Masterpiece

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MASTERPIECE -
Multidisciplinary Approaches and Software Technologies for Engagement, Recruitment and Participation in Innovative Energy Communities in Europe

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Deliverable 5.3

Intervention Programme: All Pilots Implementation

Title	Intervention programme: All pilots implementation
Document description	The planning and progress of the Intervention Programme; monitoring for baselining and final long-term (after refining the developed enabling technologies) intervention activities in all 4 pilot cases will be coherently reported in the current iterative deliverable. 3 versions of the deliverable are foreseen to ensure reporting transparent and solid outcomes at different yet quite important phases of the different pilot demonstration tasks 5.2, 5.3, 5.5 and 5.5. Each subtask is expected to complete and coherently report on M15 (monitored data for baselining and demos planning), M30 (completed first cycle of intervention activities and project prototype deployment), M42 (final intervention execution and monitoring).
Nature	DEM — Demonstrator, pilot, prototype.
Task	T5.1, T5.2, T5.3, T5.4, T5.5.
Status	INITIAL
WP	WP5. Integration, demonstration, and evaluation
Lead Partner	RDIUP
Partners Involved	
Date	

Revision history	Author	Delivery date	Summary of changes and comments
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Version 0.1	RDIUP	16/02/2024	1st Version
Version 0.1.1	TROYA	18/02/2024	Contributions to: Turkish Pilot Site
Version 0.1.2	ALEC & UPP	20/02/2024	Contributions respectively to: French Pilot Site & Swedish Pilot Site
Version 0.2	RDIUP	22/02/2024	2nd Version
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Version 0.3	RDIUP	29/02/2024	3rd Version
Version 0.3.1	NGENIC & BERC	29/02/2024	Contributions respectively to: Swedish Pilot Site & Italian Pilot Site
Version 0.4	RDIUP	05/03/2024	4th Version
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1. EXECUTIVE SUMMARY

Deliverable 5.3, titled 'Intervention Programme: All Pilots Implementation' lies under the scope of WP5 'Integration, Demonstration & Evaluation'. Rooted in the tasks from T5.1 to T5.5 covering the Proof of Concept, System Integration & Pilot adaptation, and the intervention programme across the four pilot countries, this report marks a significant preliminary achievement in the Masterpiece project. It captures the planning, preparation, and progress of the Masterpiece intervention programme.

The intervention programme is designed to implement and test assumptions and strategies, fostering the expansion of ECs while enhancing participant's understanding of energy resource dynamics within communities, covering sharing, distribution, planning, and sales. The programme is also designed to monitor and gauge the success of the interventions.

Spanning diverse pilot sites in Italy, Turkey, France, and Sweden, the Masterpiece intervention programme navigates distinct regulatory landscapes and embraces unique social and economic contexts.

This deliverable, structured across various sections, introduces the pilot sites, defines use cases and KPIs, the tools to be used for the use case achievement, and provides an assets' overview of each pilot site. The document further delves into the current integration status, detailing existing APIs, the present situation, and outlining the next steps and action points for pilot implementation. Concluding with insights into challenges and barriers, this document sets the stage for forthcoming releases.

2. INTRODUCTION

2.1. Background and context

In response to the pressing need for transformative solutions in the European energy landscape, the Masterpiece project emerges as an ambitious initiative, seeking to redefine the dynamics of Energy Communities and foster their creation and development across Europe. At its core, Masterpiece intends the establishment of a digital coordination and cooperation arena, distinctive for its participative-by-design approach. This initiative grants community members unprecedented opportunities to contribute to services and innovation. Pioneering both user-centric solutions and participatory methodologies, the initiative sparks citizens' involvement, marking a distinctive approach within the European energy ecosystem.

By pioneering both technical and social innovations, the Masterpiece intervention programme seeks to transform traditional energy consumers into active agents and dynamic contributors within collaborative energy communities. Rooted in participatory approaches like co-creation, the programme accelerates citizen involvement, laying the foundation for a dynamic and inclusive energy systems. The scope of Masterpiece extends beyond theoretical propositions, aiming to demonstrate the practical applicability and replicability of methodological and technical innovations.

With staged implementation across Italy, Turkey, France, and Sweden, Masterpiece traverses geographical, social, and economic spectrums, embracing different regulatory and administrative frameworks. This deliverable reveals not just an intervention programme, but a collective pursuit dedicated to shaping a sustainable and participatory future in the European energy landscape.

2.2. Relationship with other WPs, Deliverables, and Tasks

The current deliverable harmonises seamlessly with other project deliverables and tasks across multiple Work Packages, contributing to a unified vision of the Masterpiece project's intervention programme. Emphasising these interconnections is paramount for cultivating a holistic understanding of the Masterpiece project's intervention programme and its cohesive vision.

The main interconnections with other WPS are:

- WP2 "Energy community requirements at national and EU levels for different stakeholders and shareholders".
- WP3 "Social and sustainable innovations modelling for energy communities".
- WP4 "Digital platforms and tools for energy communities".

2.2.1. Rationale for relationship with WP2

WP2 stands as a cornerstone within the Masterpiece project, playing a central role in addressing essential aspects of EU regulations and legislations pertinent to ECs. It also identified the technical, business and end users' needs within the EC sector across the EU. By addressing these requirements, WP2 sets the stage for subsequent work packages: WP3, WP4, and WP5, as well as WP6 for the business and societal impact assessment and exploitation.

This deliverable leverages the outcomes of T2.3 'Pilot surveys, validation scenarios analysis and deployment definition', T2.4 'Evaluation planning and KPIs definition', and T2.5 'Social innovations specifications and architectural blueprint', generated early in the project. These tasks, conducted early in the project, provide critical insights into application scenarios, initial use cases, analysis, and the foundational definition of evaluation planning and KPIs.

D2.3 titled 'Functionalities' needs and performance measurement planning', describes the outcomes of T2.3 and T2.4, emphasising application scenarios and KPIs definition. The initiation of pilots in Month 10, following the submission of D2.3 in Month 6, underscores the necessity for a more detailed explanation of Use Cases and KPIs. The temporal misalignment between D2.3 submission and pilot initiation has created an information gap, necessitating an in-depth exploration within this deliverable series.

Furthermore, D5.3 is intricately linked to D2.7 titled 'Architecture design and functional blueprint' delivered in Month 9. This early version formalises and synthesises, both technically and functionally, all envisaged operational blocks within the project's conceptual framework based on the activities foreseen in T2.5. It also supports the technical development and integration in WP3, WP4, and WP5.

2.2.2. Rationale for Relationship with WP3 and WP4

The rationale for the relationship with WP3 and WP4 is rooted in the intrinsic connection between the definition of use cases and the identification of tools within Masterpiece. WP3 and WP4, collectively form the backbone of the project's technical and conceptual framework.

Without a clear understanding of how Masterpiece tools function together, delivering a good set of use cases becomes challenging. Therefore, this deliverable will not only present the use cases as explained in the rationale for the relationship with WP2, but also showcase the interplay between Masterpiece tools. This elucidation provides a holistic view of how these tools synergise, demonstrating their collaborative functionality.

D4.1 titled 'Requirements of the digital platform, conceptual design and definition of the tools for flexibility' plays a role in this relationship. It serves to formalise the identified tools technically and functionally, also known as functional /operational blocks derived from

D2.7. In its initial version, D4.1 serves to support the development and integration activities planned in WP3, WP4, and WP5.

Additionally, D4.3 titled ‘First implementation of the digital platform and tools’, describes the deployment of the digital platform in its initial version. This deliverable includes a description of the digital tools that are in functional form at the time of submission. While D4.3. will delve into the specific details of these tools and their respective groups, the current deliverable provides a brief yet insightful overview of the Masterpiece tools. This overview sets the stage for a successful delivery of the first report in its series, focusing on the planning and progress of the intervention programme.

2.2.3. Alignment with WP5 Tasks

Positioned as a pivotal element of WP5, D5.3 aligns specifically with the tasks outlined in WP5, focusing on the practical implementation of pilots’ scenarios across Italy, Turkey, France, and Sweden, with the overarching objective of showcasing the tangible application of the Masterpiece Intervention Programme.

This report leverages key components of WP5, particularly T5.1 titled 'Proof of Concept, System Integration & Pilot adaptation'. Within this task, D5.3 integrates the Proof-of-Concept pilot scenario, as it paves the way for the smooth implementation of Masterpiece intervention programme. Additionally, this report details the tasks T5.2, T5.3, T5.4, and T5.5., offering a view of the planned activities, progress, and adaptation strategies across the diverse pilot sites.

Additionally, this report sets the stage for T5.6 titled 'Intervention Programme: evaluation of social, environmental, technical and economic impacts', which represents the culmination of the intervention efforts, focusing on the evaluation of the integrated Masterpiece solution within real-world EC pilots. This task aims to provide an in-depth analysis of the project's evolution and impact by considering multi-dimensional aspects, including social, environmental, technical, and economic dimensions. The evaluation process is also informed by the requirements analysis conducted in WP2 and the KPIs defined in T2.4, emphasising a rigorous and iterative evaluation approach over the course of the pilots.

2.3. Document Structure Overview

This foundational document D5.3, the first in a series, provides an instalment essential for understanding the trajectory of the Masterpiece intervention programme. It lays the groundwork for subsequent releases, namely D5.4 titled ‘Intervention Programme: All pilots implementation interim update’, and D5.5 titled ‘Intervention Programme: All pilots implementation final update’, which will offer nuanced insights into specific aspects of the intervention programme.

D5.3 unfolds in diverse sections associated with the implementation of interventions across the varied pilot sites. The document is structured as follows:

- Execution Plan: This section introduces the survey strategy and outlines the execution plan for the intervention programme.

- Pilots Description:

    - Introduction to Pilot Sites: This section introduces diverse pilot sites in Italy, Turkey, France, and Sweden, providing context and setting the stage for subsequent detailed discussions.

    - Use Cases and KPIs: The document defines and elaborates on the use cases and KPIs, establishing the parameters for evaluation the success and impact of the intervention programme, and providing the tools to be used for the latter.

    - Assets Overview: Offering insights into available and selected assets, including devices and potential social data sources across the pilot sites.

- Current Integration Status: This section provides an overview of the current integration status, outlining existing APIs and detailing the present situation at each pilot site.

- Next Steps and Action Points: Detailing the programme forward, this section outlines the next steps and action points in the ongoing implementation of the intervention programme.

- Insights, Challenges, and Barriers: The document concludes with reflections on insights gained, challenges encountered, and barriers identified during the initial phases, setting the groundwork for subsequent releases and in-depth analyses.

Each of these sections is divided to address the specifics of each pilot site, ensuring a nuanced and comprehensive understanding of the Masterpiece intervention programme's implementation across geographical, social, and economic spectrums.

3. EXECUTION PLAN

The execution plan serves as a foundational guide for the systematic implementation of Masterpiece interventions and pilot activities. This plan delineates the project execution approach, outlining the strategies to achieve the primary objectives specified in the Grant Agreement. These objectives include a 30% increase in EC adhesion, a 20% increase in federated services with ECs, and the creation of embryonic models for mobility services across the pilot sites. The pursuit of these goals has specific methodological implications for programme execution.

The Masterpiece approach places a strong emphasis on its intervention programme to foster growth and understanding within ECs. Employing a participatory approach, the project's execution plan engages various stakeholders and community members, adhering to the principles of Community-Based Participatory Research (CBPR). This approach ensures equitable involvement of all parties throughout the process, where each party contribute with its expertise and shares decision-making and ownership. The execution approach prioritises role clarity, process efficiency, and adaptability to the dynamic nature of pilot implementations and interventions within the ECs. It considers the diverse contexts of pilot sites, ensuring interventions are tailored to specific community needs while maintaining a cohesive project-wide strategy.

The crucial component of the Masterpiece execution plan is the survey strategy, particularly significant for the evaluation and measurement of KPIs in selected use cases.

Survey Strategy

Surveys are a very helpful evaluation tool for gathering participants' feedback, allowing for direct interaction between the analyst and the individuals for whom the piloting event is intended.

To guarantee the reliability and relevance of survey data, Masterpiece has opted for a phased approach.

The strategy started with the identification of the control user group in each pilot site. Initially, a selected group of test users, a sub-set of the broader energy community members, will participate in the first launch of surveys feedback. The size-sample is of 10 to 20 participants, so that the group is representative of the community.

By pilot-testing on a small scale, Masterpiece partners can identify what modifications, conditions, and supports are necessary for implementing the initiative on a larger scale.

This approach allows for the validation of survey quality through initial feedback and necessary adjustments. Once quality is confirmed, the survey circulation will expand to include all Energy Community members. This phased approach mitigates risks associated

with data quality, providing a controlled environment for the initial phases, and ensuring that broader community surveys are based on proven methodologies. This enhances the credibility and utility of the collected data for robust evaluations and insights.

The first trial marks an initial step in the execution of the Masterpiece intervention programme. The survey strategy in the initial piloting phase facilitates monitoring potential problems, preventing their deterioration, and ensuring the accomplishment of several goals before the full implementation.

4. PILOTS DESCRIPTION - PILOTS SITES : UCS, KPIS, ASSETS

In executing Masterpiece project's intervention programme, a well-defined strategic vision is paramount, guiding specific and measurable goals. These goals range from the adoption of innovative technologies to behavioural shifts in energy consumption and the establishment of collaborative frameworks within energy communities.

The proof-of-concept scenario serves as the foundation of the pilots' implementation, and therefore, it will be prominently included in this report. Use Cases are the narrative backbone of each pilot, illustrating specific scenarios to be explored and implemented. These real-world situations reveal how the Masterpiece solutions address tangible challenges within diverse community contexts. KPIs are essential for providing quantifiable metrics to gauge the success and impact of each pilot. By defining measurable parameters, Masterpiece ensures a systematic approach to assessing interventions' effectiveness across social, environmental, technical, and economic dimensions, which is crucial for later analysis. The Assets Overview provides a site's assessment through an inventory of resources, capabilities, and existing infrastructures. This overview ensures that all necessary elements are in place to realise the strategic vision and achieve the defined objectives.

4.1. Overview of Pilots Descriptions

The table.1 below showcases an illustrative representation of Masterpiece pilots' partners, including key information such as the pilot country, pilot supervisor, owner, number of ECs.

Detailed information regarding strategic goals, use cases, KPIs, and assets for each pilot will be presented in the subsequent section.

Table 1: Overview of Pilots' Descriptions

Pilot Case	Pilot Partner Supervisor	Pilot Partner Owner	Pilot Site	Number of ECs	Comments
PoC Spain	UMU (main contact) ODINS*	UMU	Universidad de Murcia	1	*ODINS: technical support
Turkey	TROYA	UEDAS	Aşağıçavuş (a forest village)	1 (2nd EC pending on Canakkale)**	The forest village in the alternative plan chosen

					for the EC. **Canakkale is pending due to the earthquake
Italy	R2M	BERC	Municipality of Berchidda	1	
France	RDIUP	ALEC	Solévent	1	
		SEIN	Poissy & Magnanville	1 EC in Poissy & 1 EC in Magnanville	3 ECs in total (SEIN & RDIUP)
		RDIUP	Les Mureaux	1	
Sweden	SUST	NGENIC	BRF Väppeby Backe	1	
			BRF Venus	1	
			Austerland	1	
		UPP	Dansmästaren	1	

4.2. Detailed Pilots Descriptions

In the forthcoming section, to have a complete idea of Masterpiece pilots, we aim to detail Masterpiece pilots. This entails a thorough breakdown of each pilot's objectives, intricacies of defined use cases, the KPIs established to gauge the programme's success, the tools designated for KPIs measurement, the strategy for achieving the outlined use cases at each pilot site, and an overview of the assets in each unique setting.

4.2.1 PoC: Spain - UMU: Universidad de Murcia

4.2.1.1. Introduction to Pilot Sites: Description and main goals

The University of Murcia is the Proof of Concept (PoC) for Masterpiece. This PoC will serve as an example for the rest of the pilots. More specifically, the PoC corresponds to a subset of facilities (e.g. buildings, photovoltaic solar installations, etc.) of the university, as UMU has more than 60 assets and physical resources across its five campuses.

The subset of facilities in the PoC include both photovoltaic installations and buildings, mainly located on the Campus of Espinardo. These buildings have various operational devices, some of which are isolated in terms of communication, while others are already integrated into existing building management systems.

A characteristic aspect of the PoC is the differentiation of two types of members within the energy community. On one hand, there are individuals, namely those who utilise university facilities (e.g., students, professors, etc.). On the other hand, there are the university buildings themselves. This distinction allows us to implement various strategies at different scales within the PoC, as they are reflected in its use cases. This enables coverage from the individual level of citizens to the university infrastructure.

The main aim of the PoC is to take one step beyond what a traditional energy community is, by aiming to i) form what we call a *Digital Energy Community* (more information on this concept can be found in D4.3). To achieve this, the objectives are focused on using solutions and tools developed in Masterpiece; ii) raising awareness and informing users about energy communities to foster a socially responsible community; iii) digitalising the energy infrastructure of the selected subset of the university (e.g. energy monitoring, integration of new devices, communication with isolated devices, etc.); iv) promoting energy flexibility for efficient management that can adapt to various factors in the energy sector.

4.2.1.2. Use Cases and KPIs

UC1 - Fostering a Socially Responsible Energy Community

UC1 description and main goals:

This use case push towards the construction of a socially responsible energy community while materialise the digital counterpart of the energy community. The goal is to have connection to the maximum number of participants through the app, and with that, being able to capture and in cases enhancing of community engagement and commitment to sustainability.

UC1 - KPIs:

- KPI1: Number of people who have installed the tool.

UC1 - Tools to be used:

- MEET App.

UC1 - Achievement Strategy:

The use of the MEET App installation will be promoted to allow the different PoC's users to discover and get to know the world of ECs.

UC1 - KPIs Measurements:

Number of connections/installs in/of the MEET App in the PoC.

UC 2 - Promoting Collaboration and Self-Consumption from PV

UC2 description and main goals:

This use case focuses on directing solar power generation (solar power flows will be simulated based on actual photovoltaic generation available on campus) to power air conditioning systems in specific study rooms, designated as "climate shelters". The goal is to create energy-efficient and comfortable spaces that encourage sustainable study and interaction. By concentrating solar energy in these selected areas, the initiative aims to demonstrate the effective use of renewable energy while inspiring a change in community behaviour.

The level of success is measured by the number of people that moves to these climate shelters and therefore, that have accepted to change their usual location of study. This reflects a broader commitment to environmentally responsible and energy conscious living within the community in their everyday life.

UC2 - KPIs:

- KPI1: Number of people reached and percentage that attained the collaborative behaviour.

UC2 - Tools to be used:

- DR-FLEX

UC2 - Achievement Strategy:

DR-FLEX will be used to analyse the solar generation pattern of UMU installations, and encourage people to move to specific study rooms, called "climate shelters". Leveraging the functionalities provided by DR-FLEX, recommendations will be sent to users to encourage the movement of these key climate shelters where photovoltaic generation has been concentrated. We encourage users to gather in study rooms whose climate control consumption is sourced (simulated mode) from photovoltaic (PV) energy, and to avoid spreading out into many partially filled rooms, thus preventing the wasteful use of excessive climate control. By concentrating occupancy in rooms powered by renewable

energy, we aim to optimize energy usage and reduce the environmental impact of climate control systems.

UC2 - KPIs Measurements:

Due to the information regarding the real-time occupancy of the study rooms, considered as "climate shelters," thanks to installed counting cameras, it is possible to measure the number of people who have participated and their commitment. Furthermore, collecting information about the reach and user feedback is possible thanks to DR-FLEX.

UC 3 - Management of Demand and Fair Pricing

UC3 description and main goals:

It involves designing and implementing demand modifications based on energy prices and renewable generation. There are going to be two types of interventions:

- To modify the demand based on tariffs/grid signals.
- Demand Shift Towards Self-Consumption: which includes not only to modify the demand from low period of renewable generation to high generation periods, but also to encourage users to modify, to collaborate by modifying assets during high renewable energy generation periods, promoting sustainable energy use.

UC3 - KPIs:

- KPI1: 10 % Energy savings
- KPI2: 10 % cost energy savings

UC3 - Tools to be used:

- DR-FLEX

UC3 - Achievement Strategy:

To achieve UC3, DR-FLEX tools will be used with the aim of modifying the EC (Energy Consumption) demand based on a series of different criteria:

- Energy cost savings: The demand will be modified according to electricity tariff prices.
- Encouraging consumption during renewable generation periods: shifting demand to periods of high photovoltaic generation, reducing energy consumption from the grid.

For these two strategies, the load control functionality of DR-FLEX tools will be utilized, being capable of directly controlling the climate control systems of various participating buildings. In this way, the aim is to modify the EC demand in an automated manner.

UC3 - KPIs Measurements:

In the PoC, data on consumption at the building level and climate system will be provided, which will allow for the evaluation of the energy impact of deploying this use case and the

calculation of the KPIs in a straightforward manner. Additionally, the availability of electricity prices on the platform enables the calculation of energy cost savings.

UC 4 - Achieving Sustainable Energy Transition and Equitable Access

UC4 description and main goals:

This use case aims to equalise the energy saving potential between the different faculties of a community. Considering the faculties as members of the EC. Therefore, we have considered faculties are classified as "energy poor" those with outdated infrastructures and no smart monitoring and "altruistic" well equipped with efficient infrastructures and monitoring systems and capable to exporting clean energy. The goal is to distribute the solar power generation (clean energy) according to these savings' potential of the faculties to decrease the footprint in all faculties, thus improving the energy situation of the less equipped ones. This strategy not only enhances grid independence, but also ensures a fair and collective approach towards a sustainable energy transition, emphasizing the improvement of the entire community without leaving any group at a disadvantage.

UC4 - KPIs:

- KPI1: % Increase in grid energy independence (community level). % Deviation in energy savings potential before and after (variation)

UC4 - Tools to be used:

- DR-FLEX.

UC4 - Achievement Strategy:

In the PoC, there are buildings of different purposes, construction dates, materials, and equipment. This means that there are buildings with different energy-saving capacities, as they may be conditioned by their age, insulation of materials, or even by the age or lack of control of their systems. Therefore, the objective of this use case is to try to reduce the inequality between buildings with higher energy-saving potential (altruistic buildings) and buildings with lower potential (energy poor buildings). The aim is to allocate solar power (renewable energy in a simulated way) based on the energy-saving capabilities of the different faculties, with the intention of reducing the environmental impact across all faculties. This approach aims to enhance the energy conditions of those less equipped, promoting grid autonomy and fostering a collective and equitable movement towards sustainable energy practices. This method seeks to uplift the whole community, ensuring no group is left behind in the shift towards sustainability.

DR-FLEX is used for:

- Estimate the potential for energy savings (related to energy flexibility)
- Include information on the demand profile at the device level.
- Include information on the materials and infrastructure of each building.

- Distribute PV generation among the buildings.

UC4 - KPIs Measurements:

Considering the initial energy-saving capacity factor and the distribution of renewable energy consumption, improvements can be compared from a scenario of equitable distribution to one of altruistic distribution. This approach allows for assessing the shift in grid independence as resources are allocated not equally, but rather based on the potential for energy efficiency and support for buildings with less inherent capacity to save or generate energy. This method emphasizes a targeted enhancement of energy independence, focusing on elevating the overall community's sustainability by prioritizing assistance to those in greater need.

4.2.1.3. Assets Overview

So far, the list of assets that are going to be used in this pilot is not fully closed. The group of confirmed hardware assets includes:

- Monitoring of energy consumption at a building level for multiple buildings in the Campus. All the buildings involved in the use cases will be monitored.
- Monitoring of energy consumption of the HVAC systems of multiple buildings, including most of the buildings participating in the pilot.
- Monitoring of energy generation of at least one PV solar plant installed in the Campus.
- Monitoring of temperature sensors for certain buildings involved in flexibility-related use cases (open to be used in other use cases).
- Control of HVAC units (on/off) at building level in multiple buildings.
- Control of HVAC units (on/off + operation mode + temperature set point) at a room level in multiple buildings.
- People counting cameras in one of the locations (related to one of the use cases defined).

4.2.2. Italy - BER: Municipality of Berchidda

4.2.2.1. Introduction to Pilot Sites: Description and main goals

Berchidda municipality is an Italian town of 2668 inhabitants in the province of Sassari, northern part of Sardinia.

The uniqueness of Berchidda, apart from being a small and cohesive community, with an economy based on quality agricultural and wine products and an important and internationally renowned summer jazz festival, lies in the fact that it has its own electricity grid, a very rare case.

In adherence to the Grant Agreement, Berchidda will be joined by R2M Solution, while the partner Gridability has withdrawn from the consortium of partners.

As part of its initiatives, the municipality is replacing the old meters with new smart meters, around 1600 units, which should make the network fully smart and remotely controllable.

The overall goal for Berchidda is to set up the energy community, where smart technologies and community engagement converge to create a sustainable and interconnected energy landscape.

4.2.2.2. Use Cases and KPIs

UC1 - Promoting the transition from consumer to prosumer in an informed and conscious manner among citizens.

UC1 description and main goals:

Extrapolation of prosumer benefits information to consumers to increase consumer interest in transitioning to become prosumers taking advantage of the smart meters.

The Berchidda community has a broad knowledge of what EC is. A few months ago, the Italian government gave a hopefully definitive shape to EC in terms of incentives, administrative and bureaucratic processes, etc. As the EC evolves, the Berchidda community has been informed but not in detail (too many changes have taken place and not enough time to organize the information).

Now it is important that people are made aware of the existing legal framework, benefits, and constraints, and what the next steps will be for the start-up of the EC. To move from the role of consumer to that of prosumer, it is therefore very important to know what it means to participate in an energy community and what you have to do to play an active role in it.

On average, prosumers and consumers have both a smartphone and an internet line.

UC1 - KPIs:

- KPI1: Number of individuals informed.
- KPI 2: Nº of consumers interested in becoming prosumers.

UC1 - Tools to be used:

- MEET App
- EC-Recommender tool

UC1 - Achievement strategy:

While replacing old meters with new smart meters necessary to extrapolate and use data both from consumers and especially from prosumers, ad hoc meetings between the pre-EC manager and technical staff of the municipality can be studied and organised to show the tools developed, their usefulness and how to use them. In this phase, one could not only test the tools but also gather feedback from the pre-EC manager and technical staff of Berchidda to improve and customise the dedicated tools as much as possible.

Once the final and definitive version of the tools has been obtained, they can be presented through workshops with the population.

The best period for the workshops could be during the days of the GA to be held in Berchidda in May 2024.

So, to summarise, the ideal route could be:

1. Online session between pre-EC managers & technical staff in Berchidda with R2M to discover Meet App (EC discovery and learning tool).
2. Online session between pre-EC managers & technical staff from Berchidda with EXP and CERTH to discover EC-Recommender tool (profiling and helping decisions- testing tool).
3. Wrap up with feedback to better calibrate the proposed tools.
4. Presentation of the final tools to citizens, both consumers and prosumers, with 2 workshops (or one workshop) during the GA days in Berchidda.

UC1 - KPIs Measurements:

KPI1 and KPI2 will be measured with different feedback coming out from the workshops. In a physical manner or directly from the tools. For example:

- N° of people who download the apps after the presentation in the workshops.

- N° of people who decide to ask for material/information to go deeper in EC knowledge.

UC2 - Achieving Active Participation and Sensibilisation in Sustainable Energy Usage

UC2 description and main goals:

In the small community of Berchidda, the Municipality wants to organize public events and meetings also within village fairs (agricultural fairs, religious festivals, etc.) for capacity-building moments. The aim is to explain in simple and clear terms the business plan behind the creation of an EC so that every citizen can understand the socio-economic benefits that it can bring.

UC2 - KPIs:

- KPI1: More than fifty citizens have collaborated and been interested in creating the official energy community.
- KPI 2: Nº Interaction within the learning process

UC2 - Tools to be used:

- MEET App
- Compass
- ECOOP

UC2 - Achievement strategy:

Users discovering the potential of energy communities (its benefits and potential) through the Meet App.

Using the COMPASS tool for both individuals and the business world to learn about incentives, potential for investments, ways to save etc.

Finally, ECOOP to be used by EC manager for EC membership process, monitoring etc.

UC2 - KPIs Measurements:

KPI1 is going to be measure by the combination of the interested parameters resulted of the tools used in this UCs. But it can also be very much anchored with the direct signature on an expression of interest document for the creation of EC. This document can be presented directly at the end of workshops, gathering moments where information and insight material on EC/energy issues, in general, is distributed.

KPI2 will be measured through the n° requests about the tools, n° of app downloads.

4.2.2.3. Assets Overview

- 106 Private PV.
- 5 Municipality PVs; Needs to build new PV plants for setting up REC.
- New Smart Meters (1600) are going to replace old ones.
- Secondary cabin concentrators installed; 19 transformers.
- Cabins are under the process to be completely automated and remotely managed.

- Smart grids and smart meters and platform permit an optimal data exchange and best and optimised/efficient use of energy between prosumers and consumers.
- SCADA platform to be used to potentially exchange data (medium voltage)

4.2.3. Turkey - UEDAS: Aşağıçavuş Forest Village

4.2.3.1. Introduction to Pilot Sites: Description and main goals

Due to the earthquake in Turkey, the Çanakkale pilot site, as was determined in the Grant Agreement, is pending.

The selected Turkish pilot site is Aşağıçavuş, a forest village. Within this village, there are 19 rooftop solar plants with a capacity of 2250 kWp (DC) per plant. These installations, done by the Ministry of Agriculture and Forestry, aim to support forest villages. In this way, an energy community will be formed with the forest villagers.

All meters integrated into the systems can be remotely monitored, allowing us to easily access consumption and production data for project use.

4.2.3.2. Use Cases and KPIs

UC1 - Understanding ECs and engagement of citizens.

1st phase of UC1 description and main goals:

With all the technical infrastructure in place for producing and storing renewable energy, TROYA will organise specific seminars and energy literacy education to inform and engage the inhabitants in the pilot site to start an energy community. According to preliminary Turkish site studies, 12 of the 19 households have low education and energy literacy levels.

For the next step, TROYA is planning to increase their knowledge and awareness by providing energy, climate, sustainability, and some technical training to a total of 19 households. The aim is to create the concept of Energy Community with at least 10 of these 19 households' community through these trainings and by that to create the first EC concept in Turkey.

1st phase of UC1 - KPIs:

- KPI1: Nº Interaction within the learning process
- KPI2: Rate of understanding of the EC environment

1st phase of UC1 - Tools to be used:

- MEET App.
- EC-Recommender.

1st phase of UC1 - Achievement strategy:

As the households do not have an internet connection, but the pre-EC manager does. The pre-EC manager is going to be the bridge between the tools and the households. The pre-EC manager will undergo training to use the MEET App and EC-Recommender. Pre-EC

manager will organise workshops to transfer and to make households be in touch with this tool, achieving ECs understanding and engagement. Therefore, the overview path to be followed will be:

- Workshops EC-Recommender: profiling and helping decisions- testing tool.
- Workshops Meet App: EC discovery and learning tool.

1st phase of UC1 - KPIs Measurements:

KPI1 and KPI2 will be measured through different feedback obtained from the workshops, either physically or directly from the tools.

2nd phase of UC1 description and main goals:

Second phase of this use case focuses on empowering the people of the pilot site to acquire a solid knowledge and understanding of ECs by exploring within a great variety of resources. Also, to inform and engage the citizens of the village about the potential for starting their own energy community, leveraging the existing technical infrastructure in the pilot site. According to the first site study, since the knowledge level of the households is low, most of them are uninformed about the energy community and are hesitant about it. TROYA and UEDAS will plan to test the steps of creating a community together by developing them with ecological and conceptual training to familiarise them with the energy community concept and include them in it. Our aim from 19 households will be to ensure that users act as an energy community with 50% participation.

2nd phase of UC1 - KPIs:

- KPI3: Rate of acceptance to create an Energy Community

2nd phase of UC1 - Tools to be used:

- ECOOP.
- EC-Recommender.

2nd phase of UC1 - Achievement strategy:

The ECOOP application will be used for implementing the strategy to achieve this second phase of UC1. Due to the pilot site's lack of internet access and low digital literacy among users, EC Managers will be authorised by TROYA coordinators. EC Managers will conduct regular field visits and collect data. This data will be uploaded to the ECOOP app. Initially, one EC will be created among 19 households, and each household will be coded separately and entered the system. Consumption profiles for these households will be established. All households have rooftop PV systems, and their production capacities and self-consumption will be reported monthly through the application. If any members wish to leave the community or if the number of committee members decreases, flow will also be managed through the application. Motivational activities will be conducted based on the data to actively engage members in the application. Monthly reward methods will be

experimented, such as energy-saving comparisons among members and challenges and measuring how much they have reduced their carbon footprints, and EC Managers will measure their reactions to these incentives.

These strategies are to be measured with a special decarbonisation and savings algorithm within the application. The application will provide monthly data on self-consumption and energy savings for each household. Data needed by application could be taken through UEDAS AMR system API providing energy consumption or if manual data entry is required historical data could be also provided for a specific date. In this way, EC Managers will share the data for each household at pilot meetings and strengthen the adaptation of members to the energy community by implementing incentive methods.

As for EC-Recommender, it will be used for decision making.

2nd phase of UC1 - KPIs Measurements:

The KPI3 will be measured by the number of households joining the EC through the ECOOP system.

Therefore, the KPI3: Rate of acceptance to create an Energy Community = [(Nº of households entered the system of ECOOP for the EC / Total number of households) *100].

*Entered, meaning, that they allow to implement/have their data and household consumption profile in the ECOOP.

UC2 - Achieving Active Participation and Sensibilisation in Sustainable Energy Usage

UC2 description and main goals:

The pilot site uses solar panels on designated buildings, with the goal of going beyond simple green energy deployment. Each customer has individual solar installations, and they are going to be treated as a unified system, i.e., from a community standpoint being total community solar generation. This ensures a fair and efficient energy transition throughout the community, eliminating generation disparities.

Therefore, users will be encouraged by providing them with recommendations to adjust their energy consumption when there is community solar production, as well as to show them the consumption and solar generation of the community.

UC2 - KPIs:

- KPI1: Energy shifted to solar generation periods (from the Community point of view) (kWh)
- KPI2: Community participation rate (%)

UC2 - Tools to be used:

- DR-FLEX.

UC2 - Achievement Strategy:

As the households do not have internet connection, the path to be follow will be:

- Once the DR-FLEX tool is ready, TROYA (together with the leader of UMU - if needed) will organise workshops with the households to learn how to interpret the visualised data (consumption, PV generation in individual / community way), how to actuate based on the recommendations, to show the results of the shifting they have made (when it is applicable), etc.

- The EC manager will be responsible for informing households about the recommendations. The EC manager will receive (at first hour in the morning) from the DR-FLEX tool to adjust their energy consumption based on PV generation.

UC2 - KPIs Measurements:

KP1: will be measured by comparing a consumption baseline (to be decided, e.g., the day before) with the shifted consumption day, based on the day recommendation received.

KPI2: In the recommendation of DR-FLEX there will be the option for the person using it, to indicate if it has acted based on the recommendations. [User Action Confirmation Rate (%)]

4.2.3.3. Assets Overview

The pilot site uses solar panels, and each customer has individual solar installations, and they are going to be treated as a unified system, i.e., from a community standpoint being total community solar generation.

Data needed by application could be taken through UEDAS AMR system API providing energy consumption or if manual data entry is required historical data could be also provided for a specific date. In this way, EC Managers will share the data for each household at pilot meetings and strengthen the adaptation of members to the energy community by implementing incentive methods.

4.2.4. France - SEIN : PART'Ener : Poissy and Magnanville

4.2.4.1. Introduction to Pilot Sites: Description and main goals

In Poissy and Magnanville, PART'Ener aims to redefine collective energy initiatives.

SEIN, through the PART'Ener project, supports the Grand Paris Seine & Oise region (73 municipalities) in the development of local energy loops and energy communities. Our goal is the development of 10 EC by 2026. In France, there are tools to identify the solar potential of territories for large installations. There are no tools to map the solar potential for energy community projects, which are mechanically and legally smaller.

Our objective is to promote both the development of solar energy and self-consumption. We need to cross the solar potential with the consumption potential (global and by typology of actors), considering the regulations limitations (e.g. 2km, 3MW), to locate and size the ECs.

In Poissy and Magnanville, we will have a single energy plant installed on two car parks.

4.2.4.2. Use Cases and KPIs

UC 1 - Evaluation of Joint Ownership Model for collective PV installation Investment

UC1 description and main goals:

This use case aims to establish a joint ownership model for the collective investment in PV installations. The objective is to create a collaborative framework where participants contribute collectively to develop and co-consume energy generated by the PV installations.

The PART'Ener project, through this model, proposes a tailored Joint Ownership Model wherein members co-invest for collective PV installation, creating a sense of shared ownership and shared benefits.

Participants will pay entrance tickets from 500€ to 20.000€, in return they receive from 5-15% of surplus energy for self-Consumption.

UC1 - KPIs:

- KPI1: Up to 60 engaged members | Establishing 3 categories of members: Residential, Small and Medium businesses, Large Groups or Consumers.
- KPI2: CAPEX per kW installed < 2500 EURkW | Yearly OPEX per kW PV installed < 50 EUR.

UC1 - Tools to be used:

- COMPASS
- EC-SIM

- SIT
- EC-MGMT

UC1 - Achievement Strategy:

The assembly of the two energy communities (Poissy and Magnanville) is underway. The energy community of Poissy is more advanced than the EC of Magnanville. The COMPASS tool will be presented to the participants of the two energy communities to identify and test new levers to accelerate the creation of the Magnanville energy community. This work will also be done based on feedback from Poissy.

A lot of technical-economic data was collected during the first stages. They will be implemented in EC-SIM-SIT-MGMT to test the tools and validate the results obtained with other tools. Workshops will be organised to present the tools and results obtained in our first two communities to the partners of the two energy communities.

UC1 - KPIs Measurement:

Contractual documents and annual reports from the two energy communities and output data from the tools used: number of user accounts, user profiles, technical-economic analysis.

UC 2 - Promoting Inclusivity, fair governance, and Equity, in Collaborative Self-Consumption ECs

UC2 description and main goals:

The aim is to encourage EC members to adopt new measures and behaviours, this involves the impact of their consumption patterns, and additional investment. Therefore, the goal is to boost their long-term engagement and promote a faire governance and collective decision-making processes.

UC 2 - KPIs:

- KPI1: At least 3 actor profiles represented in EC: public and private economic actors, academic actors, households.
- KPI2: Balanced governance - at least 3 votes per category of stakeholders during decision-making.

UC 2 - Tools to be used:

- ECOOP
- EC-Recommender

UC2 - Achievement Strategy:

Organisation of workshops and events to present ECs and profile local actors, interested actors and actors committed to participating in an EC.

Use of the EC-Recommender to profile individual participants in addition to economic actors to promote the diversity of actors within the energy community.

Presentation and use of the ECOOP tool for leading energy communities in the decision-making process.

UC2 - KPIs Measurement:

The KPIs will be measured by the Masterpiece tools used and justified with documents from EC (contractual documents, reports, ...). ECOOP will track the numbers of votes during decision-making, and analyse the actor profiles represented in EC.

4.2.4.3. Assets Overview

Each EC, in Poissy and Magnanville, has one collective PV production installation of about 110 kWp to be shared between all EC members. It represents a total yearly production of about 120 000 kWh for 20 years lifetime exploitation.

4.2.5. France - RDIUP : Les Mureaux

4.2.5.1. Introduction to Pilot Sites: Description and main goals

Les Mureaux Energy Community is still at a very early stage. Its vision is centred around empowering citizens while promoting solar-powered energy community ownership. This EC will learn from the previous French EC to enhance practices and improve the involvement and engagement of EC members.

In Les Mureaux, we have the goal to have several distributed PV installations on car parks and buildings.

A storage system will be tested in EC les Mureaux to provide specific services for participants that have not consumed their part.

4.2.5.2. Use Cases and KPIs

UC 1 - Empowering Citizens' Access to Solar-Powered Energy Community Ownership

UC1 description and main goals:

The goal of UC1 is focusing on facilitating the discovery of ECs at early stage and informing citizens about sustainable energy practices while promoting solar energy and self-consumption.

Also, an accessible framework for proximity eligibility and analysis should be provided for all potential EC members to allow them to explore the possibility ECs' joining.

The EC model involves association creation, co-investment, and co-consumption of energy. The model engages communities, businesses, and citizens. Participants are encouraged to be involved in EC management, strategy, and community animation, fostering engagement and diverse projects beyond energy production.

UC1 - KPIs:

- KPI1: Eagerness to learn more about ECs.
- KPI2: Acceptance to join a Solar-powered ECs (%).

UC1 - Tools to be used:

- MEET App.
- ECOOP
- COMPASS

UC1 - Achievement strategy:

Through MEET App: Hosting educational campaigns (webinars, workshops, and interactive sessions) to train potential EC participants to learn more about ECs. ECOOP to

facilitate EC formation, encourage co-investment and promote co-consumption of solar-powered energy. Through ECOOP, participants can discuss with other members and EC managers, organise events and online meetings, share documents, vote online, etc.

The COMPASS tool will be presented to Les Mureaux partners to identify and test new levers to accelerate and consolidate the assembly of the energy community. This work will also be done based on feedback from Poissy and Magnanville.

UC1 - KPIs Measurements:

KPI1: MEET App to provide educational content and use analytics to track user engagement with the educational content, and measure number of participants in webinars and workshops. + Quiz KPIs: result of a quiz given in the various pilots' workshops.

KPI2: ECOOP to monitor the percentage of participants who join and participate in Solar-powered ECs. Through the number of participants who join EC that ECOOP gauge community interest and acceptance.

4.2.5.3. Assets Overview

The EC in les Mureaux will be composed of various distributed PV installations in two schools and one in Newton building. At this stage, we have one small PV POC (in the Newton building) of about 5 kWp and a battery storage of about 9.8 kWh. Several Shelly e-meters are already installed with the possibility to use Linky provided by TSO via the official interfaces integrated in the ECOOP tool.

Potential stakeholders are already expressed their willing to join and contribute to the EC (Les Mureaux City, Co-working Newton building, Emile Zola school and SEINERGY lab building).

4.2.6. France - ALEC: Solévent

4.2.6.1. Introduction to Pilot Sites: Description and main goals

Solévent was created in November 2018. 250 people are now involved in this energy community. Citizens, cities, companies, and associations can take part in the capital. For the moment, they are only working on photovoltaic solar energy. 293 MWh are produced each year, all of which is reinjected into the grid. Total investment is €275k. Solévent is an SAS (simplified joint stock company) with variable capital and cooperative operations. Any individual can apply to become a shareholder, and legal entities can become shareholders in the company.

The Bordeaux City Council has voted to acquire a stake in Solévent and Solévent is working the department of Gironde on some projects. A part-time employee has been working for the EC since November 2020. He is responsible for project development, community organisation and communication.

4.2.6.2. Use Cases and KPIs

UC 1 - Management of the EC and participation of the members in the activities

UC1 description and main goals:

1/To facilitate a transparent management of the Energy Community, with the view of solar energy production of the EC to both EC managers and members.

2/To encourage participation and interest among EC members, creating a more engaged and informed community by facilitating the information exchange, social interaction, and the organization of various community activities.

UC1 - KPIs:

- KPI1: Number of logins / Time spent on ECOOP.
- KPI2: Number of interactions between participants (participation frequency in private chat rooms and discussions/ number of meetings organised within the EC).

UC1 - Tools to be used:

- ECOOP.

UC1 - Achievement Strategy:

EC members can visualise the production on their PV plants -via a web page or an app.

EC members can discuss with other EC members, organise thematic group discussion, organise event (with shared calendar), can share document, can organise online meeting and can communicate with EC manager.

EC manager can communicate with EC members, can share documents online, can organise a vote online, can do the financial checking.

EC manager can manage mailing lists (prospects and actual members).

2 training workshops need to be organised:

- 1 for EC manager to learn how to use the manager interface.

-1 for EC members to learn how to use the tools - it would be interesting to have a document/replay explaining the tools for the EC members that cannot attend the workshop.

UC1 - KPIs Measurements:

ECOOP can measure the KPI by:

- Number of accounts and logins.
- Time spent on ECOOP.
- Participation frequency in private chat rooms and discussions.
- Number of meetings organised within the EC.

UC 2 - Enrolment and on-boarding on the EC

UC2 description and main goals:

To streamline the subscriptions and on-boarding for new members joining the Energy Community (EC), minimizing administrative complexities.

UC2 - KPIs:

- KPI1: Number of new members interested in joining the EC.
- KPI2: Qualitative feedback of EC-Recommender (online questionnaire).

UC2 - Tools to be used:

- ECOOP.
- EC-Recommender.

UC2 - Achievement Strategy:

- EC-Recommender helps EC manager in prospecting phases by recommending arguments depending on the target.
- EC-Recommender helps EC manager to engage EC members/ to increase the engagement in the community activities of EC members.
- 1 training workshop is needed for EC manager to know how to use the tool.
- ECOOP facilitates the enrolment of new EC members by allowing an online subscription (digital signature, external payment for initial version; potential integrated online payment in future versions).

- Best option would be the possibility for EC manager to integrate the enrolment tool in Solévent WordPress website - with relevant plug-in / script for EC manager to use.
- 1 workshop with EC manager is needed to present ECOOP enrolment tool.

UC2 - KPIs Measurements:

- ECOOP count the number of people that consult the tool / registration page.
- EC-Recommender: KPI could be qualitative feedback from EC manager regarding the use of the tool on a panel of selected members - using questionnaire (TBC with EXP).

UC 3 - Achieving Active Participation and Sensibilisation in Sustainable Energy Usage

UC3 description and main goals:

This use case focuses on the pilot site's schools which have solar panels installed in their main buildings (primary, elementary, etc). School users will be encouraged to adjust their consumption when there is solar production, by providing them recommendations and by showing them the consumption (if possible) and solar generation. It could be interesting to do it not only on an independent level (per school), but also as the community level with the aggregation of solar panels generation of several schools, allowing each school to see its consumption / production compared to the total aggregated one. Another option would be to display regional consumption / production so that the users can be aware of consumption peaks.[1]

UC3 - KPIs:

- KPI1: In the recommendation of DR-FLEX there will be the option for the person using it, to indicate if it has acted based on the recommendations. [User Action Confirmation Rate (%)].

UC3 - Tools to be used:

- DR-FLEX.

UC3 - Achievement Strategy:

- Once DR-FLEX is ready, ALEC (together with the leader of UMU - if needed) will organise a workshop to present it to the users (teachers, parents, pupils, agents) to learn how to interpret the data, and to actuate based on the recommendations, the tool, etc.

[1] HTTPS://WWW.RTE-FRANCE.COM/ECO2MIX/LES-DONNEES-REGIONALES#CONSOMMATION-ET-PRODUCTION

- Schools will be able to see their generation in an individual manner and to see in an anonymous way the aggregated one (the total of the three schools). They will receive recommendation to shift energy / to promote the consumption during high solar generation periods.
- Users can see the regional consumption/production and are informed of consumption peaks so that they can erase or switch their consumption.

UC3 - KPIs Measurements:

- DR-FLEX allows user to indicate if he or she has actuate based on recommendation.

4.2.6.3. Assets Overview

At this stage, Solévent has installed photovoltaic solar panels on the roofs of 4 schools.

The output of the solar panels is visible in real time for each building via an application (Sunny Portal) included with the purchase of the inverter (SMA).

Table 2: Photovoltaic Solar Panels Installations in Solévent

Name of installation	Power installed	Investment
School Marcel Sembat - Bègles:	36 kWc	40 000 €
School Betey - Andernos:	84 kWc	90 000 €
School Gambetta - Bègles:	33 kWc	47 000 €
School Centre - Le Bouscat:	100 kWc	90 000 €

+ New 30kWc project in Marc Rebeyrol school in Canéjan = March 2024

4.2.7. Sweden - UPP: Dansmästaren

4.2.7.1. Introduction to Pilot Sites: Description and main goals

Dansmästaren is what is called a multi-hub - a building holding several functions and techniques. The facility was built by Uppsala municipality (UPP), and most of the occupied area is under UPP's management and data control. Several attempts have been made to either start an energy community in UPP's command or to engage citizens to start their own. Thus far, all attempts have failed, either by regulatory hindrances or lack of support from citizens. With Masterpiece, UPP aims to create a use case according to the aforementioned scenarios, with the end result being an established energy community.

4.2.7.2. Use Cases and KPIs

UC 1 - Understanding ECs and engagement of citizens.

UC 1 -description and main goals:

Inhabitants of the pilot site will be empowered to understand ECs through diverse resources. UPP aims to inform and engage the inhabitants in the pilot site, encouraging them, with UPP's assistance, to initiate an energy community.

UC1 - KPI:

- KPI1: More than five citizens have collaborated and have been interested in the creation of the official energy community with active participation in the Masterpiece digital platform.

UC 1 - Tools to be used:

- MEET App.
- Compass
- ECOOP

UC1 - Achievement Strategy:

Users to discover ECs and the energy world through MEET App in parallel with the EC-recommender tool. The COMPASS tool will keep UPP, and the users informed and aware about the incentives, investments, other fundings, etc. ECOOP will be used by the EC manager for joining and monitoring, etc.

UC1 - KPI Measurement:

KPI1 is measured in individuals using the previous chosen Masterpiece tools, at least five individuals per tool are needed to qualify for a KPI.

UC2 - Empowering Citizens in Renewable Energy Community

UC2 description and main goals:

If a group is interested in starting an energy community, this use case will utilise tools to make simple calculations of the feasibility of an energy community. It aims to explore possible options such as investment, financials, energy flow of energy communities considering all the technical infrastructure in place of the pilot site for producing and storing renewable energy showing the inhabitants the possible investments.

UC2 - KPIs:

- KPI1: At least two communities/organisations have used the tool to gauge the possibility of forming an energy community.
- KPI2: % "Success ratio" in - after using the tools - the community takes further steps to start an energy community should be at least 25 %. [Further steps include contacting the municipality or the DSO for additional information].

UC 2 - Tools to be used:

- EC-SIM

UC2 - Achievement Strategy:

Conduct meetings with citizens, both physical and through UPP's web page, to present the EC-SIM tool and guide its usage.

UC2 - KPIs Measurement:

KPI1 will be qualified as approved, if the municipality is present when the tool is used (UPP will document it).

Number of tool usage sessions: Track the sessions conducted, whether guided or not, for measurement.

UC 3 - Registering an official EC.

UC3 description and main goals:

UPP views energy communities as an effective tool for the energy transition but is uncertain about the administration and processes behind it. UPP therefore aims to register - in its own name - an energy community and learn from it. The energy community will utilise the digital platform that Masterpiece offers. This use case emerges from the other two, demonstrating how UPP will successfully become an energy community through the various Masterpiece tools.

UC3 - KPIs:

- KPI1: UPP is an official energy community.

UC3 - Tools to be used:

In this use case the components are not applied directly but are derived from those used in the other two cases.

UC3 - Achievement Strategy:

Feed from and follow-up on the other two use cases to achieve the goal of UPP becoming an official energy community.

UC3 - KPIs Measurement:

Official document from UPP will serve as a Boolean KPI for KPI1.

4.2.7.3. Assets Overview

- 1 incoming grid connection
- Hourly metering of consumption
- PVs on the roof
- EV chargers
- Battery storage
- Building thermal
- 133 apartments (tenants).

4.2.8. Sweden - NGENIC: BRF Väppeby Backe & BRF Venus

4.2.8.1. Introduction to Pilot Sites: Descriptions and main goals

Both BRF Väppeby backe and BRF Venus are condominium organisations that are already having a cooperation in place, but energy is not a topic and energy communities are not known.

Both sites have had plans on installing PV panels so PV will be integrated into the pilots.

In BRF Väppeby Backe, during the first 14 month of the project, the organisation has started the process of installing energy sharing infrastructure and batteries for ancillary services such as FCR. I will be interesting to see the knowledge increase in the organisation.

In BRF Väppeby Backe, the energy literacy will be increased in the test groups:

- +10 apartments in BRF Väppeby Backe.

In BRF Venus, during the first 14 month of the project, the organisation has mounted the 11 PV systems with inverters from Growatt and Ferroamp together with electricity meters from NGENIC. So, we will now be able get that data into the pilot. It will be interesting to see how many that are increasing the knowledge of the PV production and their own usage.

4.2.8.2. Use Cases and KPIs

UC 1 Strengthening social bonds and energy literacy.

UC 1 description and main goals:

This use case is to increase the knowledge and interest within the organisations, BRF Väppeby Backe and BRF Venus, increasing the energy literacy in the test groups.

UC1 - KPIs:

- KPI 1: Increased feeling of energy interest and willingness to change.
- KPI 2: Completion of at least 1 action based on your energy literacy.
- KPI 3: [Only in BRF Venus] +20 out of 80 apartments in one staircase to have increased knowledge compared to the other 720 apartments.

UC1 - Tools to be used:

- ECOOP
- MEET App.

UC1 - Achievement Strategy:

A key factor to foster the development of energy communities in Sweden is to have engaged and educated energy citizens. For this, NGENIC will use the MEET App to onboard reference persons; and the ECOOP tool to measure the increased engagement from users in BRF Väppeby Backe and BRF Venus. The strategy involves:

- Send questionnaire before intervention.

- Invite to test the app.

- Use another staircase as reference where we don't interact, so that we can measure the compared difference.

-Host digital evening meetings about energy courses, through the apps, to increase awareness.

UC1 - KPIs Measurement:

The ECOOP tool will monitor changes in user behaviour over time, verifying increased energy awareness. A comparison will be made with the usage of the customer portal.

4.2.8.3. Assets Overview

- Access to electricity meters in each apartment.
- Total measurement of the buildings.
- PV data directly from site will be available during spring 2024. These data will be provided as anonymous time-series.

4.2.9. Sweden - NGENIC: Austerland

4.2.9.1. Introduction to Pilot Sites: Description and main goals

Austerland, located in the Island of Gotland. The users that are scattered over this small region on the island of Gotland have a long history of cooperation in building a water treatment plant. The community aims to collectively own a new PV park and the aim is to empower them with increased usage of the PV they produce. The goal is to demonstrate a return on investment.

4.2.9.2. Use Cases and KPIs

UC 1 - Empowering citizens in PV community energy ownership showing the return on investment.

UC 1 description and main goals:

Empower users in Austerland to collectively own and utilize a new PV park, demonstrating the return on investment.

Regarding this pilot site, for this use case, there will be two types of users, differentiated, divided in two groups:

- Group1: Users with home DSO meters connected with an NGENIC Track P1 package that will see the whole picture of usage and PV production.
- Group 2: Users utilising the platform to show their return on investment in the cooperative PV investment. This group doesn't have their DSO meters connected.

UC1 - KPIs:

- KPI1: At least 5 users of Group 1 interact to view their usage and PV production.
- KPI2: % Average return investment for at least 5 people from Group 2.

UC1 - Tools to be used:

- EC-SIM
- SIT
- EC-MGMT (TBC)

UC1 - Achievement Strategy:

- Clearly outline the cost of monitoring production over time using the tools.
- Analyse the investment for the park and individual shares (my individual investment, 14 shares or something)
- Use the tools to estimate and track actual installation.

UC1 - KPIs Measurement:

- 10 persons have used the tools.
- 5 persons from Group 2 have used the tools to monitor their return on investment.

4.2.9.3. Assets Overview

The solar park will be constructed in 2024, with integration of production data.

During 2024, users will be offered to connect an NGENIC track unit to their DSO meters for monitoring their energy usage.

Additionally, users from Group 2 will be requested to extract historical data from their DSO meters.

4.3. OVERVIEW OF PILOTS KPIS

Masterpiece evaluation methods are both quantitative and qualitative, aiming to achieve an optimal balance between the number of users involved (quantitative) and the depth of their engagement (qualitative). The following table offers a visual summary, providing an illustrative representation of the KPIs across equivalent use cases within the pilot sites.

Table 3: Overview of Pilots' UCs & KPIs

Country-Partner organisation / Site	Use Cases	KPIs
Spain - UMU Universidad de Murcia	UC1 - Fostering a Socially Responsible Energy Community	KPI1: Number of people who have installed the tool
	UC2 - Promoting Collaboration and Self-Consumption from PV	KPI1: Number of people reached and percentage that attained the collaborative behaviour
	UC 3 - Management of Demand and Fair Pricing	KPI1: 10 % Energy savings KPI2: 10 % cost energy savings
	UC 4 - Achieving Sustainable Energy Transition and Equitable Access	KPI1: % Increase in grid energy independence (community level) and % Deviation in energy savings potential before and after (variation)
Italy - BERC Municipality of Berchidda	UC1: Promoting the transition from consumer to prosumer in an informed and conscious manner among citizens	KPI1: Number of individuals informed. KPI2: Number of consumers interested in becoming prosumers
	UC2: Achieving Active Participation and Sensibilisation in Sustainable Energy Usage	KPI1: More than fifty citizens have collaborated and been interested in creating the official energy community. KPI2: Nº of Interaction within the learning process

Turkey - UEDAS Aşağıçavuş Forest Village	UC1: Understanding ECs and engagement of citizens	1st Phase: KPI1: Nº Interaction within the learning process KPI2: Rate of understanding of the EC environment
		2nd Phase: KPI3: Rate of acceptance to create an Energy Community.
	UC2: Achieving Active Participation and Sensibilisation in Sustainable Energy Usage	KPI1: Energy shifted to solar generation periods (from the Community point of view) (kWh) KPI2: Community participation rate (%)
France - SEIN PART'Ener Poissy & Magnanville	UC 1: Evaluation of Joint Ownership Model for collective PV installation Investment	KPI1: Up to 60 engaged members | Establishing 3 categories of members: Residential, Small and Medium businesses, Large Groups or Consumers KPI2: CAPEX per kW installed < 2500 EURkW | Yearly OPEX per kW PV installed < 50 EUR
	UC 2: Promoting Inclusivity, fair governance, and Equity, in Collaborative Self-Consumption ECs	KPI1: At least 3 actor profiles represented in EC: public and private economic actors, academic actors, households. KPI2: Balanced governance - at least 3 votes per category of stakeholders during decision-making
France - RDIUP Les Mureaux	UC 1: Empowering Citizens' Access to Solar-Powered Energy Community Ownership	KPI1: Eagerness to learn more about ECs. KPI2: Acceptance to join a Solar-powered ECs (%)

France - ALEC Solévent	UC 1: Management of the EC and participation of the members in the activities	KPI1: Number of logins /Time spent on ECOOP. KPI2: Number of interactions between participants (participation frequency in private chat rooms and discussions /number of meetings organised within the EC).
	UC 2: Enrolment and on-boarding on the EC	KPI1: Number of new members interested in joining the EC. KPI2: Qualitative feedback of EC-Recommender (online questionnaire).
	UC3: Achieving Active Participation and Sensibilisation in Sustainable Energy Usage	KPI1: User Action Confirmation Rate (%).
Sweden - UPP Dansmästaren	UC 1: Understanding ECs and engagement of citizens.	KPI1: More than five citizens have collaborated and have been interested in the creation of the official energy community with active participation in the Masterpiece digital platform.
	UC2: Empowering citizens in renewable energy community	KPI1: At least two communities/organizations have used the tool to gauge the possibility to form an energy community
		KPI2: % "Success ratio" in - after using the tools - the community takes further steps to start an energy community should be at least 25 %. [Further steps include contacting the municipality or the DSO for additional information].
	UC 3: Registering an official EC	KPI1: UPP is an official energy community.

Sweden - NGENIC BRF Väppeby Backe & BRF Venus	UC 1: Strengthening social bonds and energy literacy	KPI 1: Increased feeling of energy interest and willingness to change. KPI 2: at least 1 action based on energy literacy.
		BRF Venus: KPI1 & KPI2 + KPI3: +20 of 80 apartments in one staircase will have increased knowledge apart from the other 720 apartments.
Sweden - NGENIC Austerland	UC 1: Empowering citizens in PV community energy ownership showing the return on investment	KPI1: At least 5 users of group 1 interact to see their usage and PV production. KPI2: % Average return investment of at least 5 people of group 2

4.4. OVERVIEW OF TOOLS

In this section, we present an overview of the tools developed, adapted, or currently under development, within the Masterpiece Project. The following table categorises these tools into specific groups, elucidating their individual contributions to the advancement of our Intervention Programme and highlighting their collective role in realising the project's overarching objectives.

For a more in-depth understanding of each tool and its functionalities, detailed information will be provided in D4.3.

Table 4: Overview of Masterpiece Tools

Tool Group	Tools	Partners
Group 1 Simulation and EC Management	SIT	RDIUP & AMU
	EC-SIM	ALWA
	EC-MGMT	ALWA
	COMPASS	R2M
Group 2 Discovery, Awareness, Enrolment, Engagement, and Profiling	EC-Recommender	CERTH & EXP
	ECOOP	RDIUP
	MEET App	R2M
Group 3 Flexibility, demand response and demand optimisation framework	DR-FLEX	UMU & CERTH & AMU

4.5. OVERVIEW OF ASSOCIATED PILOTS TOOLS

In this section, we provide an overview of the tools associated with each pilot site within the Masterpiece Project. The table below categorises the pilot sites along with their respective tools, organised by use case for a clearer understanding of the tools utilised in each scenario.

Table 5: Overview of Pilots' Associated Tools

Country - Partner organisation /Pilot Site	Use Case	Associated Tool
Spain - UMU /Universidad de Murcia	UC 1	MEET App
	UC 2 & UC 3 & UC 4	DR-FLEX
Italy - BERC /Municipality of Berchidda	UC 1	EC-Recommender
		MEET App
	UC 2	Compass
		ECOOP
		MEET App
Turkey - UEDAS /Aşağıçavuş Forest Village	UC 1 (1st Phase)	EC-Recommender
		MEET App
	UC 1 (2nd Phase)	ECOOP
		EC-Recommender
	UC 2	DR-FLEX
France - SEIN /Poissy & Magnanville	UC 1	COMPASS
		EC-MGMT
		EC-SIM
		SIT
	UC 2	ECOOP
		EC-Recommender
France - RDIUP /Les Mureaux	UC 1	COMPASS
		ECOOP
		MEET App
France - ALEC /Solévent	UC 1	ECOOP
	UC 2	ECOOP
		EC-Recommender
	UC 3	DR-FLEX
Sweden - UPP /Dansmästaren	UC 1	Compass
		ECOOP

		MEET App
	UC 2	EC-SIM
	UC 3	Not applied
Sweden - NGENIC /BRF Väppeby Backe & BRF Venus	UC 1	ECOOP
		MEET App
Sweden - NGENIC /Austerland	UC 2	EC-MGMT (TBC)
		EC-SIM
		SIT

5. INTEGRATION STATUS

In this section, we detail current integration status across Masterpiece pilot sites, including the existing APIs to connect disparate systems and

5.1. Summary of Existing APIs

The following table summarise the current existing APIs in Masterpiece pilot sites.

Table 6: Current Existing APIs

Country - Partner Organisation /Pilot Site	**Existing APIs**
Spain - UMU / Universidad de Murcia	Multiple systems using Modbus, Z-Wave, MQTT: • Power metering from 2 BMS • HVAC control and monitoring from 2 BMS • Power metering from different buildings obtained from a global SCADA of UMU • Power metering from HVAC units • Support for Z-Wave devices. • Power generation from PV solar plants • People counting
Italy - BERC / Municipality of Berchidda	TBC (MQTT API or Rest API): • AEC Platform API • Zecca Energia API
Turkey - TROYA / Aşağıçavuş Forest Village	• UEDAS AMR System API
France - SEIN / Poissy & Magnanville	• Linky Meters • RDIUP API
France - RDIUP / Les Mureaux	• Linky Meters • Shelly Emeters • RDIUP API
France - ALEC / Solévent	• SMA Inverters API (ongoing) • Linky API (TBC)
Sweden - UPP / Dansmästaren	• External partners' portals (Example: Sunny portal)

	• UPP Database API (Python)
Sweden - NGENIC / BRF Väppeby Backe & BRF Venus	• NGENIC Commercial API (MQTT)
Sweden - NGENIC / Austerland	• MQTT API (TBD)

5.2. Detailed Existing APIs

In this section, we explore in detail the existing APIs across the pilot sites and delve into the specifics of each pilots' API status.

5.2.1. PoC: Spain - UMU: Campus de Espinardo

The information is going to be obtained from multiple data sources as there are several different systems in the pilot.

Although the devices involved are very different, including technologies like Modbus or Z-Wave, as well as different SCADAs and BMS, a combination of software and hardware modules is going to be used to retrieve the information in a unified format.

The protocol chosen for this pilot is MQTT[2], which uses a subscription/queuing paradigm. By doing the integration in this way, all the information will enter a single path (a central MQTT broker) and any subscriber will be able to consume it, including the standard *JSON MQTT IoT Agent* of the *FIWARE IoT Platform*.

Among the already identified and either partially or totally integrated APIs, the most relevant control:

- Power metering from two BMS (for certain areas and systems).
- HVAC control and monitoring from two BMS.
- Power metering from different buildings obtained from a global SCADA of UMU.
- Power metering from HVAC units (global consumption of the HVAC systems of multiple buildings).
- Support for Z-Wave devices.
- Power generation from PV solar plants.
- People counting.

[2] HTTPS://MQTT.ORG

5.2.2. Italy - BER: Municipality of Berchidda

The data will be taken through the platform that AEC (local utility) manages remotely with the technical support of Zecca Energia, an external energy services provider. The focal point will be the smart meters (in the process of being completely replaced). If it proves necessary to extrapolate data manually, a certain amount of data from the prosumers will be extrapolated for analysis and discussion with EC Managers, to shape the energy community under construction. Under analysis which protocol to use (REST API or MQTT).

5.2.3. Turkey - TROYA: Aşağıçavuş Forest Village

Data will be taken through UEDAS AMR system API providing energy consumption or if manual data entry is required historical data could be also provided for a specific date. In this way, EC Managers will share the data for each household at pilot meetings and strengthen the adaptation of members to the energy community by implementing incentive methods.

5.2.4. France - SEIN: PART'Ener

Mainly the Linky meters will be used to retrieve data production and consumption. Data can be consumed via ECOOP API provided by RDIUP.

5.2.5. France - RDIUP: Les Mureaux

RDIUP has developed an API that unifies the data fetched from Shelly API and Linky (TSO meters).

RDIUP has installed Shelly e-meters in various buildings, and one PV production. Other Shelly e-meters are expected to be integrated for extended coverage.

5.2.6. France - ALEC: Solévent

APIkey to get data from SMA inverters = ongoing with RDIUP - SMA API Developer Support contacted to get support

Linky smart meters- to get consumption data of the schools (TBC). We need the authorisations of the municipalities to get access to these data.

5.2.7. Sweden - UPP: Dansmästaren

Interesting data collection points include energy meters for the building and EV charge points and converters connected to PV's. A due diligence and mapping of existing techniques and protocols have been carried out. The possibility of opening an API directly to the pilot site's SCADA and/or PLCs via MODBUS have been deemed unsatisfactory due to safety concerns. However, relevant energy data is also already, existing API,

streamed to portals hosted by different external partners (e.g. Sunny portal) as well as a database hosted by UPP university. An API will be opened here, using Phyton.

5.2.8. Sweden - NGENIC: BRF Väppeby Backe & BRF Venus

NGENIC has an ongoing commercial service with BRF Väppeby Backe where we measure the apartments energy usage. For Masterpiece we will anonymise the data points and provide an online connection for Masterpiece platform.

The protocol chosen for this pilot is MQTT we will have a broker on mqtt.x.ngenic.eu port 8883, and the Masterpiece platform will subscribe to the online dataflow. If needed, we will move historical data offline.

5.2.9. Sweden - NGENIC: Austerland

There is no ongoing measurement, now, the solar PV park is not built yet, and the users are not on-boarded yet, but this will happen during 2024.

The protocol chosen for this pilot is MQTT we will have a broker on mqtt.x.ngenic.eu port 8883, and the Masterpiece platform will subscribe to the online data flow. If needed, we will move historical data offline.

5.3. Current Integration Status

Almost all the integrations which have been tested so far in the project have been designed using *Node-RED*[3] (visual programming front-end for JavaScript running on top of *node.js*[4]). Since *Node-RED* works with *flows*, from now on we will talk about agents or flows in the same way. In the end, an agent is developed to handle each integration using a flow (or a set of combined flows).

5.3.1. UEDAS AMR System (power metering)

The information offered by the portal provided by UEDAS includes historical readings of both consumption and generation from a certain group of meters, each one of them belonging to a client.

[3] HTTPS://NODERED.ORG

[4] HTTPS://NODEJS.ORG

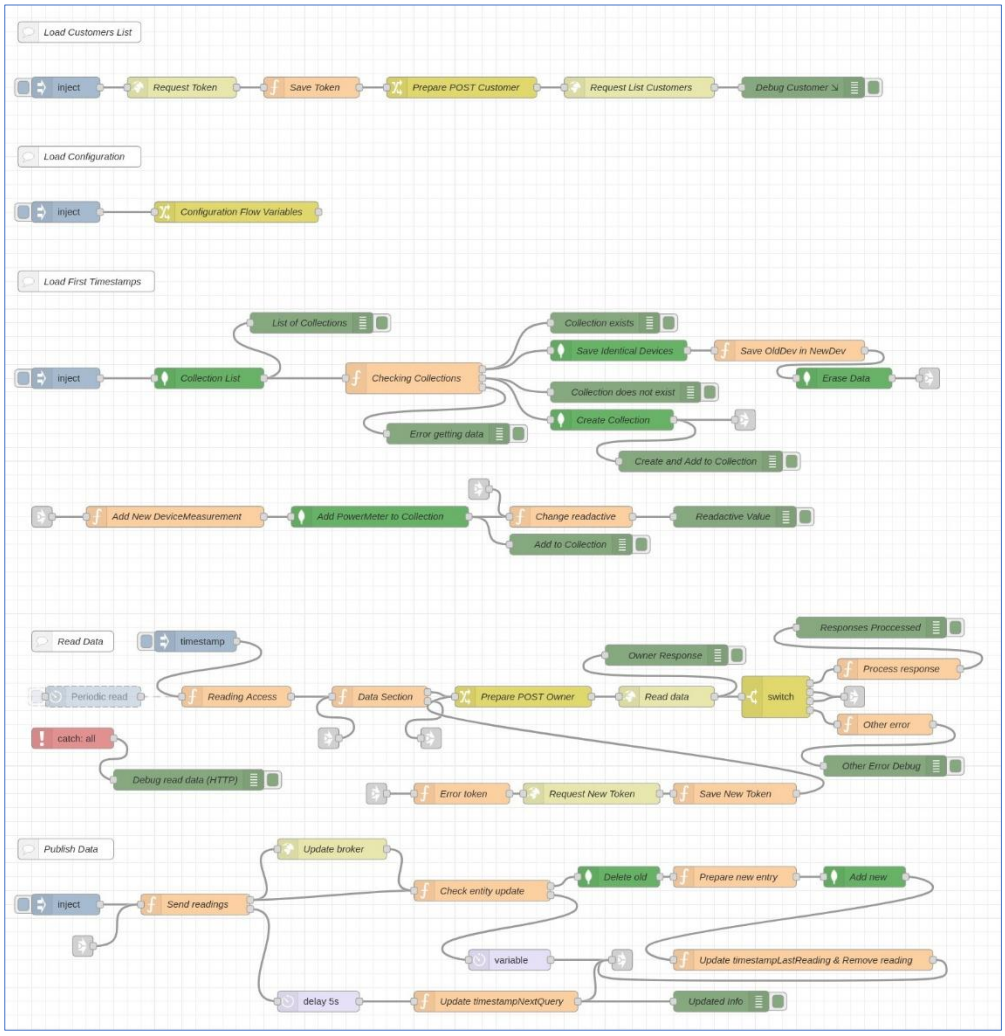

Figure 1: Integration of UEDAS AMR System

From an integration point of view, the first step to execute is to get the list of customers available. Each one of them has a unique *SubscriptionSerno* that must be used later to retrieve the readings of the corresponding meter.

Using this list, the required entities and subscriptions are created in the *FIWARE IoT Platform* to receive the incoming values, and the configuration of the agent is also generated, mapping each *SubscriptionSerno* with the right entities.

With this configuration ready, the previous flow is divided in 4 stages:

- Load configuration.
- Load first timestamps. Since the agent might be offline for some reason (a restart, a change of configuration, etc.), the flow includes an internal database to store the time-stamp of the next reading for each meter based on the last one obtained in a

previous execution. Once these timestamps have been loaded, the flow can start doing its job.

- Read data from meters. This process is launched automatically by a cron-like node every 15 minutes. A loop has been designed to retrieve all the data pending to be read from the last time until a certain moment, and here a security mechanism has been included to minimise the risk of losing data in case the meters (which use *NB-IoT* connections[5]) haven't updated the portal yet. Instead of reading exactly until the current time, each time the loop is executed, it can consume data up to X hours before (this is a configuration parameter). Once the system is fully operational, this parameter will be adjusted to minimise the delay to get the readings (caused by this mechanism) while making sure that there is no data loss. On the other hand, each value obtained is divided in 4 readings since this value represents generation or consumption for an entire hour while the duration between readings chosen in the project is 15 minutes.
- Send the readings to the *FIWARE IoT Platform*. Once it's been confirmed that a reading has been sent to the platform, the internal database is modified and the timestamp of the last reading coming from the involved entity is updated before removing it from the internal queue.

5.3.2. UPP historical data (power metering)

This historical data provided by Uppsala includes district heating, consumption, and generation.

Although these are different systems, the values are received in .xlsx files with the same format.

[5] HTTPS://WWW.GSMA.COM/IOT/NARROW-BAND-INTERNET-OF-THINGS-NB-IOT/

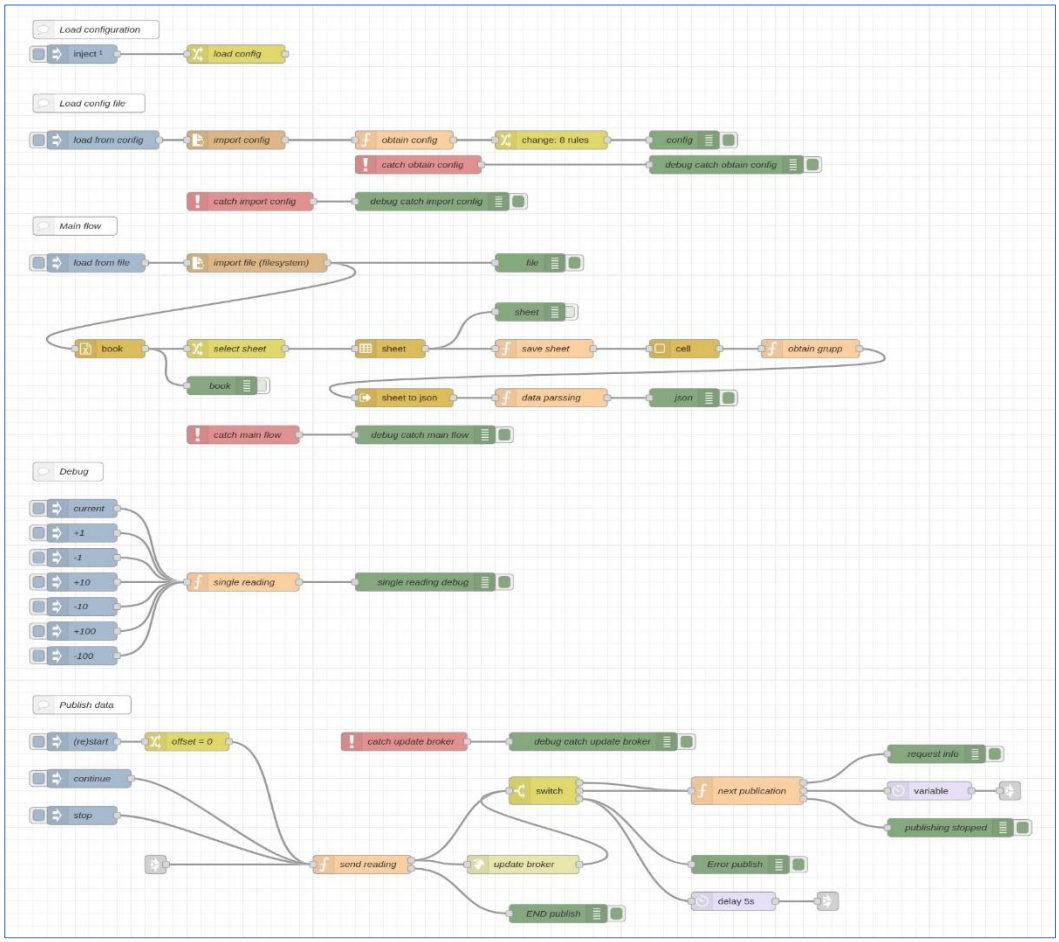

Figure 2: Integration of UPP historical readings

In this case the flow is prepared to load a custom external configuration file which can be changed in real time before launching the execution. This point is important since the information is parsed from different .xlsx files which belong to different systems and will update different entities in the *FIWARE IoT Platform*.

Once the static configuration data has been loaded (it is done automatically once the flow is deployed), the following steps need to be followed:

- Fill the external configuration file to customize the destination of the data that is going to be consumed.
- Parse the source .xlsx file.
- There is an optional step that can be performed (*Debug* section) to confirm that the parsing worked correctly. One of the points to validate is the timestamp conversion from local time (as received in the files) to UTC, which includes not only considering the offset of the Swedish time zone, but also the DST savings, which are active in this country.

- Send the data to the *FIWARE IoT Platform*. The evolution of this process will be monitored using the debug (green) nodes of the bottom-right of the flow.

5.3.3. Generic MQTT import converter

This integration has been originally designed to convert the different existing MQTT data sources (all of them using json format) to a generic format.

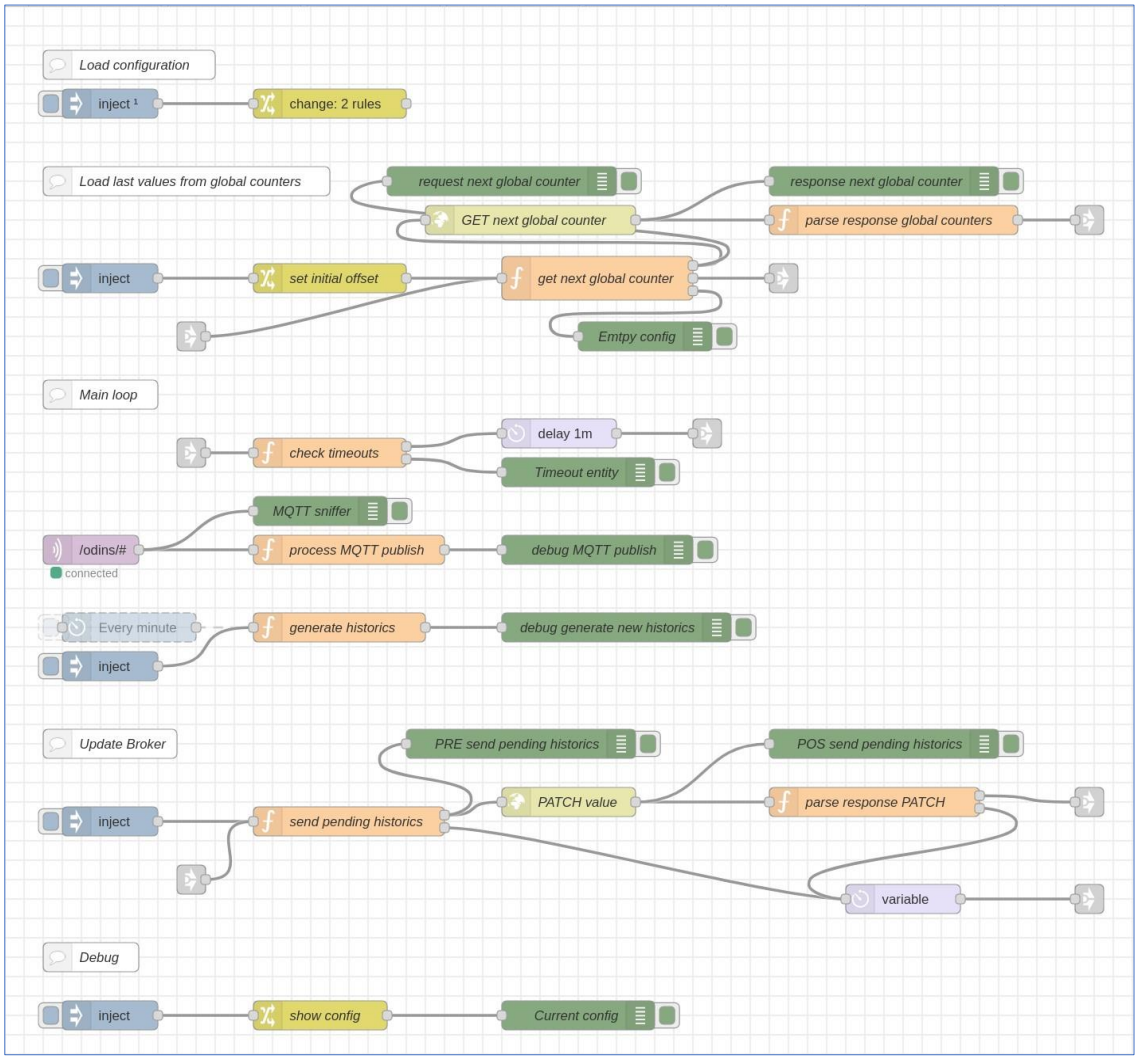

Figure 3: Integration of generic MQTT data sources

This agent offers two different (complementary) features:

- Retrieve data from MQTT and generate the readings to update the *FIWARE IoT Platform*.
- When necessary, extract incremental/partial values from global counters (including meters) when the device itself doesn't generate them.

```
{
    "brokerfiware": "http://localhost:8026",
    "headers": {
        "Content-type": "application/json",
        "Accept": "*/*",
        "fiware-service": "masterpiece",
        "fiware-servicepath": "/"
    },
    "propertyGlobalCounter": "lastGlobalCounter",
    "propertyOverflow": "overflow",
    "propertySecurityMargin": "securityMargin",
    "entityType": "DeviceMeasurementRaw",
    "propertySetValue": "numValue",
    "timestampUpdateConfiguration": {
        "type": "property",
        "property": "dateObserved"
    },
    "data": [
        {
            "entityId": "urn:ngsi-ld:DeviceMeasurementRaw:CVM-Mini1",
            "topic": "/odins/IQ0101G19014600033_3f01ea/attrs",
            "valueType": "globalcounter",
            "valueSourcePath": [
                "numValue",
                "value"
            ],
            "timestampSourceType": "attributeInPayload",
            "timestampSourceFormat": "ISO-8601-UTC",
            "timestampSourcePath": [
                "numValue",
                "observedAt"
            ],
            "reportPeriodicityInMinutes": 0,
            "reportTimeoutInMinutes": 35,
            "keepAliveTopic": "/odins/IQ0101G19014600033_3f01ea/attrs",
            "keepAlivePaths": []
        },
        {
            "entityId": "urn:ngsi-ld:DeviceMeasurementRaw:CVM-Mini2",
            "topic": "/odins/ID0102E18005200072/attrs",
            "valueType": "globalcounter",
            "valueSourcePath": [
                "3f01ea"
            ],
            "timestampSourceType": "servertime",
            "reportPeriodicityInMinutes": 15,
            "reportTimeoutInMinutes": 20,
            "keepAliveTopic": "/odins/ID0102E18005200072/attrs",
            "keepAlivePaths": [
                [
                    "powfail"
                ]
            ]
        },
        {
            "entityId": "urn:ngsi-ld:DeviceMeasurementRaw:Temperature1",
            "topic": "/odins/ID0102E18005200072/attrs",
            "valueType": "normalvalue",
            "valueSourcePath": [
                "ea1"
            ],
            "timestampSourceType": "servertime",
            "reportPeriodicityInMinutes": 15,
            "reportTimeoutInMinutes": 20,
            "keepAliveTopic": "/odins/ID0102E18005200072/attrs",
            "keepAlivePaths": [
                [
                    "powfail"
                ]
            ]
        }
    ]
}
```


Figure 4: MQTT import converter configuration example

As shown in the previous figure, certain properties have been added to the entities controlled by this module to identify whether they are linked to a global counter or not (*value Type* in each entry of the configuration is mapped to the property *generatedByGlobalCounter* of the corresponding entity), and in case it is, other additional information is required to do the calculations correctly (overflow of the counter, last value read, etc.).

When the agent is launched, once the configuration is loaded, the last values of the global counters are read from the *FIWARE IoT Platform* to synchronise this data. After that, the flow will keep track of the updates of each value, will generate the readings based on its configuration and will also identify potential timeouts in case they happen.

5.3.4. Z-Wave support

The integration of Z-Wave devices is based on the library *Z-Wave JS*[6], supported by *Node-RED*.

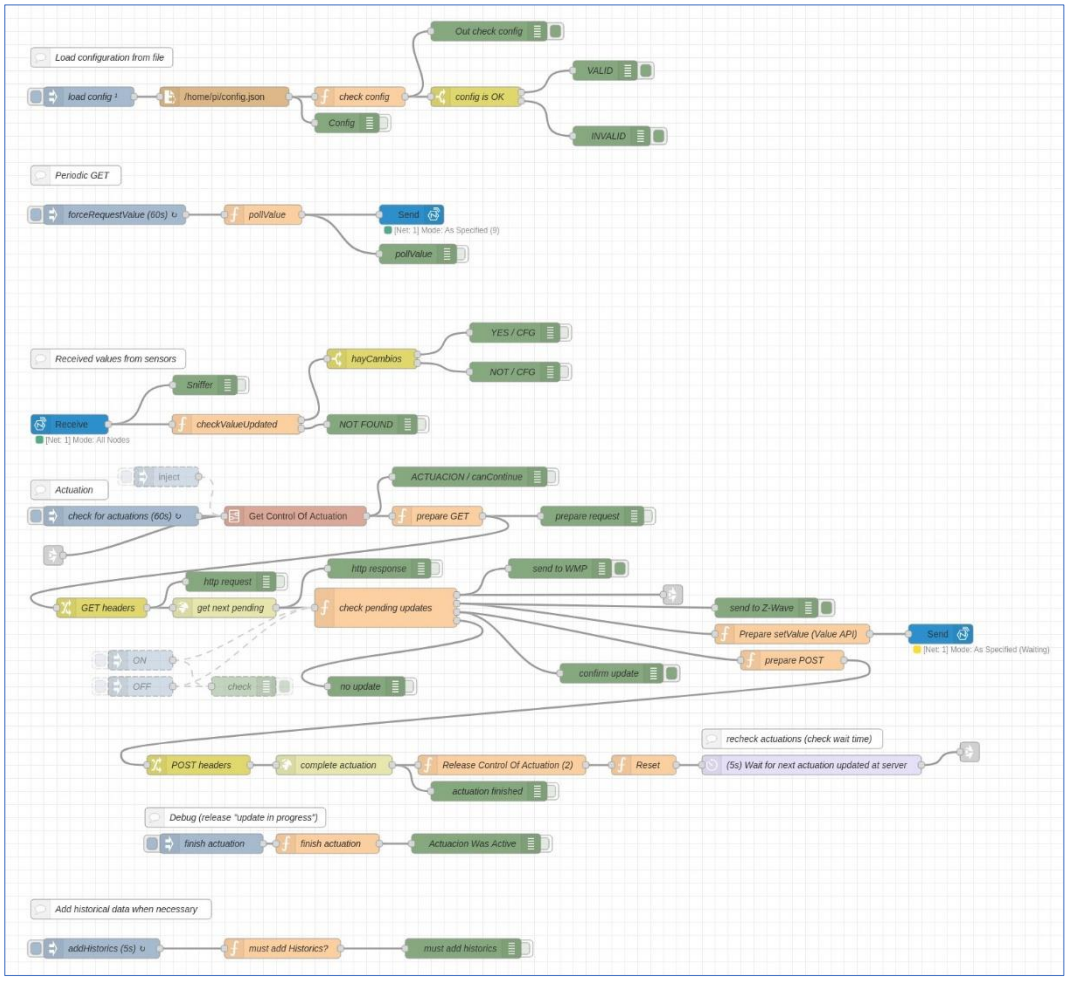

Figure 5: Integration of Z-Wave devices

This is a work in progress which was originally designed to update the *FIWARE IoT Platform* directly from the flow, using NGSI-LD[7], but it is being modified to integrate it with the *Generic MQTT import converter* so that all the information is exchanged using this protocol. As a result, all the data coming from devices will be injected in the configured

[6] HTTPS://GITHUB.COM/ZWAVE-JS

[7] HTTPS://WWW.ETSI.ORG/COMMITTEE/CIM

MQTT broker and the actuation support will also be based on the format supported by the *JSON MQTT IoT Agent* of the *FIWARE IoT Platform*.

Regarding configuration, the *Z-Wave JS* plugin for *Node-RED* offers a control panel which shows all the devices included in the Z-Wave network as shown in the following figure.

Figure 6: Z-Wave JS control panel

The information of the selected device is offered in the lower panel, grouped by classes (following the definitions of the Z-Wave protocol). Double-clicking on any of them, a pop-up shows everything needed to generate the configuration files of the IoT Gateway.

```
{
   "valueId": {
      "commandClassName": "Meter",
      "commandClass": 50,
      "endpoint": 0,
      "property": "value",
      "propertyKey": 65537,
      "propertyName": "value",
      "propertyKeyName": "Electric_kWh_Consumed"
   },
   "meta": {
      "type": "number",
      "readable": true,
      "writeable": false,
      "label": "Electric Consumption [kWh]",
      "unit": "kWh",
      "ccSpecific": {
         "meterType": 1,
         "rateType": 1,
         "scale": 0
      }
   },
   "propertyid": "0-50-value-65537",
   "endpoint": 0,
   "valueData": {
      "value": 19.845,
      "unit": "kWh"
   }
}
```


Figure 7: Configuration of a single Z-Wave reading

This information must be stored in the template file of the pilot (see the section related to the template files linked to the data models in D4.3) and with this, the configuration will be generated by the tools designed for this purpose (tools that create the configuration of the *FIWARE IoT Platform*, the agents and the IoT Gateways based on the templates).

5.4. Next Action Points & Next Steps

In this section, we outline the steps of the upcoming phases and the specific actions forward in each pilot site.

5.4.1. PoC: Spain - UMU: Campus de Espinardo

In the context of hardware data sources, the work on this pilot will continue with the validation of the existing integrations and with the finalisation of those which are in progress.

In parallel, new devices will be installed and will have to be integrated as well, and all the information is expected to be available in the following 2 months.

On the other hand, activities related to use cases which involve users will be carried out once the required tools have reached the required maturity level (tools designed in WP3 and WP4).

5.4.2. Italy - BER: Municipality of Berchidda

The municipality of Berchidda has already organised special workshops in the past to publicise the benefits and opportunities of creating an energy community. Now what it intends to do is to organise more restricted and specific meetings to sift through more precise information, behaviour, degree of awareness and considerations. The local community has a cursory knowledge of an energy community but can boast a good degree of curiosity and responsiveness to innovations, not least because of the high degree of social cohesion that exists among community members. This cohesion will help the use of, for example, the MEET App that is expected to provide useful indications to prosumers/consumers for optimised energy use within the energy community members, once created.

5.4.3. Turkey - TROYA: Aşağıçavuş Forest Village

TROYA team will organise specific seminars and energy literacy educations to inform and engage the inhabitants to start an energy community. The pilot had low education and energy literacy level. For the next step, TROYA is planning to increase their knowledge and awareness by providing energy, climate, sustainability and some technical training to a total of 19 households. The aim is to try to create the concept of energy community with at least 10 of this 19-household community through these trainings and to try to create the first EC concept in Turkey. MEET App + EC-Recommender will be use for the measurement.

Once the DR-FLEX tool is ready, TROYA will organise workshops to with the households to learn how to interpret the visualized data (consumption, PV generation in individual/community way), how to actuate based on the recommendations, to show the results of the shifting they have made (when it is applicable), etc. with DR-FLEX.

The EC manager will be responsible for informing households about the recommendations the EC manager will receive (at first hour in the morning) from the DR-FLEX tool to adjust their energy consumption based on PV generation.

5.4.4. France - SEIN: PART'Ener

The primary focus in the upcoming phase is to finalise the ECs in Poissy and Magnanville and make them operational.

Another aspect involves updating the Business model of the Self-consumption EC.

The ECOOP tool will be widely used to operate the joining and participation phase of each EC and ensure the generation of monthly reporting for both EC members and ENEDIS.

5.4.5. France - RDIUP: Les Mureaux

Les Mureaux EC is currently in an early stage. Initial steps will involve identifying potential EC members, informing them about the initiative, and convincing them to join our EC. RDIUP will leverage the tools provided by Masterpiece once ready, particularly ECOOP and MEET App, to reach out to local actors and engaging citizens at large.

5.4.6. France - ALEC: Solévent

Our immediate objectives include finalising the data collection process -plantID / DeviceID and APIKey to get production data.

Additionally, we plan to organise dedicated workshops involving EC manager, EC members, and schools' users.

5.4.7. Sweden - UPP: Dansmästaren

Tenants will be invited to test and use the selected tools for the pilot, and citizens will also be invited and encouraged to test selected tools by informing about the opportunity through the Uppsala Municipality Website. Through this we want to gain further insights into how the selected tools (COMPASS, ECOOP) may incentivise citizens to become a) EC members and/or b) EC managers. With these lessons in mind, UPP will evaluate as how to best involve the municipality as a stakeholder, directly or indirectly in an EC.

5.4.8. Sweden - NGENIC: BRF Väppeby Backe & BRF Venus

For both BRF Väppepy Backe and BRF Venus, NGENIC will provide questionnaires to invite the EC members to test the selected tools, ECOOP and Meet App. NGENIC will ensure that 1 'test group' that is not involved in the testing and intervention actions, monitors how well the tools function and increases the interest in the opportunities that ECs provide. We will arrange digital evening meetings using the apps as study material and raise awareness of the tools, about ECs and Masterpiece.

5.4.9. Sweden - NGENIC: Austerland

With Austerland NGEN will test the selected apps EC-SIM and SIT to monitor the de facto cost of using the app for monitoring production of the planned solar park (to be built during 2024) and monitor the interest of a) EC managers and b) EC members of continuous monitoring of the production from the PV park.

6. INSIGHTS, CHALLENGES, AND BARRIERS

In this section we unravel the insights gained, confront the challenges faced, and navigate the barriers encountered. This section is the basis of lessons learned and obstacles to overcome.

6.1. PoC: Spain - UMU: Universidad de Murcia

Possible barriers or challenges that could be seen in the pilot include, on the one hand, the reliability of the data from one of the solar PV generation assets. The datalogger used to collect inverter readings at one of the PV installations is old. Its behaviour will be observed, as the data collection of this installation could be compromised due to random problems with this device which has apparently been problematic in the past.

On the other hand, it is necessary to consider possible constraints that limit the ability to demonstrate the functionality of the flexibility services in a real environment. Therefore, the PoC will try to anticipate such constraints and be prepared to work within the possible limits imposed by the university's authorities or the conditions of the environment. We are ready to adapt strategies to ensure the success of the pilot, going as far as possible within the constraints imposed.

6.2. Italy - BER: Municipality of Berchidda

One of the problems the municipality is facing is that the smart meters are having problems transmitting data due to a very weak internet line, and solutions are being studied. In addition, there is still no Energy Community Manager who can coordinate the various activities, but a pre-EC manager is being considered, a hybrid figure who can take initiatives, collect data from prosumers and manage the preparatory and preparatory activities of the energy community.

6.3. Turkey - TROYA: Aşağıçavuş Forest Village

Due to the low levels of education and digital literacy in pilot households in Turkey, along with limited technology usage, all residences lack internet access. In light of this challenge, a pilot plan has been devised. The plan aims to appoint an Energy Manager to collect information from the pilots and integrate the data into applications.

6.4. France - SEIN: PART'Ener

The main challenge faced by the ECs is the proximity criteria (2km) which is a real barrier to identify 60 members. Overcoming this challenge is crucial for reaching the membership identification to the 60 members target. At this stage, an application has been submitted to obtain the necessary authorization.

6.5. France - RDIUP: Les Mureaux

The primary challenge in Les Mureaux context is the distributed production, necessitating robust tools for monitoring, management, and reporting.

6.6. France - ALEC: Solévent

Getting Schools consumption data requires time as the project and its context need to be explained to different municipalities to obtain the required authorisations.

6.7. Sweden - UPP: Dansmästaren

An initial gauging of interest of the pilot site residents' participation in an energy community have rendered lukewarm results. This is probably mainly due to energy communities being virtually unheard of nor discussed nationally in Sweden. A due diligence of national research on energy communities support this claim.

Several national regulatory hindrances (e.g. unlawful to share electricity) have been pinpointed during Masterpiece. The main driving forces seem to be of an economical nature - somewhat different from the other pilot sites - why UPP might take a different approach of gaining interest.

Getting access to reliable (and securely gathered) data is yet again a source of delays and nuisance.

6.8. Sweden - NGENIC: BRF Väppeby Backe & BRF Venues

The two condominium organisations are old and have been in place for a long time managing their buildings. Most of the tenants in the organisations regard this as being a rental apartment they are not really engaged in the same applies to the question of energy, both Heat and Electricity.

The steering boards of these two condominium organisations have now decided to start to buy electricity collectively for all tenants removing their DSO meters and invest in rooftop solar PV.

The challenge is to engage the whole organisation and all tenants regarding energy as a scares resource and start engaging in the smart usage of the resource. As power and grid costs are accelerating.

6.10. Sweden - NGENIC: Austerland

In Austerland energy community we instead have very interested and engaged people who are willing to push the boundaries of the policies and regulations.

The challenges for them are mainly with the local DSO and the regulatory rules in Sweden especially around taxation and not being able to share energy.

7. CONCLUSIONS

The clear delineation and quantification of our objectives lay a solid foundation for the subsequent phases in this deliverable's series, ensuring ongoing evaluation of goal achievement and intended benefits. The specific KPIs for each pilot site are outlined in the Table 3 of the KPIs overview, facilitating impact assessment of the Masterpiece intervention programme.

Maintaining consistent communication with the pilot sites, including programme participants, throughout and beyond the piloting phase is paramount. This ensures the timely resolution of challenges and necessary adjustments for the smooth execution of the programme. The WP5 teams are committed to implementing a systematic approach for continuous monitoring of the pilots and the intervention programme, which includes an iterative cycle of data collection and analysis, progress tracking, identification of emerging issues, and flexible adaptation of strategies for continuous improvement.

Looking beyond the immediate scope, the outcomes achieved through the Masterpiece intervention programme aim to inform and guide policymakers in scaling support programs for ECs and assist them in their informed decision-making processes. These contributions are aimed at fostering the long-term success and sustainability of ECs.

The initial 15 months of the project have laid a solid foundation for implementation from both technical and non-technical perspectives. As a result, we are optimistic about achieving the KPIs and anticipate favourable outcomes.

8. REFERENCES

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