholders.		
Formula	N/A		
Prerequisites for estimation	N/A		
Responsible of the measurement	UNINOVA		
Unit of measurement	#		
Related UCs		Related UCs	
Delivery Date	M42		
Target Value	6		



Project Level KPI ID	P12		
Objective Group	EO3/KO3		
Name	Number of regulatory sandboxes created in pilots		
Short Description	This KPI tracks the number of regulatory sandboxes created in pilot projects.		
Full Description (objective, what we're calculating, outcomes from KPI)	This KPI tracks the number of regulatory sandboxes established in pilot projects. These sandboxes can be either fully implemented under the umbrella of the COMMUNITAS project or through cooperation with other ongoing initiatives at pilot level. The evolution of this KPI will be monitored under T4.4 (particularly in the Social and Policy Labs)		
Formula	N/A		
Prerequisites for estimation	N/A		
Responsible of the measurement	UNINOVA & TNO		
Unit of measurement	#		
Related UCs	All	Related UCs	All
Delivery Date	M42		
Target Value	3		

Project Level KPI ID	P13		
Objective Group	EO3/KO3		
Name	Number of organized knowledge transfer workshops on progressive market frameworks for DR-based products		
Short Description	Number of organized knowledge transfer workshops on progressive market frameworks for DR-based products		
Full Description (objective, what we're calculating, outcomes from KPI)	Number of workshops for knowledge transfer between pilots organized aiming at finding barriers, drivers and needs of citizens and organizations, for the set-up of DR		
Formula	N/A		
Prerequisites for estimation	N/A		
Responsible of the measurement	EDP		
Unit of measurement	#		
Related UCs	UC7	Related UCs KPIs	U10-U14, U20
Delivery Date	M42		
Target Value	5		

Project Level KPI ID	P14		
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Objective Group	EO3/KO3		
Name	Number of entities that adopt the role of EC manager, offering DR schemes and ECs' management platform to its clients, via COMMUNITAS Replication Academy (T6.2)		
Short Description			
Full Description (objective, what we're calculating, outcomes from KPI)	Number of managing entities offering DR and EC management to their clients via COMMUNITAS Tools		
Formula	N/A		
Prerequisites for estimation	DR and EC management Tools developed		
Responsible of the measurement	EDP & UNINOVA		
Unit of measurement	#		
Related UCs	UC3 and UC7	Related UCs KPIs	U4, U5, U10-U14, U17, U19, U20
Delivery Date	M42		
Target Value	8		

Project Level KPI ID	P15		
Objective Group	EO3/KO3		
Name	Participation of Leaders' EC managers in different energy markets throughout project		
Short Description	This KPI tracks EC managers involvement in market activities such as trading, purchasing and regulatory interactions, reflecting their proactive role in leveraging market opportunities and optimizing energy usage.		
Full Description (objective, what we're calculating, outcomes from KPI)	This KPI measures the extent to which Leaders' EC managers are engaged in various energy markets over the course of the project. The goal is to ensure that these managers are actively involved in critical market activities as trading, policy advocacy, regulatory development, and strategic planning. By tracking and verifying the participation of leaders' EC managers in various energy markets, the project can ensure that these influential figures are effectively driving forward market innovation and integration ^{2,3} .		
Formula	Sum of different market activities in which EC managers reported participation.		
Prerequisites for estimation	• Identification of EC managers. • Classification of Market Activities (trading sessions, regulatory meetings, policy advocacy events, industry conferences, and strategic planning sessions...)		

² Laura H.G.J. Van den Berghe, Anna J. Wieczorek, "Community participation in electricity markets: The impact of market organisation", [Environmental Innovation and Societal Transitions](#), Volume 45, December 2022.

³ Energy Community Secretariat, "Policy Guidelines on the concepts of energy communities", March 2024. Available: https://www.energy-community.org/dam/jcr:70bed24f-42b1-41b4-920e-a451dd54f070/PG%20on%20energy%20communities_ECS_12032024.pdf



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D5.1 Implementation & Monitoring plan and knowledge transfer framework

	Data Collection Mechanisms set up, for tracking and recording the participation of EC managers (attendance logs, meeting minutes, official reports, feedback from stakeholders...).		
Responsible of the measurement	ETRA		
Unit of measurement	#		
Related UCs	UC9, UC11	Related UCs KPIs	U6, U7, U8, T15, T20, T21
Delivery Date	M42		
Target Value	3		

Project Level KPI ID	P16		
Objective Group	EO4		
Name	Number of solutions enabling automatic participation		
Short Description	This KPI measures the count of tools/solutions implemented within the project that facilitate and automate user engagement or involvement in energy markets and incentive mechanisms.		
Full Description (objective, what we're calculating, outcomes from KPI)	This KPI quantifies the implementation of the project tools/solutions that automate user engagement or involvement in energy management, energy tracking and monitoring, decision-making processes, etc. to enhance their active role in innovative energy markets and incentive mechanisms. By tracking and analyzing this KPI, the extent and impact of automation initiatives can be measured, facilitating strategic decisions aimed at further improving operational efficiency and user experience.		
Formula	N/A		
Prerequisites for estimation	- Access to technical and operational documentation for each solution to verify its functionality, deployment date, and the specific processes it automates. - Availability of performance metrics or indicators associated with each solution, to help assessing the effectiveness and impact of automated solutions on organizational processes.		
Responsible of the measurement	ETRA		
Unit of measurement	#		
Related UCs	UC6, UC7, UC9, UC11	Related UCs KPIs	UC10, UC14
Delivery Date	M42		
Target Value	4		

Project Level KPI ID	P17		
Objective Group	EO4		
Name	Number of pilots testing automated participation		
Short Description	This KPI measures the number of pilots actively evaluating the use of the automated project tools/solutions to engage participants in innovative energy markets and incentive mechanisms.		



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Full Description (objective, what we're calculating, outcomes from KPI)	The primary objective of this KPI is to evaluate the extent to which automation is being explored to improve engagement, efficiency, and outcomes in the relevant domain. By accurately verifying the number of pilots testing automated participation, the impact of automation on participant engagement and process efficiency can be optimized. ⁴		
Formula	N/A		
Prerequisites for estimation	N/A		
Responsible of the measurement	ETRA		
Unit of measurement	#		
Related UCs	UC6, UC7, UC9, UC11	Related UCs KPIs	U10, U14
Delivery Date	M42		
Target Value	4		

Project Level KPI ID	P18		
Objective Group	EO4		
Name	Percentage of automated market participation events and transaction fulfilled		
Short Description			
Full Description (objective, what we're calculating, outcomes from KPI)	This KPI assesses the percentage of P2P transactions that were automatically successfully included in the market among all the transactions made inside the P2P Energy Market Platform. Automated transactions include both transactions submitted by devices or the COMMUNITAS platform and transactions set up in advance to meet consumer preferences. This will be a rule-based transaction, meaning the user will define when and how this process will be done automatically.		
Formula	$(\text{Number of automated market participation events and transaction successfully included} / \text{Number of P2P transactions}) \times 100$		
Prerequisites for estimation	P2P Energy Market deployed in pilot sites		
Responsible of the measurement	EDP		
Unit of measurement	%		
Related UCs	UC9	Related UCs KPIs	U6-U10, U14, U17
Delivery Date	M36		
Target Value	75%		

Project Level KPI ID	P19		
Objective Group	EO4		
Name	Average consumer satisfaction ratio due to automation technology and real-time information		

⁴ TwinERGY project. <https://www.twenergy.eu/news/twinergy-proofing-1>



Short Description	This KPI measures the average satisfaction ratio of consumers resulting from the implementation of automation technology and real-time information systems.		
Full Description (objective, what we're calculating, outcomes from KPI)	The primary objective of this KPI is to assess the impact of automation technology and real-time information systems on consumer satisfaction. This evaluation helps in understanding how these technological advancements are perceived by consumers and their effectiveness in improving consumer experience. We are calculating the average satisfaction ratio of consumers based on their feedback regarding the automation technology and real-time information systems. This involves collecting survey data from consumers and quantifying their satisfaction on a standardized scale. Outcomes: - Insights into consumer satisfaction and the perceived benefits of automation and real-time information. - Identification of strengths and weaknesses in the current technological implementations. - Data-driven decisions to enhance technology and information systems for better consumer satisfaction. - Overall assessment of the effectiveness of automation technology and real-time information in improving consumer experience.		
Formula	Average Satisfaction Score (satisfaction score/number of respondents)		
Prerequisites for estimation	• Survey design • Citizens' engagement • Data collection • Data analysis		
Responsible of the measurement	ASM		
Unit of measurement	% Likert Scale (1 to 5): 1 - Very Dissatisfied 2 - Dissatisfied 3 - Neutral 4 - Satisfied 5 - Very Satisfied		
Related UCs	UC6, UC7, UC9, UC11	Related UCs KPIs	U10, U14
Delivery Date	M42		
Target Value	90% (4.5 in Likert Scale)		

Project Level KPI ID	P20
Objective Group	K05
Name	Average number of participants per workshop
Short Description	Pilot stakeholders present at social and policy lab's workshops
Full Description (objective, what we're calculating, outcomes from KPI)	To bring together sufficient participants in activities organized by COMMUNITAS pilots to reach these workshops' goal.



calculating, outcomes from KPI)			
Formula	Pilots document the presence of stakeholders/members at workshops and report to TNO through the action plan. TNO verifies and reports.		
Prerequisites for estimation	N/A		
Responsible of the measurement	TNO		
Unit of measurement	# (of Stakeholders)		
Related UCs	UC9	Related UCs KPIs	
Delivery Date	M42		
Target Value	10		

Project Level KPI ID	P21		
Objective Group	KO5		
Name	Number of insights for innovative solutions inputted by citizens' Design Thinking moments		
Short Description	Qualitative conclusions drawn from engagement activities hosted by the pilots		
Full Description (objective, what we're calculating, outcomes from KPI)	To further develop the innovative solutions through engagement activities. To verify if these are valid, the number of useful insights must be documented.		
Formula	Format for documentation		
Prerequisites for estimation	N/A		
Responsible of the measurement	TNO		
Unit of measurement	# (Nº of qualitative insights)		
Related UCs	N/A	Related UCs KPIs	U9
Delivery Date	M42		
Target Value	40		

Project Level KPI ID	P22		
Objective Group	KO5		
Name	Number of stakeholders engaged during application of the methodology for citizen and consumer engagement (tools and Knowledge Base);		
Short Description	This KPI measures the number of stakeholders actively engaged during the application of the methodology for citizen and consumer engagement, including the use of tools and the Knowledge Base.		



D5.1 Implementation & Monitoring plan and knowledge transfer framework

Full Description (objective, what we're calculating, outcomes from KPI)	The primary objective of this KPI is to track and evaluate the extent of stakeholder engagement during the implementation of methodologies designed for citizen and consumer engagement. This helps in understanding the reach and effectiveness of the engagement strategies and tools, ensuring broad participation and feedback from relevant stakeholders. We are calculating the total number of stakeholders who are actively participating in the engagement processes, utilizing the provided tools, and accessing the Knowledge Base. Stakeholders include citizens, consumers, community leaders, policymakers, and other relevant parties. Outcomes: • Measurement of stakeholder participation and involvement. • Insights into the effectiveness of engagement tools and the Knowledge Base. • Identification of active and engaged stakeholders for future reference. • Evaluation of the reach and impact of the engagement methodology.		
Formula	Number of engaged stakeholders = total count of stakeholders actively participating		
Prerequisites for estimation	• Identification of stakeholders • Engagement methodology • Tracking mechanism • Data collection • Report		
Responsible of the measurement /estimation	ASM		
Unit of measurement / estimation	# (Nº of Stakeholders)		
Related UCs		Related UCs KPIs	
Delivery Date	M42		
Target Value	100		

Project Level KPI ID	P23
Objective Group	EO6
Name	Guidelines and best practices on P2P and DR incentives
Short Description	This KPI evaluates the number of guidelines and best practices developed, as well as legislative modifications suggested, regarding incentives and pricing for P2P markets and DR schemes.
Full Description (objective, what we're calculating, outcomes from KPI)	Current incentive and pricing structures do not adequately support peer-to-peer (P2P) markets and demand response (DR) schemes. Therefore, new guidelines and legislative changes are needed to promote innovation and efficiency in these energy models. This KPI evaluates the number of guidelines and best practices developed, as well as legislative modifications suggested, regarding incentives and pricing for P2P markets and DR schemes.
Formula	N/A
Prerequisites for estimation	N/A



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Responsible of the measurement / estimation	UNINOVA (with support from TNO here and there with the analysis of the best practices and translation into a guideline)		
Unit of measurement	#		
Related UCs	UC7, UC9, UC10	Related UCs	UC7, UC9, UC10
Delivery Date	M42		
Target Value	1		

Project Level KPI ID	P24		
Objective Group	EO6		
Name	Submission of peer-reviewed scientific work of the drivers and rules identified as results achieved in COMMUNITAS		
Short Description	This KPI evaluates the production of scientific work relating to the understanding the drivers of adoption for the technologies developed in COMMUNITAS or the rules and regulations related to their application.		
Full Description (objective, what we're calculating, outcomes from KPI)	The KPI tracks the production of scientific peer reviewed work. The number of peer reviewed journal articles or peer reviewed conference proceedings should be counted.		
Formula	N/A		
Prerequisites for estimation	N/A		
Responsible of the measurement / estimation	UNINOVA & UNL		
Unit of measurement	#		
Related UCs		Related UCs KPIs	
Delivery Date	M42		
Target Value	1		

Project Level KPI ID	P25		
Objective Group	EO6		
Name	Policy recommendations for the involved COMMUNITAS demonstrators		
Short Description	The KPI evaluates the number of policy recommendations that will be done based on the legal and policy analyses done in WP 4 and deliverable 7.5		
Full Description (objective, what we're calculating, outcomes from KPI)	Several workshops will be organised on the topic of laws and policies that have an impact on energy communities. Based on these workshops relevant laws and policies will be discussed and in 7.4 policy recommendations will be formulated		
Formula	N/A		

Prerequisites for estimation	N/A		
Responsible of the measurement / estimation	TNO		
Unit of measurement	#		
Related UCs	None (only indirectly and depending on generalisability of lessons about Use Case implementation)	Related UCs	None (only indirectly and depending on generalisability of lessons about Use Case implementation)
Delivery Date	M42		
Target Value	1		

Project Level KPI ID	P26		
Objective Group	EO7/KO6		
Name	Number of new ECs to be created due to COMMUNITAS		
Short Description	Number of new ECs to be created due to COMMUNITAS		
Full Description (objective, what we're calculating, outcomes from KPI)	This KPI will measure the number of ECs formed with the support of COMMUNITAS innovative solutions, until the end of the project. This ECs include the project's listener pilots (Sun Gate, and Zagreb), two of the learner pilots (Cascais, and Halkidiki), and an external EC.		
Formula	N/A		
Prerequisites for estimation	N/A		
Responsible of the measurement / estimation	EDP		
Unit of measurement	#		
Related UCs	UC1, UC2, UC3, UC4	Related UCs KPIs	U1-U5, U16-U19
Delivery Date	M42		
Target Value	5		

Project Level KPI ID	P27		
Objective Group	EO7/KO6		
Name	Number of asset planning simulations performed using COMMUNITAS tool		
Short Description	This KPI counts the number of asset planning simulations carried out using the COMMUNITAS tool		
Full Description (objective, what we're calculating, outcomes from KPI)	The objective of the KPI is to keep track of the number of asset planning simulations carried out using the COMMUNITAS tool. The definition of "asset planning simulations carried out" is related to the single simulations carried out, not to the number of energy communities for		



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calculating, outcomes from KPI)	which simulations are carried out, which means that if 10 simulations are carried out for 10 energy communities, the target of 100 simulations is met.		
Formula	N/A		
Prerequisites for estimation	The COMMUNITAS planning tool is completed and ready to be used for asset planning simulations		
Responsible of the measurement / estimation	RINA		
Unit of measurement	#		
Related UCs	UC2	Related UCs KPIs	-
Delivery Date	M42		
Target Value	100		

Project Level KPI ID	P28
Objective Group	EO7/KO6
Name	Increase in renewable energy generated on-site in COMMUNITAS demos
Short Description	This KPI counts the additional amount of electrical energy produced by renewable energy technologies included in an energy transition project.
Full Description (objective, what we're calculating, outcomes from KPI)	The objective of the KPI is to estimate additional electrical energy produced by RE on-site in COMMUNITAS demos. The increase in renewable energy can be occurred by reducing curtailment due to higher utilization of Demand Response technics and BESS exploitation. Additionally, the increase in renewable energy generation can be occurred due to more RE systems install, and more favourable weather conditions (for example higher wind speeds, higher irradiation and lower ambient temperatures in case of PVs). The weather conditions might be unfavourable so a reduction in renewable energy generation might occurred. That said, a correction factor due to variable weather conditions have to be used in order to identify the actual impact from COMMUNITAS use cases and not from other factors.
Formula	$\Delta E_{RE} = E_{RE_{final}} - E_{RE_{start}} \pm E_{RE_{adj}}$
Prerequisites for estimation	$E_{RE_{start}}$ is the generated renewable energy used as a baseline for a demo site and specific energy period. Preferably a full year. $E_{RE_{final}}$ is the generated renewable energy that occurred after the application of COMMUNITAS use cases for a full year on a demo site. Includes the energy that might be installed due to the COMMUNITAS project. $E_{RE_{adj}}$ is the amount of energy that will be adjusted due to the different climatic conditions between the baseline year and the measurements' year for a demo site. It will be estimated based on the average wind speed, solar radiation and other differences between renewable sources assets. The years of estimations will be defined based on the available measurements



Responsible of the measurement / estimation	CERTH		
Unit of measurement	GWh/year		
Related UCs		Related UCs KPIs	-
Delivery Date	M42		
Target Value	30 GWh/year		

Project Level KPI ID	P29		
Objective Group	EO7/KO6		
Name	Increase in overall RES capacity in COMMUNITAS demos		
Short Description	This KPI counts the additional installed nominal power that was installed in each demo during the project duration.		
Full Description (objective, what we're calculating, outcomes from KPI)	The objective of this KPI is to record the installed power in each of the COMMUNITAS demos. This will contribute to the overall targets of COMMUNITAS. Technologies from all the energy vectors will be included in this estimation, demo site. Decommissioned RES will be considered if it occurred due to End of Life, fatal error, or expired licences.		
Formula	$\Delta P_{RES} = \sum P_{RES_{inst}} - \sum P_{RES_{decom}}$		
Prerequisites for estimation	$\sum P_{RES_{inst}}$ The sum of the nominal power of all the new RES installations during the COMMUNITAS project for each one of demo sites $\sum P_{RES_{decom}}$ The sum of the nominal power of all the decommissioned RES installations during the COMMUNITAS project for each one of demo sites		
Responsible of the measurement / estimation	CERTH		
Unit of measurement	MWp		
Related UCs		Related UCs KPIs	
Delivery Date	M42		
Target Value	30 MWp		

Project Level KPI ID	P30		
Objective Group	EO7/KO6		
Name	Reduction of CO2eq due to increase RES energy penetration		
Short Description	To estimate the reduction in greenhouse gases emissions.		



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Full Description (objective, what we're calculating, outcomes from KPI)	This KPI, in fact, reflects the CO ₂ eq emission savings from the total RES interventions over the previous state i.e. before COMMUNITAS project. Renewable energy systems overall, reduce the CO ₂ eq over their life cycle. The CO ₂ savings depends on the amount of energy produced/exploited by the RE systems (Related to KPI P30) and the CO ₂ emission factors of the system that they replace (avoidance of using other sources emission from combustion or grid equivalent emissions). As the existence of BESS is important for increasing RE penetration, their lifecycle equivalent emissions will be included into the estimations		
Formula	$\Delta GHG = GHG_{old} - GHG_{new}$		
Prerequisites for estimation	GHG_{old} CO₂ equivalent emissions per each demo site for the baseline year GHG_{new} CO₂ equivalent emissions per each demo site for an appropriate year after the application of COMMUNITAS Use Cases The most important prerequisites that will be needed for the estimation are: • Fuel specific emissions and mass of fuel; • Electrical grid emissions per kWh; • Specific emissions of renewable energy systems during their life cycle		
Responsible of the measurement / estimation	CERTH		
Unit of measurement	tonneCO ₂ eq /yr		
Related UCs	UC13	Related UCs KPIs	
Delivery Date	M42		
Target Value	6900 tonneCO ₂ eq/yr		

Project Level KPI ID	P31
Objective Group	E07/KO6
Name	Number of citizens involved in capacity building programs
Short Description	This KPI measures the number of people reached by COMMUNITAS Replication Academy
Full Description (objective, what we're calculating, outcomes from KPI)	The COMMUNITAS Replication Academy aims to empower local communities by providing comprehensive training and resources. Through this academy, citizens and stakeholders gain valuable insights into sustainable energy practices and demand response (DR) actions. Participants learn to replicate successful energy models and strategies within their own communities. This KPI measures the number of people reached by COMMUNITAS Replication Academy
Formula	N/A
Prerequisites for estimation	N/A
Responsible of the measurement / estimation	UNINOVA



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Unit of measurement	#		
Related UCs		Related UCs KPIs	
Delivery Date	M42		
Target Value	5500		

Project Level KPI ID	P32		
Objective Group	EO7/KO6		
Name	All ECs to expand pool of members or number of services.		
Short Description	Assesses the adoption rate of the COMMUNITAS services provided to the community members		
Full Description (objective, what we're calculating, outcomes from KPI)	The objective of this KPI is to evaluate the effectiveness of ECs in increasing the number of community members or expanding the range of services offered. Higher adoption rates indicate successful engagement and service relevance, contributing to community growth and user satisfaction.		
Formula	Community members of all pilots using at least one COMMUNITAS service or tool / Total number of community members in all pilots.		
Prerequisites for estimation	Assess the exact number of community members in all the demo areas.		
Responsible of the measurement / estimation	EDP		
Unit of measurement	%		
Related UCs	All	Related UCs KPIs	
Delivery Date	M42		
Target Value	10%		

Project Level KPI ID	P33
Objective Group	EO7/KO6
Name	Overall TRL for COMMUNITAS' outcomes
Short Description	Overall Technology Readiness Level (TRL) for COMMUNITAS technical Key Exploitable Results
Full Description (objective, what we're calculating, outcomes from KPI)	The objective is to calculate the overall TRL reached by COMMUNITAS project's outcomes by the end of the project. The TRL reached by each KER will be indicated to RINA, at the end of the project, by the partners leading the development of the results. KER Leaders are the ones possessing the highest knowledge on the specific KERs. The KPI value will be obtained calculating the average TRL between all the technical Key Exploitable Results. The target value of overall TRL 7 (System prototype demonstration in operational environment) or TRL 8 (System complete and qualified) will be met if the abovementioned



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	average value is equal or greater than 7 and if at least 75% of technical KERs have TRL equal or greater than 7.		
Formula	$TRL_{Overall} = \frac{TRL_{KER1} + TRL_{KER2} + \dots + TRL_{KERn}}{n}$ KER1, KER2, ..., KERn: technical KERs n: number of technical KERs		
Prerequisites for estimation	KER Leaders estimates of TRLs for their technical KERs		
Responsible of the measurement / estimation	RINA		
Unit of measurement	#		
Related UCs		Related UCs KPIs	
Delivery Date	M42		
Target Value	TRL 7-8		

Project Level KPI ID	P34		
Objective Group	KO7		
Name	Business models to be elaborated		
Short Description	This KPI counts the number of possible business models applicable to the COMMUNITAS project.		
Full Description (objective, what we're calculating, outcomes from KPI)	The objective of this KPI is to track the number of new business models that are in the process of being developed and refined.		
Formula	N/A		
Prerequisites for estimation	N/A		
Responsible of the measurement / estimation	RINA		
Unit of measurement	#		
Related UCs		Related UCs KPIs	
Delivery Date	M42		
Target Value	8		

Project Level KPI ID	P35		
Objective Group	KO7		
Name	Business model focusing on energy poverty alleviation per Leader and Learner pilots		

Short Description	This KPI calculates the number of different business models that have been identified, designed, and validated as part of the Leader and Learner pilot initiatives.		
Full Description (objective, what we're calculating, outcomes from KPI)	The objective of this KPI is to monitor and evaluate the diversity and feasibility of various business models developed through the Leader and Learner pilot programs aimed at alleviating energy poverty. This KPI will help in understanding how many distinct, viable business models can be created and potentially implemented based on insights and data from the pilot projects. By monitoring this KPI, organizations can better understand the effectiveness and potential of their efforts in developing sustainable energy solutions for poverty alleviation, guiding future strategies and resource allocation.		
Formula	N/A		
Prerequisites for estimation	N/A		
Responsible of the measurement / estimation	RINA		
Unit of measurement	#		
Related UCs		Related UCs KPIs	
Delivery Date	M42		
Target Value	1		

Project Level KPI ID	P36		
Objective Group	K07		
Name	Innovative financing mechanisms proposed		
Short Description	This KPI calculates the number of financing mechanisms that are identified and proposed for the energy community-based services and projects		
Full Description (objective, what we're calculating, outcomes from KPI)	The main objective is to explore different financing mechanisms being in close contact with the pilot members to identify their willingness or barriers to invest in community-based investments. The financing mechanisms are also going to include crowdfunding mechanisms and reward-based schemes.		
Formula	N/A		
Prerequisites for estimation	N/A		
Responsible of the measurement / estimation	CERTH		
Unit of measurement	#		
Related UCs		Related UCs KPIs	
Delivery Date	M42		
Target Value	2		



Project Level KPI ID	P37		
Objective Group	EO1		
Name	Average reduction in electricity costs		
Short Description	This KPI measures the reduction in electricity costs (Euro per kWh) across COMMUNITAS Energy Communities		
Full Description (objective, what we're calculating, outcomes from KPI)	The objective of this KPI is to track the average cost savings (Euro per kWh) from an energy community perspective or, if this is not possible, the average cost savings from end user/prosumer's perspective. Either of these entities will be estimated as a relative reduction %. In the first case, the annual average energy costs will be provided by the ECs that participate in the project for an indicative year before COMMUNITAS project and for an indicative year after COMMUNITAS project. As said, these data might not be available to 3rd parties as they are sensitive business data, then cost reduction will be estimated for the average end user considering the individual contribution of the related tools such as Optimems and DR. For the cost saving from the user/prosumer's perspective an average will take place		
Formula	$RElCo_{EC} = \frac{\Delta ElCo}{ElCo_{beforeCOM}} = \frac{ElCo_{afterCOM} - ElCo_{beforeCOM}}{ElCo_{beforeCOM}}$ Or $AvRElCo_{Prosumer} = \frac{\sum RElCo_{prosumer}}{No_{prosumers}}$ were, $RElCo_{prosumer} = \frac{\frac{TotalCost_{afterCOM}}{Ener_{Consumed_{afterCOM}}} - \frac{TotalCost_{beforeCOM}}{Ener_{Consumed_{beforeCOM}}}}{\frac{TotalCost_{beforeCOM}}{Ener_{Consumed_{beforeCOM}}}}$ $No_{prosumers}$ is the number of prosumers where values have been acquired for this estimation. This KPI will be estimated for each of the leader pilot.		
Prerequisites for estimation	Data on electricity costs per kWh before and after the application of COMMUNITAS tools for each demo site. Total Energy Cost before and After COMMUNITAS for prosumers and quantities for Energy Consumed before and after COMMUNITAS tools.		
Responsible of the measurement / estimation	CERTH		
Unit of measurement	#		
Related UCs	UC5, UC7	Related UCs	UC5, UC7
Delivery Date	M42		
Target Value	up to 20%		



Project Level KPI ID	P38		
Objective Group	EO1		
Name	Increase in self-consumption		
Short Description	The KPI measures the increase in self-consumption within all COMMUNITAS Energy Communities		
Full Description (objective, what we're calculating, outcomes from KPI)	The objective of this KPI is to track the growth in self-consumption of renewable energy within the COMMUNITAS ECs. The self-consumed energy is the energy generated from renewable sources (Community Assets) that is consumed by members within the communities. In general, the mechanisms that can be considered for the increase of self-consumption are: • Increase of renewable energy production • Reduce the electrical demand (due to energy efficiency measures) • Reduce the needs for non-community energy (e.g. from the grid). The outcomes from this KPI will reveal the success of the interventions made in the context of COMMUNITAS to promote self-consumption of renewable energy, identifying areas for improvement, and driving further adoption of sustainable energy practices. The self-consumption increase will be a relative figure. This KPI provides a logistic approach over a period (a year) and does not consider production-consumption simultaneity. This KPI will be estimated for each of the leader pilots.		
Formula	$RSC = \frac{SC_{after} - SC_{before}}{SC_{before}}$ Where: $SC_{after} = \frac{EnerProd_{after}}{EnerCons_{after}}$ $C_{before} = \frac{EnerProd_{before}}{EnerCons_{before}}$		
Prerequisites for estimation	$EnerProd_{after}$ Annual Electrical Energy produced after COMMUNITAS interventions $EnerCons_{after}$ Annual Electrical Energy consumed after COMMUNITAS interventions $EnerProd_{before}$ Annual Electrical Energy produced before COMMUNITAS interventions $EnerCons_{before}$ Annual Electrical Energy consumed before COMMUNITAS intervention		
Responsible of the measurement / estimation	CERTH		
Unit of measurement	%		
Related UCs		Related UCs KPIs	



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Delivery Date	M42
Target Value	up to 15%

Project Level KPI ID	P39		
Objective Group	EO3/KO2		
Name	Increase of system reliability capacity		
Short Description	This KPI measures the increase of system (grid) reliability after the installation of COMMUNITAS-related technology.		
Full Description (objective, what we're calculating, outcomes from KPI)	The objective of the KPI is to measure how COMMUNITAS solutions can contribute to a more reliable system at the local (community) level. Under this scope, reliability is measured in terms of the number of interruptions (SAIFI) and the duration of these interruptions (SAIDI) and will consider as well other important events affecting power quality (e.g. overvoltages or voltage sags).		
Formula	N/A		
Prerequisites for estimation	Smart metering data availability, local generation data availability (e.g. data from PV Inverters)		
Responsible of the measurement / estimation	UNINOVA		
Unit of measurement	#		
Related UCs		Related UCs KPIs	
Delivery Date	M42		
Target Value	5%		

Project Level KPI ID	P40		
Objective Group	EO7		
Name	Investment triggered in RES		
Short Description	KPI measures the total investment that has been triggered within the COMMUNITAS project for RES.		
Full Description (objective, what we're calculating, outcomes from KPI)	The objective of this KPI is to track and monitor the total investment that has been triggered in RES technologies. What it is calculated is the total investment (i.e. the sum of Installation Cost for RES) that has been initiated or stimulated until the end of COMMUNITAS project for all the pilots.		
Formula	$TotalInvestment_{RES} = \sum Inv_{RES}$ Where Inv_{RES} is the total investment of each pilot.		
Prerequisites for estimation	The total installation costs for RES by the COMMUNITAS pilots. New projects initiated or existing projects are considered investments.		



Responsible of the measurement / estimation	CERTH		
Unit of measurement	M€		
Related UCs		Related UCs KPIs	
Delivery Date	M42		
Target Value	30 M€		

Project Level KPI ID	P41		
Objective Group	EO7		
Name	Jobs created during the project period		
Short Description	This measures the direct employment opportunities generated by the investment in renewable energy technology facilitated by COMMUNITAS, reflecting the project's contribution to job creation within the energy sector and related industries.		
Full Description (objective, what we're calculating, outcomes from KPI)	This KPI quantifies the number of new employment opportunities resulting from the projected investment of at least 30M€ in renewable energy technology for self-consumption and citizen-owned projects facilitated by COMMUNITAS. It considers the expected exponential increase in investment until 2030, reaching 80M€, and considers the energy sector-related employment impact factor of approximately 10.6 jobs per million euros invested. Additionally, the KPI acknowledges the creation of additional jobs due to the emergence of new market roles, such as the EC manager, studied within the COMMUNITAS project. It also highlights the potential for exponential job growth beyond the project period, reflecting COMMUNITAS' contribution to accelerating the adoption of Energy Communities (ECs) and the expected creation of 850 jobs by 2030.		
Formula	Investment Triggered in RES x 10.6 jobs/million		
Prerequisites for estimation	N/A		
Responsible of the measurement / estimation	EDP		
Unit of measurement	#		
Related UCs		Related UCs KPIs	Related with previous Project KPI: P40
Delivery Date	M42		
Target Value	315		

Project Level KPI ID	P42		
Objective Group	EO5		
Name	Types of consumers and buildings involved		
Short Description	KPI quantifies different consumer profiles and building typologies engaged through COMMUNITAS		



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Full Description (objective, what we're calculating, outcomes from KPI)	This KPI measures the diversity and distribution of consumer types and building structures within the energy communities. It aims to quantify the variety of consumer profiles and building typologies participating in ECs, reflecting the inclusivity and reach of the community-based energy initiatives.		
Formula	N/A		
Prerequisites for estimation	Data Collection: Gather comprehensive data on the participating energy communities, including information on the types of consumers and building categories. Define clear segmentation criteria for different consumer types and building categories to ensure accurate classification and analysis.		
Responsible of the measurement / estimation	EDP		
Unit of measurement	#		
Related UCs		Related UCs KPIs	
Delivery Date	M42		
Target Value	>9		

Project Level KPI ID	P43		
Objective Group	EO2		
Name	Number of new incentive mechanisms for consumer engagement in energy markets		
Short Description	This KPI measures the number of new incentive mechanisms implemented during the project that aim to motivate consumer participation and behaviour change in energy markets.		
Full Description (objective, what we're calculating, outcomes from KPI)	This KPI measures the number of new incentive mechanisms that can include, but are not limited to, dynamic pricing models (UC7 – DR and NILM), reward programs, gamification techniques, peer-to-peer energy trading incentives (UC9 – P2P Energy Market), green energy certifications (UC11 – GoOs), energy efficiency financing and other novel approaches that motivate consumers to actively participate in energy management and decision-making processes. Main outcomes: – Increased citizens and ECs Participation in energy markets. – Users to adopt more efficient energy consumption habits, contributing to overall energy savings and sustainability. – Drive innovation within the energy sector, by developing more effective engagement strategies. – Better demand-side management, reducing peak loads and improving grid stability. – Provide tangible benefits to users and a sense of contribution to wider energy goals.		
Formula	N/A		
Prerequisites for estimation	• Clear definition of incentive mechanisms and types of incentives (financial rewards, dynamic pricing models...) • Establish a baseline count of existing incentive mechanisms at the start of the project. • Document each new incentive mechanism including objectives, target		



	audience, implementation date, etc.		
Responsible of the measurement / estimation	ETRA		
Unit of measurement	#		
Related UCs	UC7, UC9, UC11	Related UCs KPIs	U6, U7, U10, U11 U14, U17
Delivery Date	M42		
Target Value	≥7		

Project Level KPI ID	P44
Objective Group	EO5
Name	Number of pilots demonstrating KER2, KER4 and KER5
Short Description	This KPI measures the number of pilots that are actively showcasing the functionalities and benefits of three of the project KERs.
Full Description (objective, what we're calculating, outcomes from KPI)	The objective of this KPI is to quantify and assess the number of pilot sites demonstrating the capabilities and benefits of three of the project's Key Exploitable Results (KERs), which are designed to enhance energy management and increase engagement in ECs. These KERs are the following ones: - KER2: Energy community management platform - KER4: Investment advisor for household- and community-level sustainable investments. - KER5: Energy Community Planning Tool. Each pilot project should: - Implement one or more of the tools. - Engage a representative sample of users from the target community. - Collect and analyse data on tool usage, user engagement, and the impact on energy flexibility, energy management and market participation behaviours. Main outcomes: - Understand how widely and effectively the KERs are being implemented and used in real-world settings. - Provide valuable insights from pilots into user engagement, satisfaction and improvement areas for each tool. - Assess the tools scalability and potential for wider adoption across different communities and countries. - Support informed decision-making and strategic planning for broader implementation. - Contribute to the overarching objective of empowering citizens, enhancing their engagement and fostering a collaborative approach to sustainable energy management.
Formula	N/A
Prerequisites for estimation	• Ensure that the KERs are fully developed, tested and ready for deployment in the pilots.



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	- Engage key stakeholders as local governments, community leaders, citizens and other potential users. - Provide support to pilots on the usage of the tools. - Track the progress and outcomes of each one of the pilots. - Establish protocols to ensure privacy and security of data collected during the project.		
Responsible of the measurement / estimation	ETRA		
Unit of measurement	#		
Related UCs	UC2, UC3, UC4	Related UCs KPIs	U4, U5, U15, U17, U19, T1, T6, T7, T12, E1, E3, S1, S8
Delivery Date	M42		
Target Value	≥5		

Project Level KPI ID	P45
Objective Group	EO4
Name	Number of P2P and/or GoOs pilots
Short Description	This KPI measures the number of pilots where peer-to-peer (P2P) energy markets and Guarantees of Origin (GoOs) solutions have been implemented.
Full Description (objective, what we're calculating, outcomes from KPI)	Each pilot must involve either P2P energy trading platforms or GoOs platforms. P2P energy markets facilitate direct energy transactions between individuals, whereas GoOs systems certify the origin of energy, ensuring it is sourced from renewable resources. These pilots are essential for testing, validating, and promoting the automated participation of citizens in innovative energy markets. Main outcomes: - Level of interest and participation from citizens in the P2P and GoOs solutions. - Impact of P2P and GoOs pilots on the energy market, including potential changes in energy distributions, pricing and market competitiveness. - Effectiveness of the incentive mechanisms designed to encourage citizen participation in the markets. - Necessary adjustments or support needed to foster the growth of P2P and GoOs tools.
Formula	N/A
Prerequisites for estimation	- Identify and engage stakeholders (energy companies, technology providers, regulatory bodies and citizens). - Review and align with existing regulatory and policy frameworks. - Establish a standardized process for collecting data on the initiation and operation of the tools. - Establish success criteria for the pilots in terms of citizen participation, energy trading volumes and the impact on the energy market.
Responsible of the measurement / estimation	ETRA



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Unit of measurement	#		
Related UCs	UC9, U10, UC11	Related UCs KPIs	U6, U7, U9, U10, U14, U17, T6, T15, T20, T21, T22, T23, T24, T25, T26, T27
Delivery Date	M42		
Target Value	≥4		

Project Level KPI ID	P46		
Objective Group	EO4 KO2		
Name	Number of EC members using automated participation		
Short Description	This KPI measures the number of members within the EC who actively utilize automated systems to engage in energy markets and participate in demand response programs.		
Full Description (objective, what we're calculating, outcomes from KPI)	This KPI captures: - The number of households or individuals within the EC that have installed and activated automated energy management systems. - The extent to which these systems are being used to participate in energy trading, peak load shifting, and other demand response activities. - The frequency and consistency of automated participation in energy-related activities. Main outcomes: - Adoption rate of the automated participation. - Level of active engagement and willingness of community members to contribute to innovative energy markets and DR programs. - Increased automated participation leads to better energy management, reduced peak demand and enhanced grid stability. - Information about the current state of technology adoption and the effectiveness of existing strategies (to be used in the development of future programs aimed at increasing automated participation in energy markets).		
Formula	N/A		
Prerequisites for estimation	• Robust data collection infrastructure capable of monitoring and recording the usage of automated participation tools. • Ensure that EC members can register and be uniquely identified. • Ensure that the automated tools are properly integrated with the CCP. • Implement data privacy and security measures to protect personal data. • Awareness and training programs to support EC members.		
Responsible of the measurement / estimation	ETRA		
Unit of measurement	#		
Related UCs	UC7, UC9, UC11	Related UCs KPIs	U6, U7, U10, U11 U14, U17, T6, T13, T20, T21, T23, T24
Delivery Date	M42		



Target Value	>1000
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Project Level KPI ID	P47		
Objective Group	EO5 KO2		
Name	Number of pilots demonstrating DR and flexibility tools (KER6 and KER7)		
Short Description	This KPI measures the number of pilots that are actively showcasing the functionalities and benefits of KERs 6 and 7.		
Full Description (objective, what we're calculating, outcomes from KPI)	The objective of this KPI is to quantify and assess the number of pilot sites demonstrating the capabilities and benefits of two of the project's Key Exploitable Results (KERs), which are designed to enhance energy management and increase citizen and consumer engagement in ECs. These KERs are the following ones: - KER6: MultiFASE – near real-time optimization of ECs' Distributed Energy Resources (DERs). - KER7: DR and optimal market position through NILM. Each pilot project should: – Implement one or more of the tools. – Engage a representative sample of users from the target community. – Collect and analyze data on tool usage, user engagement, and the impact on energy flexibility, energy management and market participation behaviors. Main outcomes: – Understand how widely and effectively the KERs are being implemented and used in real-world settings. – Provide valuable insights from pilots into user engagement, satisfaction and improvement areas for each tool. - Asses the tools scalability and potential for wider adoption across different communities and countries. Support informed decision-making and strategic planning for broader implementation.		
Formula	N/A		
Prerequisites for estimation	• Ensure that the KERs are fully developed, tested and ready for deployment in the pilots. • Engage key stakeholders as local governments, community leaders, citizens and other potential users. • Provide support to pilots on the usage of the tools. • Track the progress and outcomes of each one of the pilots. Establish protocols to ensure privacy and security of data collected during the project.		
Responsible of the measurement / estimation	ETRA		
Unit of measurement	#		
Related UCs	UC6, UC7	Related UCs KPIs	U11, U12, U13, U14, U20, T3, T4, T5, T6, T7, T9, T10,



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			T11, T13, T16, T17, T18, T19
Delivery Date	M42		
Target Value	≥5		

Project Level KPI ID	P48		
Objective Group	EO7		
Name	Exploitation workshops		
Short Description	Number of exploitation and IPR (Intellectual Property Rights) workshops		
Full Description (objective, what we're calculating, outcomes from KPI)	Number of exploitation and IPR (Intellectual Property Rights) workshops held by RINA, which are very important to ensure that partners are aligned on exploitation aspects and generate discussions between organizations.		
Formula	N/A		
Prerequisites for estimation	N/A		
Responsible of the measurement / estimation	RINA		
Unit of measurement	Number of workshops		
Related UCs		Related UCs KPIs	
Delivery Date	M42		
Target Value	2		