

D4.1 Urban WeGeneration Action Plan and Implementation Roadmap for Cascais



WeGenerate

PEOPLE-CENTRIC SUSTAINABLE NEIGHBOURHOODS



Co-funded by
the European Union

DOCUMENT INFORMATION

Report title	D4.1 Urban WeGeneration Action Plan and Implementation Roadmap for Cascais		
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Responsible Project Partner	LNEG	Contributing Project Partners	EMAC, Nova SBE, Greenvolt

Date of changes to document	Who did the changes

Document data:	File Name:	Action Plan & Implementation Roadmap - Cascais		
	No. of Pages:	73	No. of Annexes:	None
	Status:	Final Document	Dissemination Level:	PUBLIC
Project Title:	Co-creating people-centric sustainable neighbourhoods through urban regeneration	Grant Agreement ID/ Project No.:	101123546	
WP Title	WP4	Deliverable No.:	D4.1	
Due Date:	31/01/2025	Submission Date:	24/01/2025	
Keywords: words here				
Reviewed by:	VTT	Review Date:	17/01/2025	
		Review Date:		
Approved by:	FRAUNHOFER	Approval Date:	05/02/2025	

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LIST OF ABBREVIATIONS

DHW - Domestic Hot Water
EDPI - European Domestic Energy Poverty Index
EU - European Union
EV - Electric Vehicle
PHEV- Plug-In Hybrid Electric Vehicle
PV - Photovoltaic
REC - Renewable Energy Community

EXECUTIVE SUMMARY

This document provides a structured Implementation Roadmap describing what needs to be considered for the Cascais Demo, and a detailed Action Plan of concrete activities to achieve the WeGenerate project objectives in Alcabideche Neighbourhood.

The demo aims to address energy poverty and enhance comfort in social housing by integrating these buildings into a Renewable Energy Community (REC). The REC will include municipal buildings with rooftop solar photovoltaic (PV) systems acting as energy prosumers and social housing units as energy consumers. In addition to energy production, RECs seek to provide environmental, economic, and social benefits while empowering members during the energy transition. They play a crucial role in reducing energy poverty by ensuring a reliable and affordable electricity supply through locally sourced energy.

The Municipality of Cascais emphasises the significance of generating renewable energy and advancing the electrification of various industries as pivotal strategies in tackling climate change. A key focus for Cascais lies in reinforcing public-private partnerships for energy communities, particularly emphasizing local renewable energy, with the specific goal of fighting energy poverty in social housing areas.

The assessment of the social neighbourhood buildings' energy efficiency, indoor comfort and energy consumption is also important to determine the residents' energy demand and the buildings' refurbishment needs.

Specific digital tools are developed to evaluate the amount of energy that can be produced through photovoltaic systems installed in the REC buildings' rooftops, the amount auto-consumed per building and the surplus energy available for sharing.

Regarding transport and mobility, there is already a free public network of buses, and the municipality also aims to increase the length of cycling lanes by another 100 km and promote parking (for bicycles, scooters and cars) near train stations. There is a need to draw up an integrated mobility plan that would consider the location of the main intermodal terminals. The surveys that will be done within this project to the population will help gather information to fine-tune the mobility plans the Municipality has for this area.

INTRODUCTION

The Municipality of Cascais is involved in European and global initiatives to achieve climate neutrality and sustainable development goals, namely the European Covenant of Mayors, the European Green Cities Agreement and the European Union (EU) Climate Change Adaptation Mission. The EU has committed to achieving climate neutrality by 2050 and aims to reduce net greenhouse gas emissions by at least 55 per cent by 2030 compared to 1990 levels. The town of Cascais is actively engaged in efforts to achieve those goals, particularly in sectors such as transportation, buildings, agriculture and waste. Therefore, the production of renewable energy and the advancement of the electrification of various industries are seen as fundamental strategies to achieve near carbon neutrality by 2050.

One of the main goals of Cascais is the strengthening of public-private partnerships for energy communities, with special emphasis on local renewable energy, with the specific aim of fighting energy poverty in social housing areas. Therefore, Cascais contributes to the EU Solar Energy Strategy as well as to national policies on PV self-consumption systems and REC.

The study neighbourhood for this project is Alcabideche, where the aim is to mitigate energy poverty and improve the comfort and habitability of buildings by creating energy communities.

To this end, it is key to understand the local challenges, needs, motivations, and context through a deep analysis of the Demo regarding social, technical, and economic aspects. This will allow for the characterization of the buildings and energy flows in the social housing neighbourhood, the residents' houses' comfort and liveability, and evaluation of the energy poverty level.

The next step will be to define a regeneration model for the Socially Inclusive Decarbonization of the neighbourhood including approaches and solutions based on social and technological innovation that aim at transforming social housing neighbourhoods including them in active REC, by installing photovoltaic systems in the rooftops of 5 buildings managed by the municipality, 2 with and 3 without batteries, and also 3 electric vehicles' chargers.

Since citizens are at the core of the project's goals, they should be involved through participatory planning processes, including innovative governance models, decision making procedures and digital applications.

To incorporate all the data from the buildings, their users and the energy production, consumption and flows, a Digital Twin will be created to support data management/sharing and decision making.

Making this information available will motivate citizens to collaborate with the central city planning by providing them showcases with the Digital Twin. In addition, social equality and cognitive change will be stimulated through local awareness workshops promoted by the municipality.

In this project there is a close collaboration with the 4 clusters (Social Innovation and Participatory Application, Integrated Planning and Digital Application, Sustainable Mobility and Energy in the Built Environment) and also cooperation/interconnection with other relevant EU projects at the local level in Cascais so the obstacles encountered along the path can be overcome. This document presents the challenges encountered, the planning and the approaches considered.

For that an Action Plan and an Implementation Roadmap are outlined according to the following diagram.

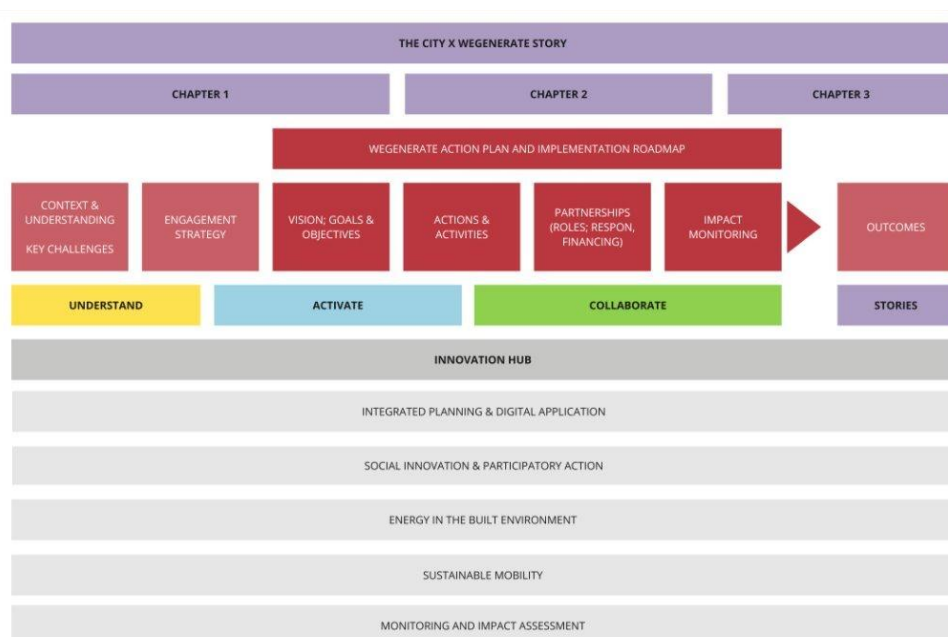


Figure 1 – WeGenerate Action Plan & Implementation Roadmap process diagram

ACTION PLAN

1. Demo Intervention Site Overview

Overall description

The Municipality of Cascais is located in Europe's West coast, in Portugal, 25 km West from Lisbon. The Municipality has an area of 97.4 km², a green area of 4 467 ha, 19 parks and gardens, 17 beaches, a coastline of 30 Km and lies between the Atlantic Ocean and Sintra-Cascais Natural Park. It has a resident population of 214 124 inhabitants and is divided in four parishes, Alcabideche, Cascais and Estoril, Carcavelos and Parede, and São Domingos de Rana. Figure 2 shows Cascais location in Portugal and Figure 3 shows the municipality boundaries and its parishes.

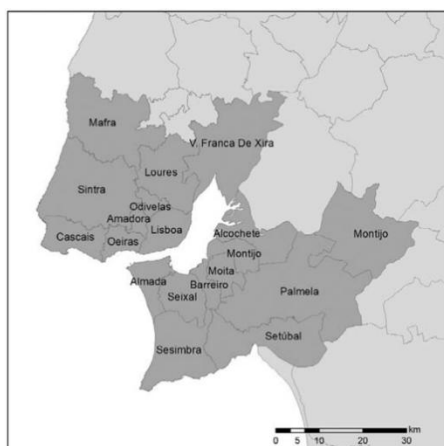


Figure 2 - Cascais Municipality location¹

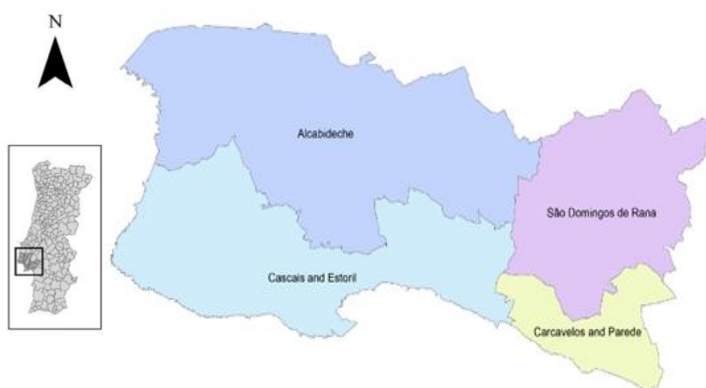


Figure 3 - Cascais Municipality and its 4 Parishes

The work main focus will be Alcabideche parish and specifically its social neighbourhoods, shown in Figure 4.

¹ Gonçalves, J.M.; Marreiros, S. Where will the airport land? A narrative about the locative uncertainty of the new Lisbon airport. Rev. Port. Estud. Reg. 2014, 37, 57–66

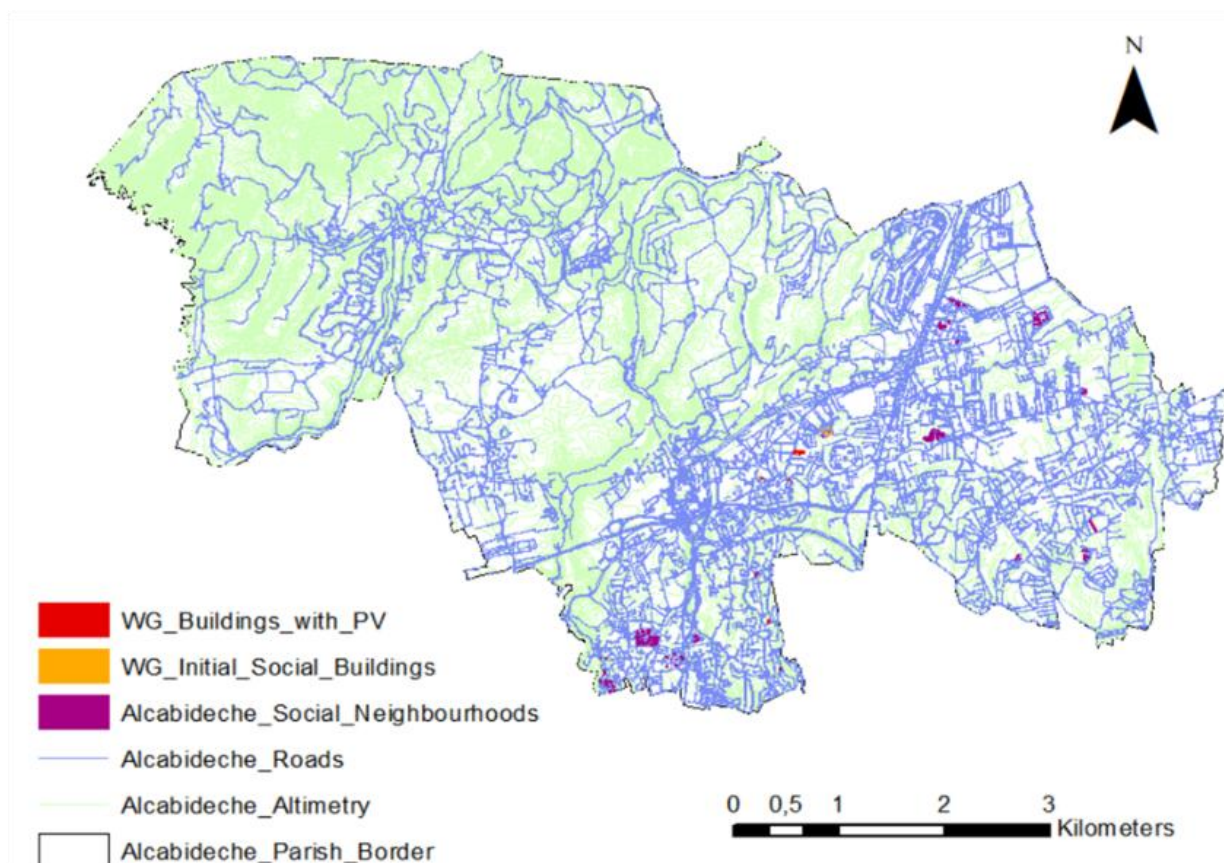


Figure 4 – Alcabideche Parish’s social neighbourhoods

With 2304 residents in Alcabideche’s social neighbourhoods the potential for replication of the measures defined in this project in other social neighbourhoods is very high, because the residents of the other social housing infrastructures would also benefit from being part of an energy community, having their buildings evaluated for indoor comfort and energy efficiency and having a list of improvement measures to be implemented by the municipality.

It is expected that the strategy tested in the chosen pilot will be adopted by other neighbourhoods in Cascais and the connection of these active local energy communities between the different neighbourhoods will allow the scale up of energy hubs at the city level.

The demo site area incorporates one of Alcabideche’s neighbourhoods named “Bairro de Alcabideche” and its boundaries are shown in Figure 5.

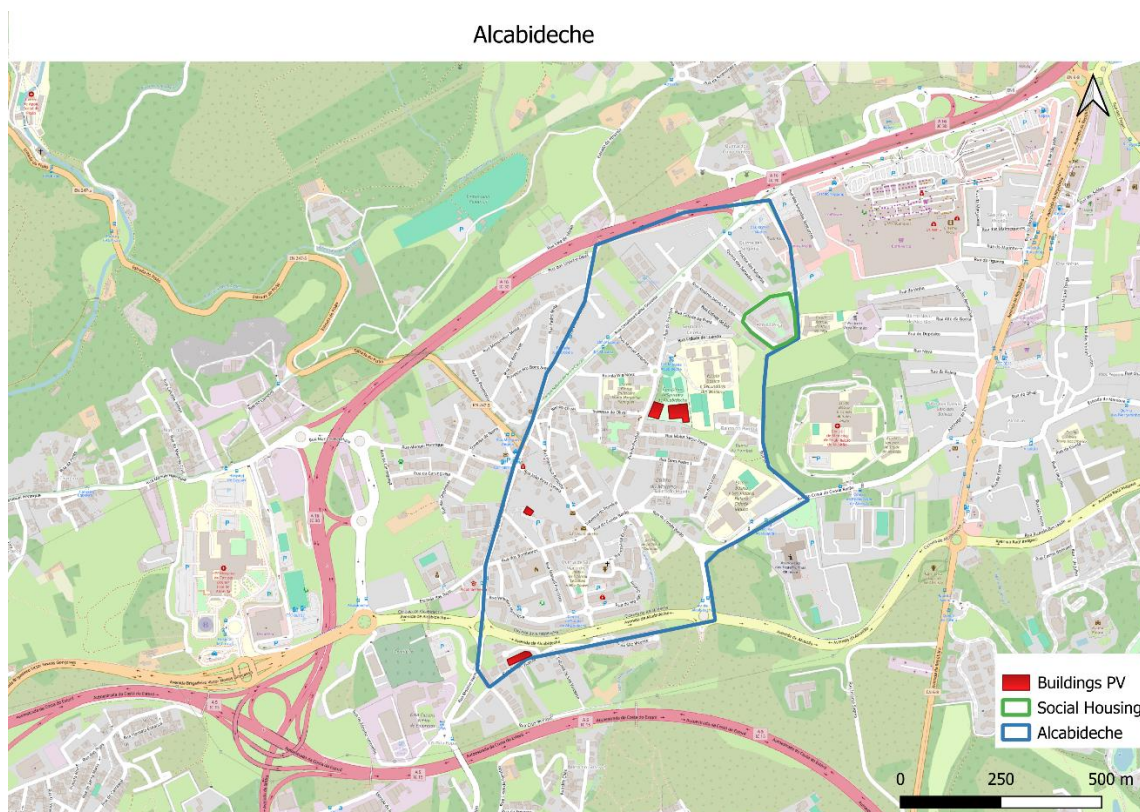


Figure 5 – Boundaries of the “Bairro de Alcabideche”

Demo site summary

Alcabideche is a diverse urban centre (outlined in blue), comprising various communities, including the social neighbourhood called “Bairro de Alcabideche” (outlined in green), schools, a sports centre, a municipal swimming pool, and cultural venues.

- Land Area: 40 ha
- Population: 2800 habitants
- 127 social housing residents
- School community of over 2500 citizens (staff, students and parents)
- 1138 monthly users of the local sports buildings
- About 50 workers in the Parish Office building
- More than 30 daily users of the day-care centre
- 300 students at the music school

Bellow, in Figure 6 and Figure 7, there is a zoom of the previous map showing all the buildings of the demo site that will participate in the REC as prosumers or consumers and the identification of each building.

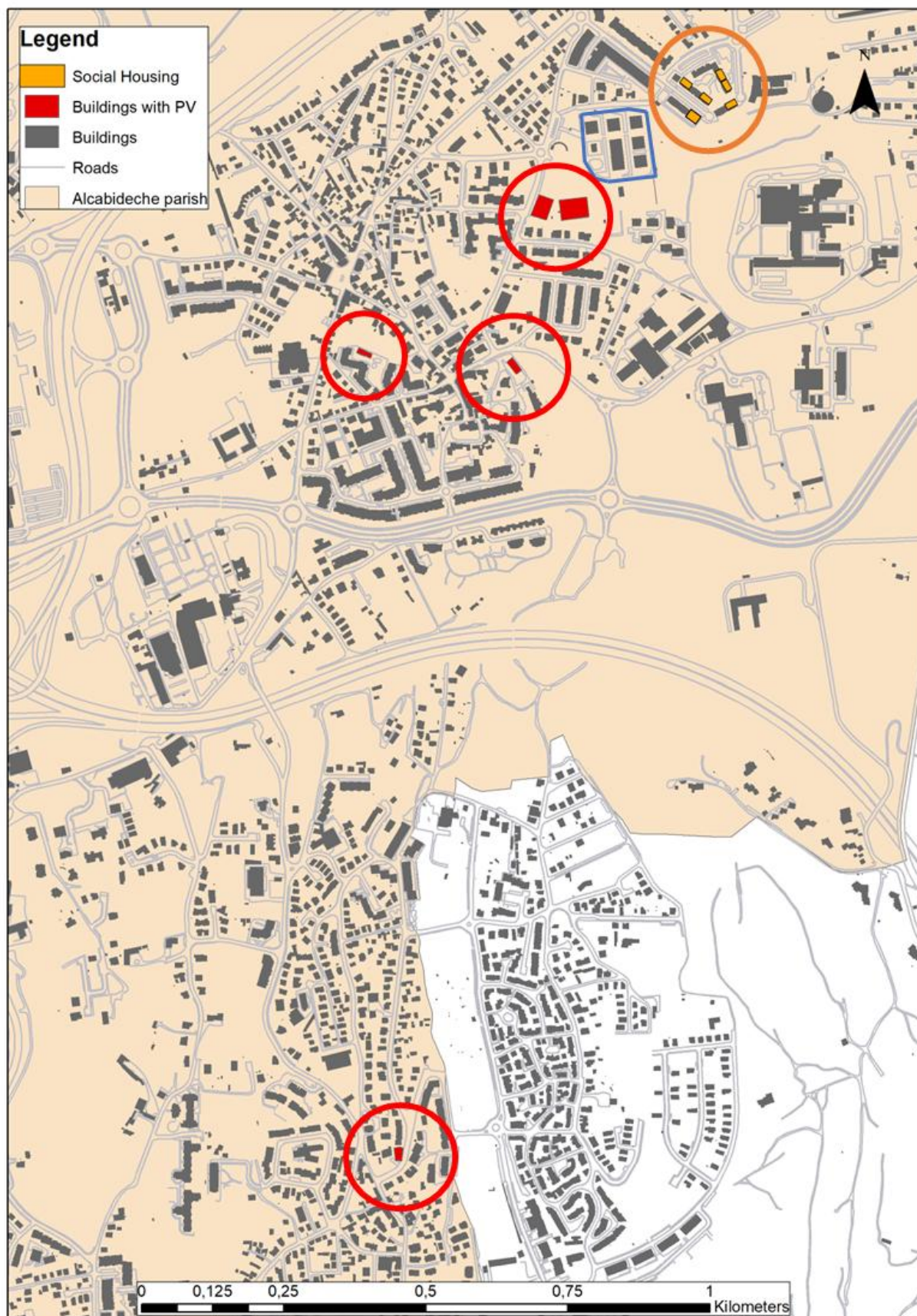


Figure 6 – Demo site buildings map

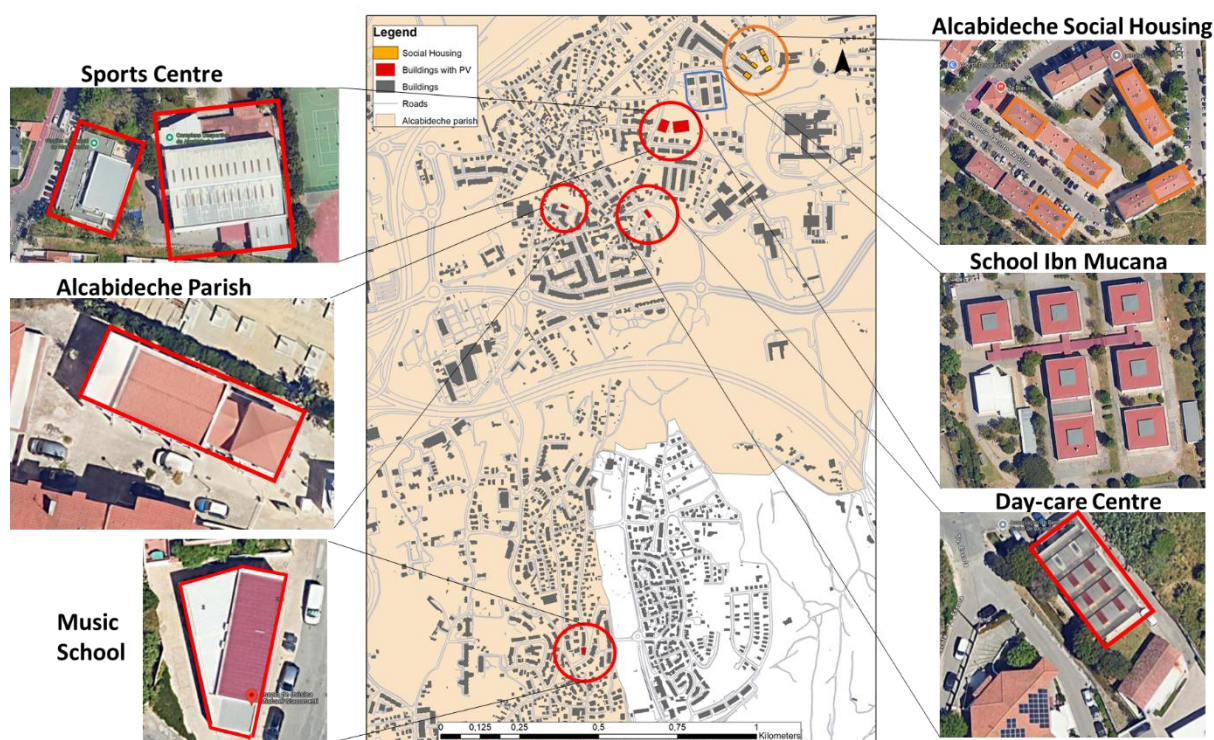


Figure 7 – Demo site buildings map connected to the buildings' identification and aerial view

To help clarify the social nexus behind the creation of this REC between the Municipality's buildings and the social neighbourhood, a scheme is presented in Figure 8 showing the energy flows (green and pink arrows) and the social connection between the users and residents (red connections) of public buildings with PV installations (in red), the social housing (in orange) and the school (in blue). These last two groups of buildings are planned to also have PV systems in their roofs in the near future, probably still in WeGenerate's timeframe, the exact timing depends on the buildings' managers.

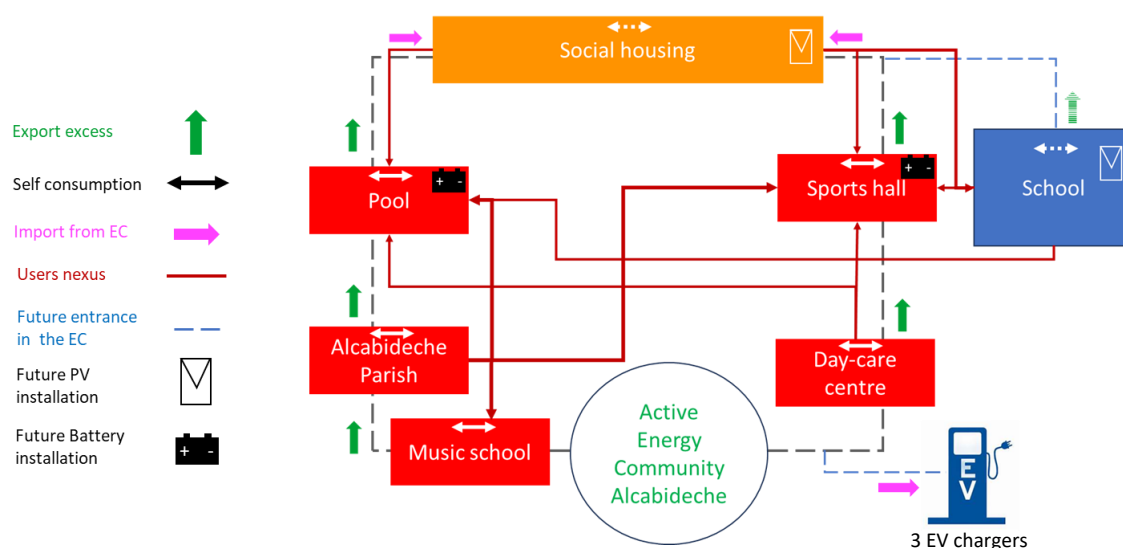


Figure 8 – “Bairro de Alcabideche” REC social nexus scheme

As future implementation, batteries will be installed in the two PV systems with higher capacity (sports-hall and swimming pool) and 3 EV chargers in the locations where they can become more beneficial to the citizens (to be defined in task A2.2). The municipal buildings are managed by different entities that are identified in Table 1.

Table 1 - “Bairro de Alcabideche” REC building’s owners and managers

Building	Owned by	Managed by
Sports Centre (Swimming pool + Sports hall)	Cascais Municipality	Alcabideche Parish
Alcabideche Parish Office	Alcabideche Parish	Alcabideche Parish
Music School	Alcabideche Parish	Alcabideche Parish
Elderly day-care centre	Alcabideche Parish	Alcabideche Parish
Ibn Mucana Highschool	Cascais Municipality	Cascais Municipality
Social Housing	Cascais Municipality	Cascais Envolverte

Social Housing

The first families moved into the houses at the end of 2003, under the “Special Rehousing Programme”, nowadays there are 127 residents living in these buildings and they are grouped into lots, as shown in Figure 9, with the following designations and addresses:

- LOTE I – Alcabideche Neighbourhood, Square Dr. António Gonçalves Amaral nr. 147 and nr. 169.
- LOTE II – Alcabideche Neighbourhood, Street António Jacinto da Silva nr. 29, nr. 30 and nr. 74.
- LOTE III – Alcabideche Neighbourhood, Square Dr. António Gonçalves Amaral nr. 6.



Figure 9 – Social Housing Buildings - Year of construction: 2003

Figure 10 shows the detail of the buildings in the three different lots.



Lote I



Lote II



Lote III

Figure 10 – Detail of some Social Housing Buildings in the different Lots

Sports Centre (Sports Hall + Swimming Pool)

Opened to the public on 25th April 1994, the Alcabideche Sports Centre is owned by the Municipality of Cascais, and has been managed by the Alcabideche Parish since 1996. This space, consisting of a Sports Hall, Swimming Pool (added in 2001) and Outdoor Space (with three distinct sport areas – a Court and a “Ball Pitching Wall” for playing Tennis, two Backboards for playing “Street Basketball” and a Children’s Playground), is a space open to the Associations, Sport Groups, Associations and Community Centres of the Parish of Alcabideche and the general population, allowing the practice of a significant number of sports, contributing, as much as possible, to safeguarding the possibility of living healthy lifestyle habits, across a very wide spectrum of ages. Also here, and because it is the only space available to the parish council, some cultural events are held.



Figure 11 – Entrance view of the Sports Hall and Swimming Pool

The Sports Center has 182 users of the sports hall, 784 users of the swimming pool and 172 senior users of the program “Seniors in Movement” (hydrotherapy classes), totalling 1138 users.



Figure 12 – “Seniors in Movement” class

Alcabideche Parish Office

This building was built in 1995. The parish employs 112 workers, and it is estimated that about half of these workers work in the Parish Office building.



Figure 13 – Alcabideche Parish Office entrance and aerial view

Elderly Day-care Centre

In this building, the non-profit welfare association “Associação de Bem Estar Social de Alcabideche” has been operating since 1998, it has more than 30 daily users.



Figure 14 – Elderly day-care centre entrance and aerial view

The association provides a range of activities whose objectives are, to provide the acquisition of knowledge, to contribute to increasing self-esteem, to provide moments of dialogue and socializing, to contribute to mental and logical exercises, to contribute to physical wellbeing and to motivate users towards new areas of interest, like music and vocal performance. In Figure 15 there is a picture of the day-care centre choir.



Figure 15 – Day-care centre choir

Michel Giacometti Music School

The school is owned by the Alcabideche Parish and began its activities in October 2002 because of the Parish Council's executive's motivation to invest in the culture of its population, also creating a suitable way to occupy the free time for those interested. In its first academic year, the school had around 25 students. Since then, the number of students has been growing, reaching an annual attendance of 300 students.



Figure 16 – Michel Giacometti Music School entrance and aerial view

Ibn Mucana Highschool

The school activities began in 1988/89 with various difficulties regarding access to the school, namely the need for roads and pavements outside and around the school; the construction of a bus stop that would allow access to students from other locations; library support, among other basic needs. On September 1991, Amoreira Secondary School was renamed Ibn Mucana Secondary School in honour of the poet Ibn Mucana, a poet who lived during the 11th century, born in Alcabideche. Currently this school has 1375 students and some of them live in the social housing, because 17 of the residents are youngsters with ages between 11 and 20 years.

The school has a modernization plan with a budget of 2.900.000 € and the implementation should start during 2025. In this plan, 8 new classrooms, the revaluing of the library and interior and exterior common spaces, and the installation of PV systems on the buildings' rooftops are expected.



Figure 17 – Ibn Mucana Highschool entrance and cycling path connecting it to the social housing

2. Policy & Regulatory Framework Analysis

National Level Financial instruments for Building Renovation

According with European Construction Sector Observatory (ECSO) the access to finance is still the biggest concern for 9.1% of Portuguese small and Medium-Sized Enterprises (SMEs) (in line with the 9.9% EU-27 average), according to the Survey on the Access to Finance of Enterprises (SAFE) results. As per the report, there has been a gradual improvement in credit conditions. 4.7% of SMEs that applied for a loan saw their application rejected in 2020, compared to the

6.3% at the EU-27 average. However, loans to non-financial corporations have substantially decreased by 35.5% over 2010-2020, going from EUR 114.6 billion to EUR 73.9 billion.

To improve the condition of access to finance for the businesses and SMEs, the Portuguese government has taken several initiatives. Some notable measures include:

- **Capitalizer Credit Line 2018-COVID-19**, implemented by IAPMEI (*Instituto de Apoio Às Pequenas e Médias Empresas e ao Investimento*) - Agency for Competitiveness and Innovation in March 2020 to help SMEs with liquidity needs. The line had the conditions of counter-guarantee of 100% and maximum financing of EUR 1.5 million in working capital and plafond treasury appropriation per company.

- Specific Support line for Medium-sized companies, small mid-caps and mid-caps, implemented by IAPMEI

(*Instituto de Apoio Às Pequenas e Médias Empresas e ao Investimento*) - Agency for Competitiveness and Innovation in September 2020 to help SMEs with liquidity needs. The new line of support will finance treasury needs that have been affected by the COVID-19 pandemic. To apply, companies will have to present a sharp drop of at least 40% of their turnover and not be able to have any financing operation, approved or contracted.

- **Tax measures to support micro, small and medium-sized enterprises in the framework of the response to COVID-19** have been introduced by the Assembly of the Republic in July 2020. The measures included temporary suspension of some taxes.

Other financial support programs are adopted in Portugal for the construction sector and are explained below.

Recovery and Resilience Program

Under this national plan, there are 3 specific investment programs related with the construction sector and the renovation of the building stock:

Energy efficiency in **residential buildings** (300 million €)

This investment is the responsibility of the Environmental Fund and seeks to promote a significant wave of energy retrofits in residential buildings, promote energy and resource efficiency, strengthen energy production from renewable sources in self-consumption regime and the fight against energy poverty. These objectives can be attained as a result of single or cumulative actions:

- Passive environmental improvements, for example, through the thermal insulation of walls, roofs and glazing;
- Active improvements, for example, through climate control systems for heating and/or cooling (e.g. heat pumps) and domestic water heating (e.g. solar thermal);
- Active improvements through, for example, the implementation of renewable electrical energy generation systems, under a renewable energy self-consumption or community system;
- Interventions aimed at water efficiency, including replacing older equipment with more efficient new equipment;
- Interventions that promote the incorporation of biomaterials, recycled materials, natural-based solutions, green façades and roofs and bioclimatic architecture solutions on existing urban buildings and individual properties.

Energy efficiency in **central government buildings** (240 million €)

Managed by the Environmental Fund, this investment aims to promote a significant wave of energy retrofits in central government buildings and educational institutions (at all levels, including higher education), encourage energy and resource efficiency and increase energy generation from renewable sources under a self-consumption system, through actions of an identical nature to those described above.

Energy efficiency in **service buildings** (€70m)

The objective is investment in a significant wave of energy retrofits in service buildings, to promote energy efficiency and increase energy generation from renewable sources under a self-consumption system. The Environmental Fund, along with the *Recuperar Portugal* Mission Structure, is responsible for the management of this component.

National Investment Program 2030 (PNI2030)

The National Investment Programme 2030 (PNI) is designed to provide investments worth EUR 22.0 billion into the areas of transport, energy and environment projects. It represents a total estimated investment of EUR 43.0 billion. Portugal will receive up to EUR 13.9 billion in grants and EUR 2.7 billion in loans as part of the Recovery and Resilience Plan. The plan, approved by the European Commission in June 2021, includes key measures to foster Portugal's green and digital transition. An overall EUR 610 million will be allocated for energy efficiency renovation interventions of public and private buildings.

I. Efficient House Program 2020 Portugal

This program provides soft loans for any measure aimed at improving the environmental performance of existing private housing. It highlights energy and water efficiency and urban waste management, but also includes other measures as: application of thermal insulation materials, installation of high-performance windows, use of home automation to manage energy consumption, installation of heat recovery systems, installation of waste reuse systems rainwater, use of appliances with better energy performance. Interventions must be carried out by authorised companies, registered in the program website's database.

II. Energy Efficiency Fund (FEE) - financial support - energy performance of buildings

The FEE is a financial instrument that aims to finance the measures identified in the PANEE (National Action Plan for Energy Efficiency). It can also support projects not foreseen in the action plan, but which contribute to energy efficiency. Several calls for projects are published every year and can be responded to by individuals or legal entities. This fund supports projects in the construction sector in particular. For example, the fund has already launched two competitions to support the installation of solar thermal panels for DHW (hot water) installations, the installation of high-performance windows and better thermal insulation solutions.

III. Sustainable buildings program

As a part of the Economic and Social Stabilisation Program (PEES), the Portuguese government launched the “**Sustainable buildings**” program in September 2020.

By the end of 2021, 4.5 million euros in non-refundable support is budgeted to facilitate energy renovation in Portugal. Owners of properties built before the end of 2006 can therefore request up to 70% reimbursement of their expenses related to energy optimization. Eligible expenses are strictly regulated by the government and classified into six categories: windows, thermal insulation, space heating/cooling and sanitary hot water systems, renewable energy production equipment, optimization of water management and, finally, incorporation of biomaterials, recycled materials, green roofs and facades and bioclimatic architectural solutions. Refunds are limited to €15,000 per owner and €7,500 per property.

IV. Financial Instrument for Urban Renovation and Revitalization 2020 (IFFRU 2020) Program

IFFRU is a financing instrument to support investment in building renovation and improving energy performance. This program offers loans with more advantageous terms than those available on the market. These loans can cover up to 100% of the investment. Energy efficiency measures include, among others, thermal insulation of the opaque building envelope, installation of high-performance windows, installation of shading devices, installation of solar panels for domestic hot water, installation of ventilation systems, etc. It uses EUR 102 million of ESI Funds resources to mobilise EUR 1.4 billion of public and private financing for urban development, with the aim of generating a total investment of around EUR 2 billion.

V. Rehabilitate to Rent – Affordable Housing (RPA-HA)

The Rehabilitate to Rent - Affordable Housing (RPA-HA) program aims to provide loans at more favourable conditions compared to market conditions to finance renovation operations of a building or part of a building. It is only intended for properties whose homes are intended, in whole or mostly, for affordable rental within the scope of the Affordable Rental Program. The energy certificate and comfort level are bonus factors in the rent calculation formula. Loan of up to 90% of the total cost of the operation.

VI. 1st Right – Support Program for Access to Housing

The 1st Right aims to support the promotion of housing solutions for people who live in unworthy housing conditions and who do not have the financial capacity to bear the cost of access to adequate housing. The Program is based on a promotional dynamic predominantly

aimed at the renovation of buildings and leasing. Public support must prioritise the renovation of buildings, rather than new construction. Promoting interventions, equipment, technologies or processes that lead to maximising efficiency in the use of energy and water are valued.

Financial support may be granted in the form of non-refundable financial contributions and loan interest rate subsidies. In either case, the maximum limit is the reference value established for each housing solution. The maximum amount of reimbursement for rehabilitation is 50% of eligible expenses. Loans have a maximum total term of 30 years.

VII. Portuguese Investment Bank (BPI) & European Investment Bank (BEI) Energy Efficiency Line

The BPI/BEI Energy Efficiency Line is intended to support investment projects in energy efficiency carried out by the business sector. To facilitate the financing application process, BPI and the BEI developed an online tool that allows checking the eligibility of energy efficiency projects and estimating the energy, cost and CO₂ savings potential of each project.

This instrument offers special spread conditions and financing terms of up to 20 years. These conditions are made possible through the signing, between BPI and the BEI, of a financing and guarantee agreement of 50 million euros.

The BPI/BEI Energy Efficiency line benefits from an 80% guarantee from the BEI, operation by operation, which allows the bank, among other benefits, to provide special conditions. These conditions allow companies to adapt the financing maturity to the payback of their respective investments. The online application is aimed at customers and suppliers of energy efficiency solutions, allowing them to carry out a framework prior to the eligibility of projects for financing. The tool also allows you to identify savings potential, helping to make investment decisions.

VIII. National Building Renovation Fund (FNRE)

FNRE is a special closed-end real estate investment fund, privately subscribed and of indefinite duration. Its main objective is to implement renovation projects to promote rental, especially housing, with a view to the regeneration and repopulation of urban centres, aiming to achieve, from a medium- and long-term perspective, an increasing appreciation of investment. Its activity began in April 2019, seeking to: provide more affordable housing rental, renovate with

benefits for holders, renovate without bureaucracy and without delay, renovate with flexibility, confidence and quality.

Within the scope of the FNRE, it is planned to create several Sub-Funds, each with asset autonomy and a duration of 10 years, possibly extendable. Sub-funds can be created at different times, whenever there is a group of properties with a global investment volume that justifies it. These Sub-Funds are flexible in location, composition and timing, and financially profitable (with a net return of at least 4%).

At an initial stage, public entities from central and local administration and third sector entities can participate. At a later stage, it is expected that other entities, public and private, are open to participation, including individuals. Participation is made through contributions in kind, through the delivery of properties for renovation, and in cash. In return, participants receive participation units in proportion to their investment. For a property to be included in the FNRE, the financial viability of the investment must be verified. The occupancy rate for permanent or student housing at affordable rents must be at least 51%. The renovated area that is not used for housing may be used for other purposes, prioritising, whenever possible, traditional commerce. The general rules and regulations relating to real estate investment funds apply to the FNRE and are subject to the supervision of the Securities Market Commission (CMVM).

IX. *Vale Eficiência* Program (Efficiency Voucher Program)

This financial support in force in mainland Portugal focuses on economically vulnerable families in situations of potential energy poverty so that they can improve the energy performance of their permanent home. A person holding an electricity contract who simultaneously meets the following conditions is eligible: (a) is a beneficiary of the Social Electricity Tariff (check the electricity bill), (b) is the owner and permanently resides in the home. This program foresees the delivery of 100,000 “efficiency vouchers” to economically vulnerable families by 2025, worth €1,300 plus VAT each. This phase aims to deliver 20 000 vouchers. In addition to the online form, the candidate must submit several documents to apply for support. The Efficiency Voucher will be sent to the beneficiary through the Environmental Fund platform, to the email address registered in the application and has a usage period of 12 months, from its date of issue, losing its value on the expiry date. The Voucher can only be used at suppliers participating in the Efficiency Voucher Program, the list of which can be consulted on the Environmental

Fund website. Types of financed projects: efficient windows and doors, thermal insulation on roofs, floors and walls, heat pumps, solar thermal systems, high-efficiency biomass boilers and recuperators, and electric boilers coupled to other renewable systems, photovoltaic panels and other renewable energy systems for self-consumption.

There exists also some **Tax Benefits programs** promoted by the Portuguese government, Municipalities and Housing and Urban Rehabilitation Institute, related with buildings renovation, as for example: Tax Benefits – VAT at a reduced rate of 6%, Tax Benefits – Municipal Taxes - are applicable to urban buildings, or autonomous fractions, with more than 30 years, through the exemption from Municipal Property Tax for a limited period of 3 years.

Energy Poverty Policies

Regarding **energy poverty**, the Long-Term Strategy to Overcome Energy Poverty (ELPPE) 2023-2050 was approved in January 2024. Its main purpose is to eradicate energy poverty in Portugal by 2050, protecting vulnerable consumers and integrating them in the energy and climate transition. This strategy was established under the National Energy and Climate Plan 2030² and articulates with the Long-Term Building Renovation Strategy and the National Strategy to Fight Poverty 2021-2030. This strategy has 4 core axis:

1. Energetic and environmentally sustainable housing

- 1.1. Increase housing energy efficiency
- 1.2. Decarbonisation of housing energy consumption

2. Universal access to essential energy services

- 2.1. Reduce the number of households having difficulty paying for essential energy services
- 2.2. Ensure the protection of vulnerable consumers in situations of energy poverty

3. Integrated territorial action

- 3.1. Strengthen the action of local structures to support citizens
- 3.2. Strengthen the supply of public housing with high energy performance

4. Knowledge and informed action

- 4.1. Increase the capacity to identify households in energy poverty
- 4.2. Increase energy literacy
- 4.3. Promote research and innovation

² https://commission.europa.eu/publications/commission-recommendation-assessment-swd-and-factsheet-draft-updated-national-energy-and-climate-1_en

4.4. Promote the training of professionals (30 000 certified professionals by 2030)

The National Energy Poverty Observatory (ONPE) was created to monitor, supervise, coordinate and report on the implementation of this strategy through the following tasks:

- Define new strategic indicators at territorial level to help in the
- Design and evaluation of public policies
- Propose public policies to eradicate energy poverty
- Promote coordination between different areas of public policy that contribute to the objectives of the ELPPE
- Promote decentralised territorial action, through coordination between the direct and autonomous state administration, namely local authorities, as well as networking with other local players, including energy agencies and private social solidarity institutions
- Promote, in collaboration with National Statistics Institute, the improvement of basic information and the development of new statistics through the integration of different data sources
- Drawing up and proposing to the government ten-year action plans against energy poverty (horizons 2030, 2040 and 2050) reviewed every three years
- Evaluate the progress of the implementation of the ELPPE, on an annual basis from the date of entry into force of this resolution, the results of which should be publicised on the websites of the ONPE, the Directorate-General for Energy and Geology (DGEG) and Energy Agency (ADENE)
- Present the government with a proposal to revise the ELPPE, every five years or whenever deemed necessary
- Promote and implement capacity-building actions for national, regional and local public and private agents involved in the implementation of ELPPE
- Propose financial, fiscal and/or financing instruments, public or private, of energy efficiency measures appropriate to the profile of identified households in energy poverty, as well as the methods for their adoption, when applicable
- Develop materials and campaigns to increase energy literacy appropriate to the profile of identified households in energy poverty
- Promote and disseminate work related to the phenomenon of energy poverty

The main Key Performance Indicators (KPI) to be achieved with ELPPE are shown in the figure below.

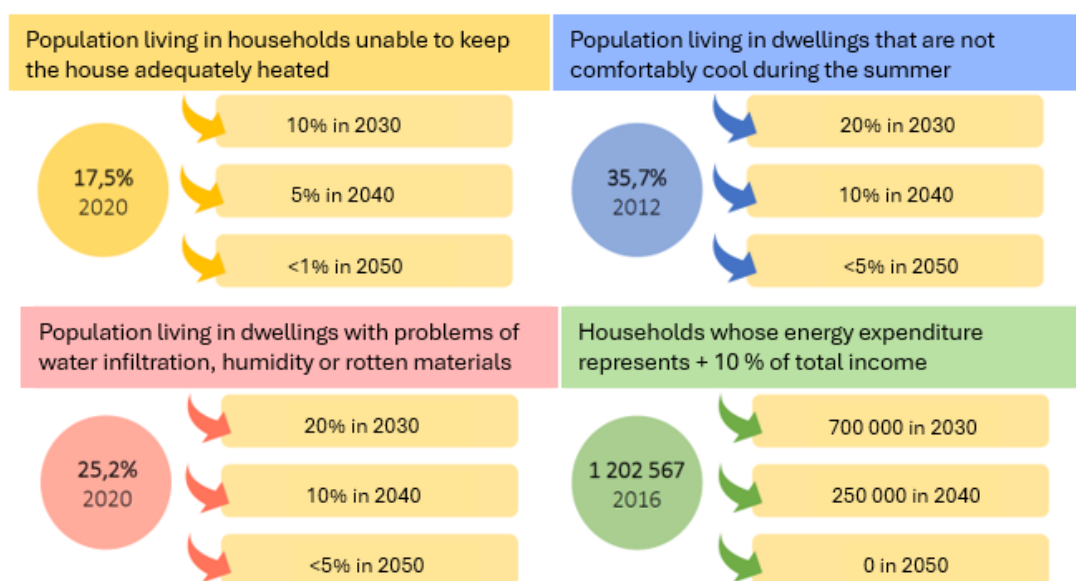


Figure 18 - ELPPE goals to be reached in 2030, 2040 and 2050

3. Problems and Opportunities

One of the identified problems is the increase in electricity prices since 2008, mainly because of the opening of the electricity market, this raised a challenge to families with low income because they had to increase their energy-related expenditures to maintain the same level of comfort they could achieve previously to 2008. The following figure shows the average electricity prices evolution between 1985 and 2021 for the domestic sector with annual consumption under 1 MWh.

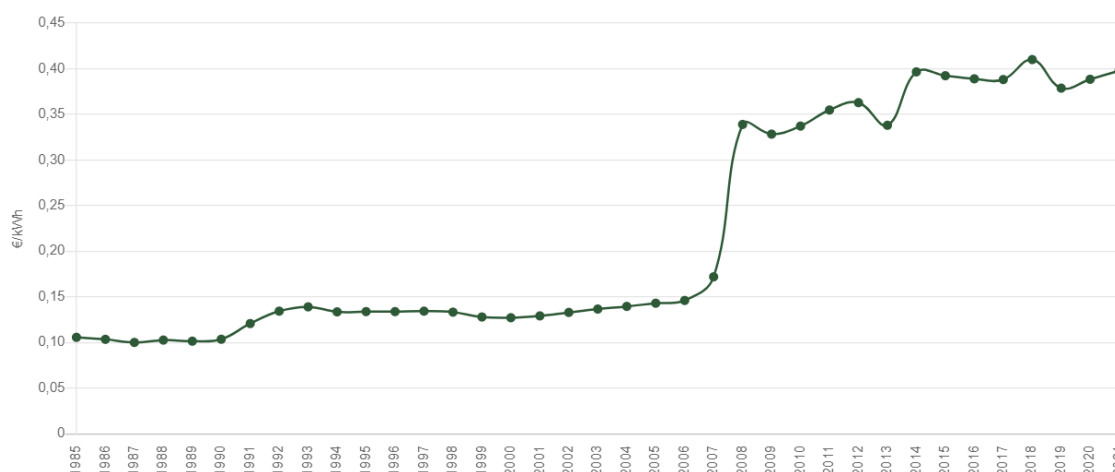


Figure 19 - Average electricity prices evolution between 1985 and 2021³

If we decompose the total energy price in its several components, we can observe how the energy and access to grids tariffs, Value Added Tax (VAT) and other fees and taxes have contributed for this increase, as can be seen in Figure 20.

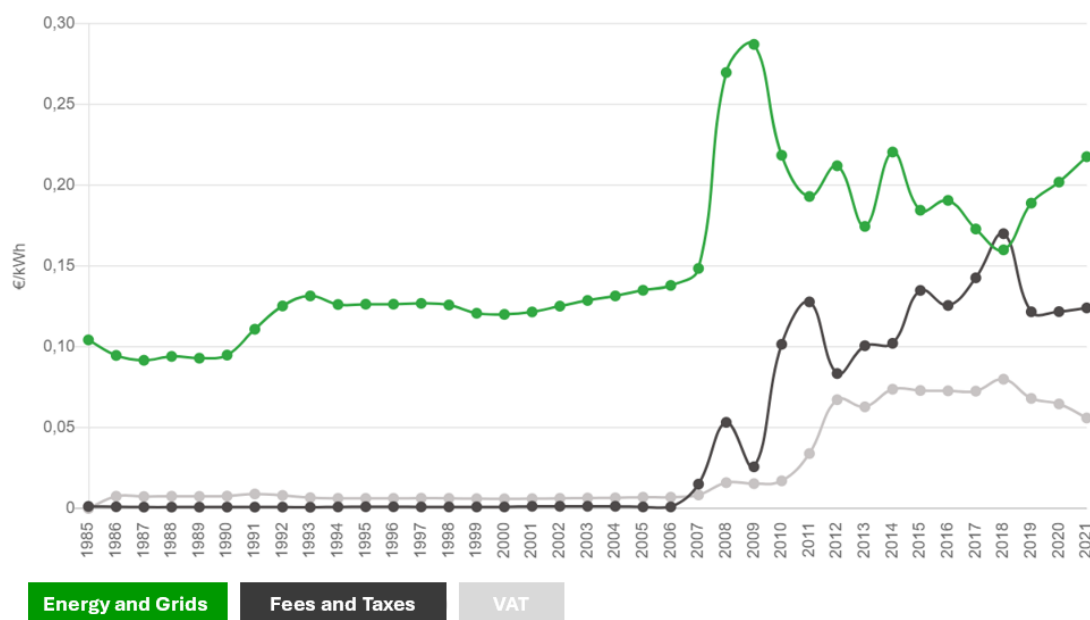


Figure 20 - Decomposed average electricity prices evolution between 1985 and 2021⁴

A good opportunity is to increase the citizens' energy literacy so they can make informed decisions regarding: (i) their energy consumption; (ii) the most efficient equipment for indoor thermal comfort; (iii) the energy supplier that guarantees the lowest energy prices in the market; (iv) the best renovation options to increase building energy efficiency and available support programmes to implement them, etc. WeGenerate project will be an excellent opportunity to intervene and help disseminate more information about these subjects.

On the other hand, the evolution of the minimum wage was much steadier and didn't have an abrupt increase between 2007 and 2008, as can be seen in the figure below. The increase between these two years was 5,7%. For the electricity price, the increase in the same period was 50%.

³ <https://www.observatoriodaenergia.pt/pt/energia-em-numeros/portugal/1985/2021/line/eurokwh/2026-2027-2028-2029>

⁴ <https://www.observatoriodaenergia.pt/pt/energia-em-numeros/portugal/1985/2021/line/eurokwh/2026-2027-2028-2029-2032,2030,2031>

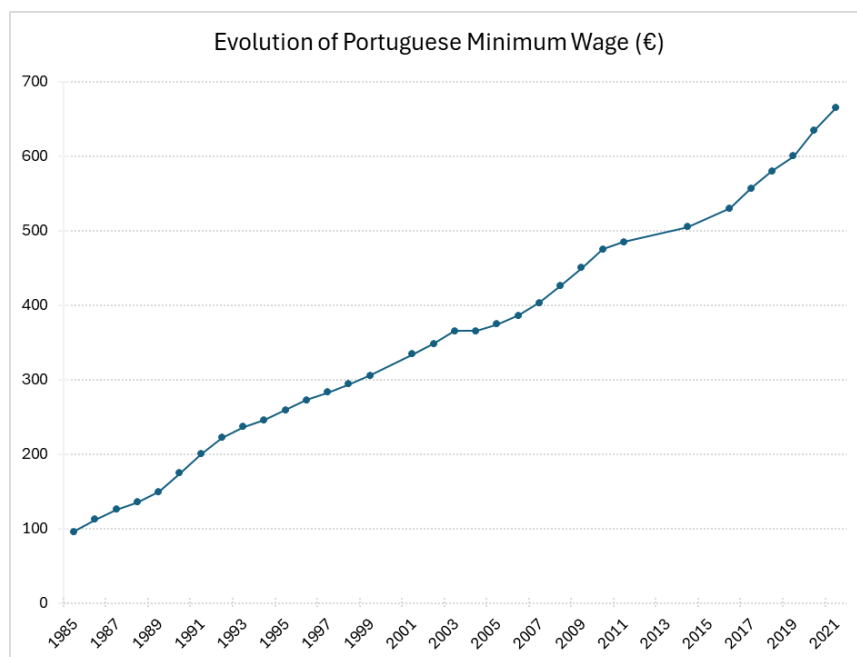


Figure 21 – Evolution of Portuguese minimum wage between 1985 and 2021⁵

There are already some available platforms that can be used by citizens to obtain more information about energy efficiency in buildings and savings in electricity bills, such as: Poupa Energia⁶, Cinergia - Energy Information Centre⁷, Energy Observatory⁸, casA+ portal⁹ and ERSE energy price simulator¹⁰, but probably most of them remain unknown to the general public. Also, until March 2025 fifty “Citizen Energy Spaces” will be implemented throughout the country to advise and help the population regarding energy and energy efficiency-related issues and this information can be shared during the project's workshops and events.

Another issue tied to the rise in electricity prices is the growing reliance on energy-intensive appliances and household equipment. As homes modernise with the adoption of air conditioning systems, electric heating, and various appliances, energy consumption has increased significantly. This places an additional financial burden on low-income families, who must now allocate more of their budget to cover these rising energy costs. Without proper

⁵ <https://www.dgert.gov.pt/evolucao-da-remuneracao-minima-mensal-garantida-rmmg>

⁶ <https://poupaenergia.pt/>

⁷ <https://cinergia.pt/>

⁸ <https://www.observatoriodaenergia.pt/>

⁹ <https://portalcasamais.pt/>

¹⁰ <https://simulador.precos.erse.pt>

guidance on energy-efficient appliances and the potential long-term savings they can provide, many households may continue to face difficulties in managing their energy expenditure effectively.

An opportunity to address this issue lies in promoting the adoption of renewable energy solutions, particularly solar energy, among households. The cost of solar panels has decreased over time, making it a more accessible option for homeowners to generate their own electricity and reduce reliance on the grid (the financial benefits of this option can be shown to the public through digital tools like Digital Twins). By raising awareness about the financial and environmental benefits of renewable energy systems, as well as providing information on available subsidies and incentives, citizens can be empowered to make informed decisions. The project could also collaborate with organisations to offer practical support on how to access these subsidies, particularly for lower-income households, enabling them to adopt solar energy with greater ease.

Furthermore, another significant opportunity is to focus on improving the energy efficiency of buildings, especially through targeted renovations in older properties. Many homes built before modern energy standards suffer from poor insulation and outdated systems, which lead to excessive energy use and higher electricity bills. By disseminating information about cost-effective renovation strategies—such as upgrading insulation, installing energy-efficient windows, and integrating smart home technologies—citizens can make better decisions to reduce their energy consumption. The project could work with local authorities to ensure these programmes are widely promoted and easily accessible, helping more households to improve their energy efficiency and lower their energy costs in the long term.

Summary of the main identified problems and opportunities

Problems

- High increase in electricity prices since 2008 with low corresponding increase in minimum wage
- Growing usage of energy-intensive appliances and household equipment leading to the increase of electricity consumption

Opportunities

- Available platforms with information about energy efficiency in buildings and savings in electricity bills
- Implementation of “Citizen Energy Spaces” to advise and help the population regarding energy and energy efficiency-related issues
- Promoting the adoption of renewable energy solutions, particularly solar energy, among households
- Improving the energy efficiency of buildings, especially through targeted renovations in older properties

4. Local Stakeholders Engagement Strategy

The Cascais Demo has a strong social engagement component, and the local stakeholder's engagement strategy is planned to reach the three different community groups that will interact with and benefit from the project. The WeGenerate project will interact with these three target groups in different ways, and with different purposes. These three groups are:

- The 127 residents of the social neighbourhood of the pilot community energy (Bairro Social de Alcabideche)
- The residents of the remaining social housing neighbourhoods of the Alcabideche Parish, a total of 2100 residents.
- Users of the public buildings that will be part of the project, where the PV panels are located. This includes both workers and users of the public services (swimming pool, gym, music school, etc.), over 3000 individuals.

To reach the target groups of community members, the demo will at a first stage engage local authorities, starting with the different departments of the Municipality of Cascais of interest:

- Cascais Envolverte, which manages the social housing infrastructure

- Cascais Próxima which is the mobility department of the municipality, managing the public transportation “light mobility” infrastructure and EV chargers of the municipality, through “MobiCascais”.
- Division of Social Intervention and Quality of Life, which works directly with community members and social housing residents specifically.

At the same time, we will engage the local parish, which has a more direct contact with all Alcabideche residents, and also the managers of the buildings that are part of the intervention, meaning the buildings where the PV panels are installed (described in the Demo Site Summary section).

The specific actions for stakeholder engagement are part of Action 5 described below. The first one is to engage with the stakeholders listed through a first presentation and event of the official launching of the project, which will be followed by bilateral meetings with the different stakeholders (A5.1.1)

Regarding the direct interaction with community members, the preliminary step is through the development of a face-to-face survey, to collect micro data at the household level (A2.1). In this survey, we will target a representative sample of the three different groups, with the following objectives:

- Socioeconomic characterization of the different groups of citizens
- Perceptions regarding available public and community services, and analysing people’s uses and needs
- Evaluate energy poverty levels
- Evaluate energy literacy levels

This data collection and analysis will be essential to plan for the upcoming interactions.

The group I) of community members (127 residents of “Bairro de Alcabideche”) is the one that will benefit more directly from the project’s activities. This group of residents will have the chance to join the pilot energy community, which will include the exceeding energy produced in the solar PV panels that will be installed in their buildings and will have a more direct interaction with the project’s activities. By actively involving these residents, we aim to address social equity, ensuring that participant community members will benefit from energy savings

and sustainability initiatives, thereby improving their quality of life and fostering a sense of community ownership in the energy transition.

The first action that will take place to engage with this group specifically is the creation of a “Neighbourhood Tutor” (A5.1.2), which will be the contact person between the project and the residents of the neighbourhood. This role already exists in other neighbourhoods where the municipality works directly with social housing residents, being useful for further initiatives in the long term. Following that, this group of residents will be contacted through the available digital channels and through face-to-face events in a first step to inform eligible residents of the pilot energy community that will be implemented, its advantages and how they can join (A5.1.3). Once the community is created, there will be several one-stop shops located across the municipality where participants and other interested citizens can visit to clarify any doubts related to the project’s activities.

The WeGenerate project will interact with this first group and the two other community groups through co-creation workshops and community meetings to promote sustainable energy use (Task A5.2). Participants will be involved in the design of the digital twin platform, so that this is designed in a way that is useful for them and will have a chance to raise their voices on the problems they face related to the project’s activities, and what they would like to see improved.

As mentioned before, to enhance engagement through an inclusive governance model, we will develop Digital Twin technology, providing a virtual representation of real energy consumption and potential savings. This tool will be an essential part of the engagement strategy with the different community groups and will be present in engagement activities with community members (workshops, information sessions, communication through digital platforms). Regular updates and an interactive tool will empower participants to share and compare consumption data, increasing their energy literacy. Finally, the three community groups will be targeted by the energy literacy and awareness campaigns that will be developed (A5.3).

In Cascais, recently important community awareness initiatives were held, some related to other projects in similar areas. These initiatives are integrated in the Cascais Climate Action Agenda #CascaisPeloClima, that promotes climate literacy and encourages participatory governance, focusing on training, raising awareness and disseminating tools for adapting to and mitigating climate change. The most recently released initiative is the Green Fund to support

Cascais families (Fundo Verde de Apoio às Famílias), which was presented to the public in December 2024, and will give financial support to low-income families for home renovation to increase energy efficiency. Table 2 describes the #CascaisPeloClima's key initiatives within the WeGenerate scope of action, which can be adapted and replicated in this context. Some of the initiatives were prior to the project beginning but are considered here because they were setting the ground to create synergies with ongoing projects that have similar goals, such as the COMMUNITAS project¹¹, enhancing the impact of both projects, and also informing residents of Alcabideche on how to access available funds and opportunities.

Table 2 - Agenda #CascaisPeloClima's key initiatives within WeGenerate scope of action

Activity Name	Activity Description	Date	Estimated Reach
Companies For Decarbonization	Climate action workshops were held, focusing on energy communities and decarbonization. One of the sessions took place within the framework of the LIFE CLIVUT project and was aimed at companies and their role in climate action, while the other was aimed at the whole community and addressed the issue of Energy Communities, through the Horizon Europe COMMUNITAS project.	28/04/23	15
Stakeholders And Citizens for Decarbonisation		28/04/23	22
Energy Community Presentation - Bicesse		02/05/23	40
Speaking For the Climate	Informal community meetings aimed at co-creating solutions and activities that enhance resilience to climate change. By focusing on Inclusive Climate Action, the initiative incorporates the pillars of Environment, economy, and Society, along with an Equity pillar to ensure a just transition- this approach maximises inclusion and fosters community involvement, ensuring that the benefits of climate action are shared equitably among all.	16/02/24	10
Energy Café	Informal meetings to promote energy literacy and games on energy efficiency, where topics such as the importance of energy saving, energy efficiency measures, electricity bill and the social energy tariff were analysed. These meetings were held as part of Horizon Europe's DATA CELLAR project (CEES – Community Energy for Energy Solidarity). The Energy Cafés have been developed as a means of providing free energy-saving advice and free energy efficiency kits (with around 70 kits already distributed).	28/02/24	30
		15/03/24	20
		21/03/24	5
		14/05/24	20
		20/06/24	20
Positive Energy for Homes and Companies	Working group for the discussion of the potential for energy savings with the use of renewable energies. This analysis was carried out by automatically analysing consumption data in real time using an innovative electronic platform.	25/03/24	5
Demonstration Webinar on Energy Communities, Energy Cafés and Cooperatives	As part of COST ACTION, this webinar allowed the discussion of the fact that while the potential of Energy Communities to empower citizens is clear, how to engage citizens on the topic of energy remains a challenge. Through a series of presentations, this webinar outlined the wide range of methods and associated considerations for stakeholders, highlighted the example of the Energy Cafés and explored the role of energy cooperatives in establishing energy communities.	20/06/24	30

¹¹ <https://communitas-project.eu/>

Available Digital Tools for citizen's engagement

Cascais has made significant investments in digitalization to enhance transparency and communication with its residents. The municipality has several key digital tools:

Fix Cascais: App designed to empower citizens by enabling them to report issues related to public space, traffic, or the cleanliness of public areas. Through the app, citizens can share geolocated images of the situation, facilitating direct communication between residents and the municipality. This streamlined process contributes to the efficient resolution of reported problems. The project will incentivize the use of this tool in Alcabideche, to improve the conditions of public spaces and to increase accountability and sense of responsibility by all citizens.

GeoCascais: It is a portal that serves as Cascais' Geographic Information System (GIS), offering citizens open access to geographic information. This tool will also be presented and incentivized the use, as it provides a visual representation of the municipality's physical characteristics, services and infrastructure. This will increase awareness on what services are already available to them, incentivizing participation and a sense of community. Community members will be invited to share their opinion on the tool, and what they would further like to see represented in this platform.

DataCascais: It is a platform that aggregates smart data collected by the city across various domains, including demography, territory, health, mobility, education, economy, and culture. This data is available for consultation and possesses the potential to be employed for monitoring processes and supporting decision-making. This tool is relevant for the project's team and may be relevant also for residents who seek for specific information on the municipality.



Figure 22 – Data Cascais main search categories

While Cascais has implemented various projects and tools focusing on digitalization and citizen empowerment, there is an ongoing effort to refine indicators related to climate neutrality,

specifically those that support the development of energy communities. This project will contribute with that.

5. Co-created Visions

In developing the ambition of the WeGenerate project, it is essential to adopt a collaborative co-creation process that involves the active participation of local stakeholders. By organising community meetings, workshops, and public forums, we can ensure that residents, local businesses, and other key players are directly involved in shaping both short-term objectives and long-term goals. A practical example of this approach is the formation of local energy communities, where neighbours come together to explore shared renewable energy generation, such as solar PV. By pooling resources and sharing the benefits, these communities can reduce their overall energy costs while fostering stronger community bonds. Additionally, workshops on energy literacy can provide practical advice on reducing energy consumption, selecting efficient appliances, and understanding utility bills, giving citizens the knowledge to make more informed decisions about their energy use.

Furthermore, this co-creation approach can leverage local expertise to develop practical, real-world solutions that are tailored to the specific needs of the community. For instance, schools and local organisations can be involved in energy-saving campaigns or educational programmes that raise awareness about the benefits of energy efficiency. Practical activities, such as home energy audits or workshops on installing basic energy-saving devices, can engage residents in a hands-on way, promoting a deeper understanding of how to reduce energy consumption. The project could also support the development of shared solar installations or energy cooperatives, where groups of households collaborate on renewable energy projects, further enhancing local energy independence. Through these efforts, WeGenerate can foster a sense of community ownership, ensuring that the transition to a more sustainable and energy-efficient future is both inclusive and effective.

6. Pilot Transformation Activities

This section includes a description of the specific transformation activities being implemented as part of the project.

Action A1 – Contextualization planning, impact assessment of the intervention measures

Within this action Cascais will plan how to assess the social housing comfort and liveability (Task A1.1), define intervention measures for the improvement of the energy efficiency and comfort of the social housing, plan the layout of Alcabideche REC between the municipality buildings and the social neighbourhood buildings and plan how to assess the impact the intervention measures will have for the social housing residents (Task A1.2). This work is done in close connection with the Innovation Hub Clusters. (i) Energy in the built environment; (ii) Integrated Planning and Digital Application; (iii) Social Innovation and Participatory Action.

The affected stakeholders will be the social neighbourhood residents, the users of the public buildings, and Alcabideche parish and Cascais municipality that will recover their investment and afterwards save money in electricity bills in the public buildings.

For the intervention measures impact assessment, the most relevant data is:

- Indoor comfort levels (temperature, humidity, airtightness and ventilation, etc) – LNEG has temperature and humidity sensors that can be used in the social housing for measurement during the project's timeline, but the residents' approval is needed;
- Electricity consumption (ideally the load profile, but those are only available for the houses that already have smart meters);
- Buildings' energy certificates to assess their energy performance or the building's projects and blueprints, list of used materials, etc .

Building Stock Energy Efficiency

According to the revision of the European Energy Performance of buildings directive, that will go through the formal adoption process in 2025, the aim is to achieve a fully decarbonised building stock by 2050. Portuguese legislation follows this directive making this objective also

a national objective. In Portugal there is a buildings certification system since 2006 called SCE (Energy Certification System), using this system buildings are classified according to their primary energy consumptions and equivalent CO₂ emissions, among other parameters, and these values are compared to reference values for different Portuguese regions. This comparison results in a classification of the buildings' performance according to 7 different categories, A+ is the most efficient and E is the least efficient.

Demo site Buildings

The characterisation of the pilot project buildings, the study for the implementation of the energy community and the collection of information on the inhabitants of the social neighbourhood are underway.

An initial analysis showed that the social housing buildings have energy certificates, but the energy producers' buildings don't have an energy audit or certification, so characterising the 5 public buildings is the first challenge to overcome.

The Demo site social housing buildings were built in 2003, 6 buildings are considered, with 58 apartments and 127 residents. The construction was made 20 years ago and at that time the buildings didn't have to comply with tight rules related to energy consumption and efficiency, thermal losses and gains, ventilation and air renovation rates, etc. Legislation on building efficiency came into force in Portugal in 2006. For that reason, there is a need for building renovation, that will lead to improvements in the buildings' performance.

Social Housing Buildings Energy Certificates Assessment

The social housing management department of Cascais Municipality, "Cascais Envolvente", shared the buildings' energy certificates and their evaluation was made. The building with door number 74 only has 1 social apartment, the other apartments were already bought by the residents and are privately owned. The building with door number 6 only has 9 apartments because it has one floor less than the other buildings, which have 12 apartments.

Regarding Domestic Hot Water (DHW), 5 buildings have natural gas water heaters and 1 building has electric water heaters (nr. 169). For air renovation there is natural ventilation through window openings and mechanical exhaustion in the bathrooms and kitchens. The Energy Classes of the apartments are mainly C (23 Apt.) and D (20 Apt.).

Figure 23 shows the energy class distribution of the apartments in each building according to the analysed energy certificates.

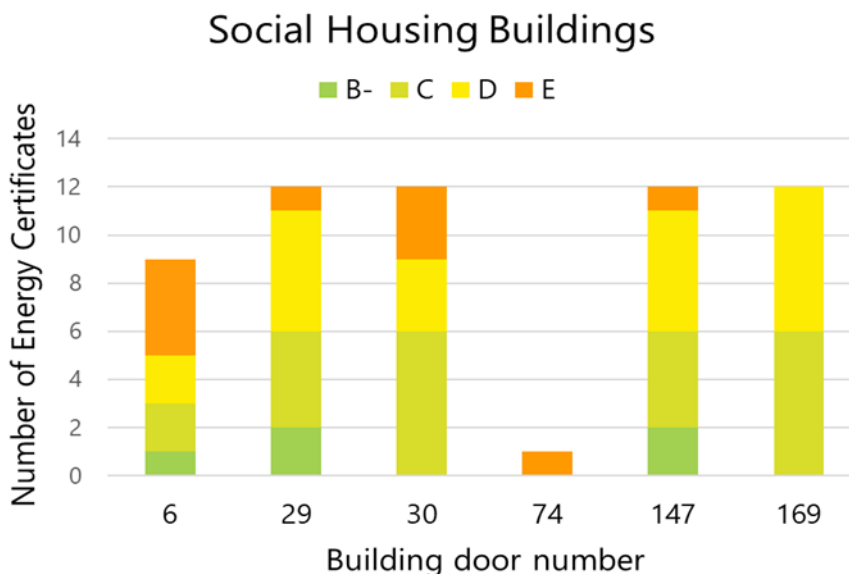


Figure 23 – Number of social housing apartments (1 energy certificate per apartment)

Figure 24 shows the yearly primary energy needs of each building considering its apartments individual needs.

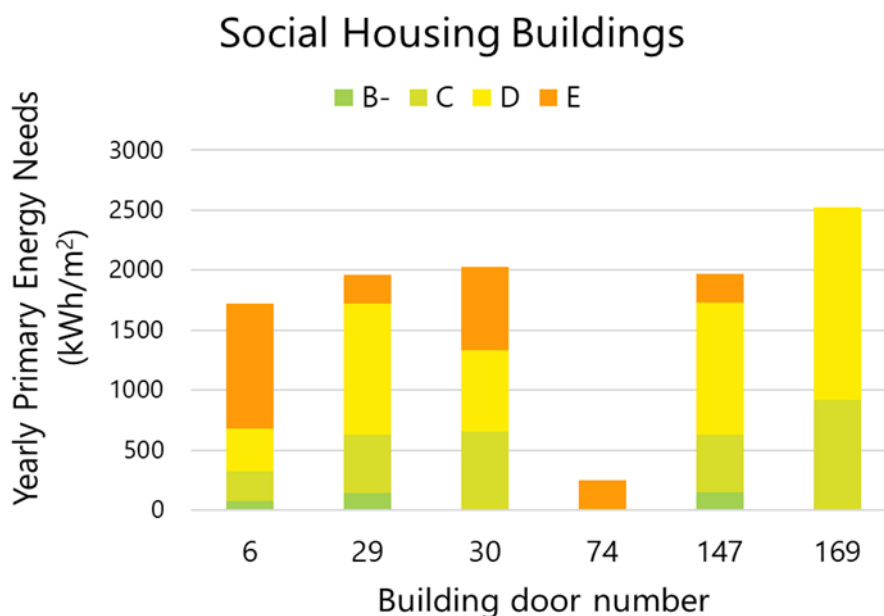


Figure 24 – Yearly primary energy needs of the social housing buildings (needs per energy class)

The following table summarizes the primary energy needs of each apartment typology, each floor has the three typologies, T1, T2 and T3 which represent 1, 2 or 3 bedrooms. Typology T2 is highlighted to show that it has the highest energy needs.

Table 3 – Average primary energy needs of each apartment typology

Typology*	Average Primary Energy Needs (kWh/m ² .year)
T1	151,9
T2	204,5
T3	184,8

As for the average energy needs in each building floor, the table below shows that the top floor of the buildings has the higher energy needs for heating and also for cooling.

Table 4 – Average energy needs per floor – primary, heating and cooling

Floor	Average primary energy needs (kWh/m ² .year)	Average heating needs (no DHW) (kWh/m ² .year)	Average cooling needs (kWh/m ² .year)
Ground	221,8	70,2	0,6
1 st	115,6	28,3	2,2
2 nd	144,0	40,5	2,6
3 rd	247,1	76,5	4

The information above shows the need for building exterior insulation of the roof and walls. The buildings' certificates indicate that the most relevant improvements to be made in the buildings are the exterior insulation and the replacement of windows for more efficient ones with high insulating window frames and at least double glass pane.

The neighbourhood buildings also need to have their roofs replaced because they are made of fibre cement. In addition to this pathology, and following a technical assessment on the ground, there is an urgent need for the façades to be conserved. The buildings are dilapidated, with cracks and a lack of conservation, giving rise to various infiltrations inside the apartments.

The second challenge is to get to know the community in the social neighbourhood in depth (Task A2.1.1). To do this, it will be necessary to survey the families who live there to determine,

for example, the number of occupants in each flat, the level of indoor comfort, the ability to pay electricity bills, their mobility options and patterns, among other information, which will then be used to adjust the existing building retrofitting and accessibility and mobility plans for this neighbourhood (Task A1.2). These improvements could be for example the installation of more lighting in some areas to increase safety, the increase in frequency of buses in the most used routes and the installation of electric chargers where they are most needed.

Although more tasks and subtasks can be defined for this action, the initial plan is described in the table below.

Table 5 – Action 1 planning

Transformation Action	Description of Tasks	Responsible Partners	Month (Start-End)	Innovation Hub Interaction ¹²				Related KPIs
				2.1	2.2	2.3	2.4	
A1 - Contextualization planning, impact assessment of the intervention measures	Task A1.1 - Assess the energy use and provide a set of retrofitting solutions	LNEG	11.2023-12.2024	X	X	X	X	NON-RENEWABLE PRIMARY ENERGY LIFE-CYCLE GHG EMISSIONS
	Task A1.2 - Evaluation of the related ongoing actions in Cascais and planning of the actions to be taken within the framework of the project	LNEG, EMAC	08.2024-02.2025	X	X	X	X	LIFE-CYCLE GHG EMISSIONS (expected after the measures implementation)

Action A2 – Evaluation of energy poverty level, of the built environment quality and indoor comfort conditions

The European commission defines energy poverty as the need for a household to reduce its energy consumption to a degree that negatively impacts the inhabitants' health and wellbeing. The main drivers that affect energy poverty levels are higher energy prices, that increase the

¹² Innovation Hub Clusters: 2.1 Integrated Planning and Digital Application, 2.2 Social Innovation and Participatory Action, 2.3 Energy in Built Environment, 2.4 Sustainable Mobility.

proportion of household expenditure spent on energy, low-income levels of families, and low energy performance of buildings and appliances. In the case of Portugal, all these three factors are critical, and it is estimated that between 1.9 and 3 million people are in energy poverty (20-30% of the country's population).

Since this is a multi-dimensional issue, to have a comprehensive understanding of the energy poverty level several indicators must be measured, that should be complementary in terms of information provided. The EU Energy Poverty Observatory developed in 2020 guidelines on energy poverty assessment, that include a list of indicators focusing on the affordability of energy services and a list of complementary indicators. These can be divided in four categories (source: EPRS, 2023):

- 1) affordability of energy related to household income;
- 2) indicators based on self-assessment and perceptions (e.g. regarding affordability);
- 3) indicators based on direct measurement, as related to housing and energy efficiency (e.g. room temperature)
- 4) indirect indicators measuring related factors (e.g. arrears on utility bills, number of disconnections, and housing quality)

Indicators can also be aggregated into composite score, as the European Domestic Energy Poverty Index (EDPI) proposed by OpenExp. Figure 25 illustrates the ranking of the energy poverty level for the different European countries, considering this composite index, where Portugal's score in energy poverty is one of the highest. However, these types of indexes are not fully informative, as this one in particular includes indicators as "ability to keep house warm in winter" and "ability to keep house cool in summer", which are highly dependent on climate conditions. Still, they are informative and can be useful for cross-country comparison. The Cascais demo will focus on the most appropriate indicators to characterize the energy poverty level of the social housing residents of the Alcabideche parish, and measure these at the household level.

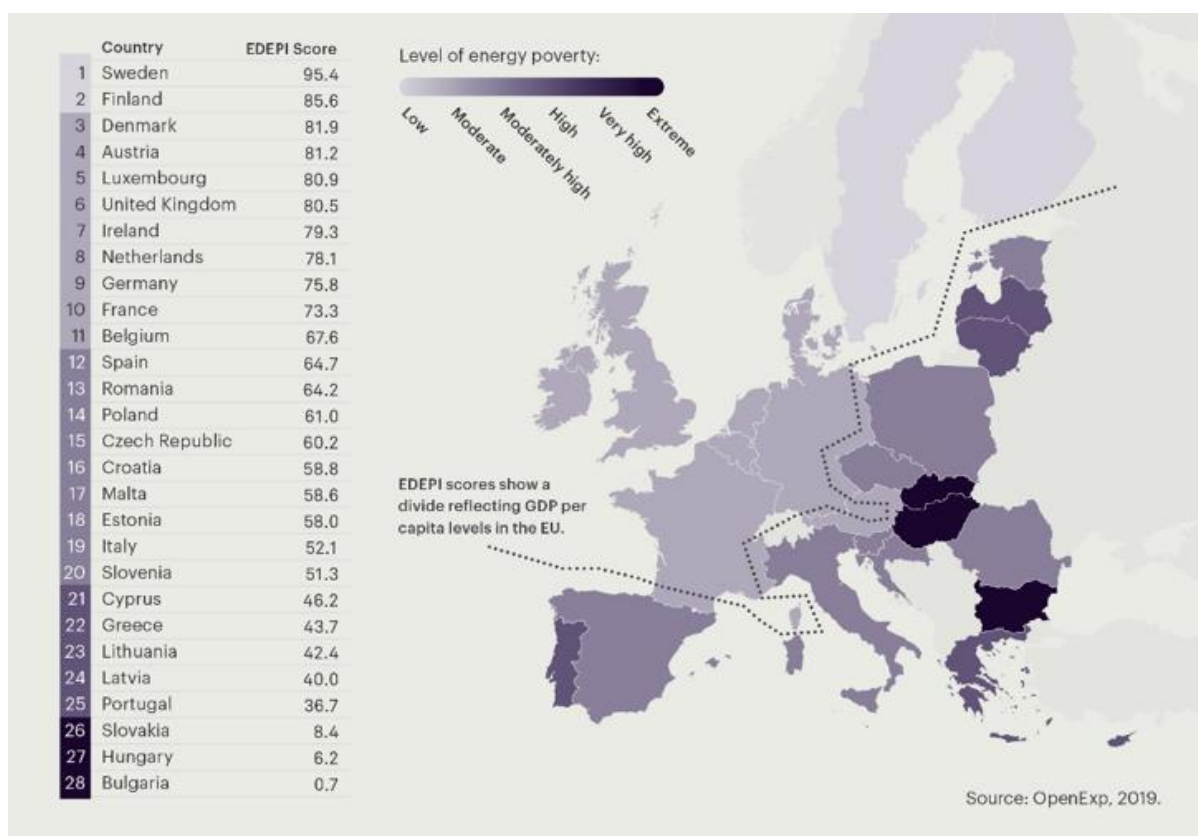


Figure 25 - Ranking of countries based on the EU Domestic Energy Poverty Index (EDEPI)

The first task of action 2 is the Characterization of the population involved, and evaluation of energy poverty level and energy literacy level (A2.1). To complete this task, the first sub-task is to select the relevant energy poverty indicators, which include the built environment quality and indoor comfort conditions, and energy literacy indicators (A2.1.1). This is done through extensive literature review and a critical analysis considering the specificities of the context. The next sub-task is the data collection that will be done before the project's intervention (A2.1.2). Data will be collected from available sources (national statistics and municipal databases), data on the built environment quality, and survey data collection. After that, the data will be analysed to answer the different objectives: characterization of the citizens involved and their perceptions on community services and infrastructures (A2.1.3); calculating energy poverty and energy literacy indicators (A2.1.4).

The second task is the evaluation of the residents' transportation needs to connect with mobility policies and evaluate where the Electric Vehicles (EV) chargers will be more useful (A2.2). This will be done through stakeholder consultation and through the collection and analysis of data, from the same sources as in A2.1.

At the moment there is no specific data about how many EV and Plug-In Hybrid Electric Vehicles (PHEV) circulate in Cascais municipality and specifically in the Alcabideche parish. According to the Portuguese Association of Electric Vehicle Users, at the end of 2024, the total number of EVs was 190 665 and of PHEV 134 789¹³. Dividing this numbers according to the population percentage of Alcabideche parish, we can have an idea of the number of electric and hybrid vehicles in this area. The total Portuguese population in 2021 (last census) was 10 343 066¹⁴ and the population in Alcabideche was 44 165¹⁵, which meant that 0.427% of the Portuguese population lived in this parish. This percentage leads to 814 EVs and 576 PHEV in Alcabideche.

To evaluate the availability of public EV chargers, a map for Alcabideche parish is shown below. There are 4 charger operators working in the parish, with 9 charging stations and 24 charging plugs. The power distribution of the chargers is shown in the pie chart of Figure 26.

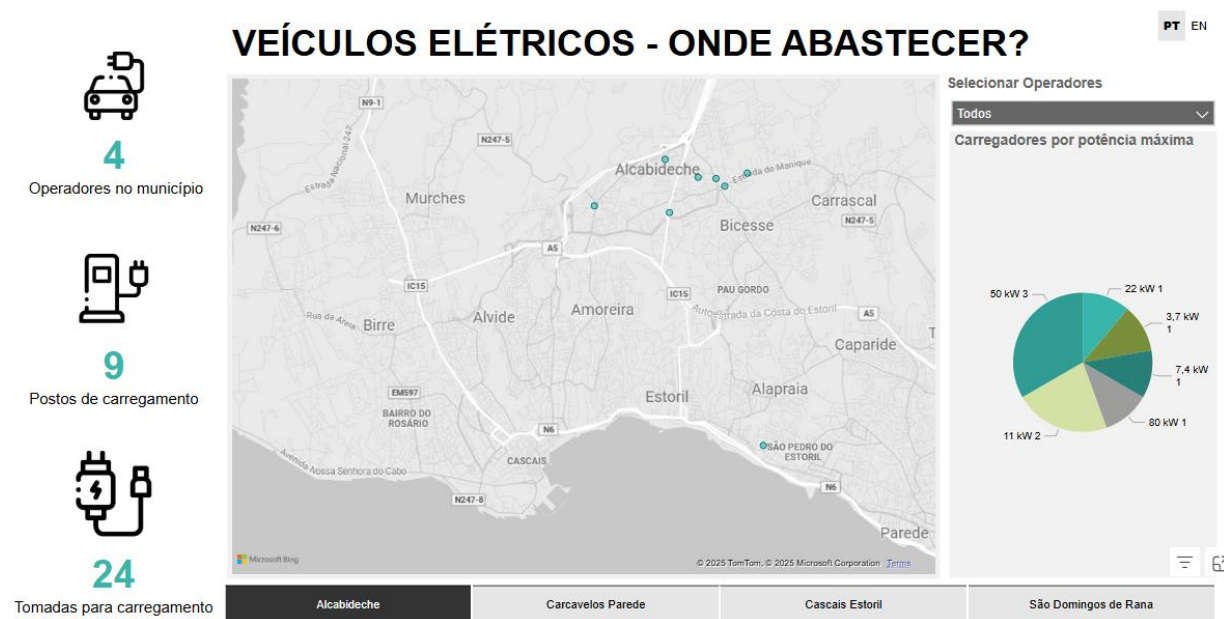


Figure 26 – Map of EV chargers in Alcabideche (data from 2022)¹⁶

Figure 27 is the result of a zoom in of the map above in comparison with the demo buildings map, and in it we can see that there is only 1 charging station with 2 plugs in the demo area, so clearly more chargers are needed and, as stated before, the information gathered in the survey will help to determine the best locations for the EV chargers.

¹³ <https://www.uve.pt/page/parque-ve-2024/>

¹⁴ <https://tabulador.ine.pt/indicador/?id=0011609>

¹⁵ <https://tabulador.ine.pt/indicador/?id=0011609>

¹⁶ <https://data.cascais.pt/geral/arquivo-mob/carregamento-veiculos-eletricos>

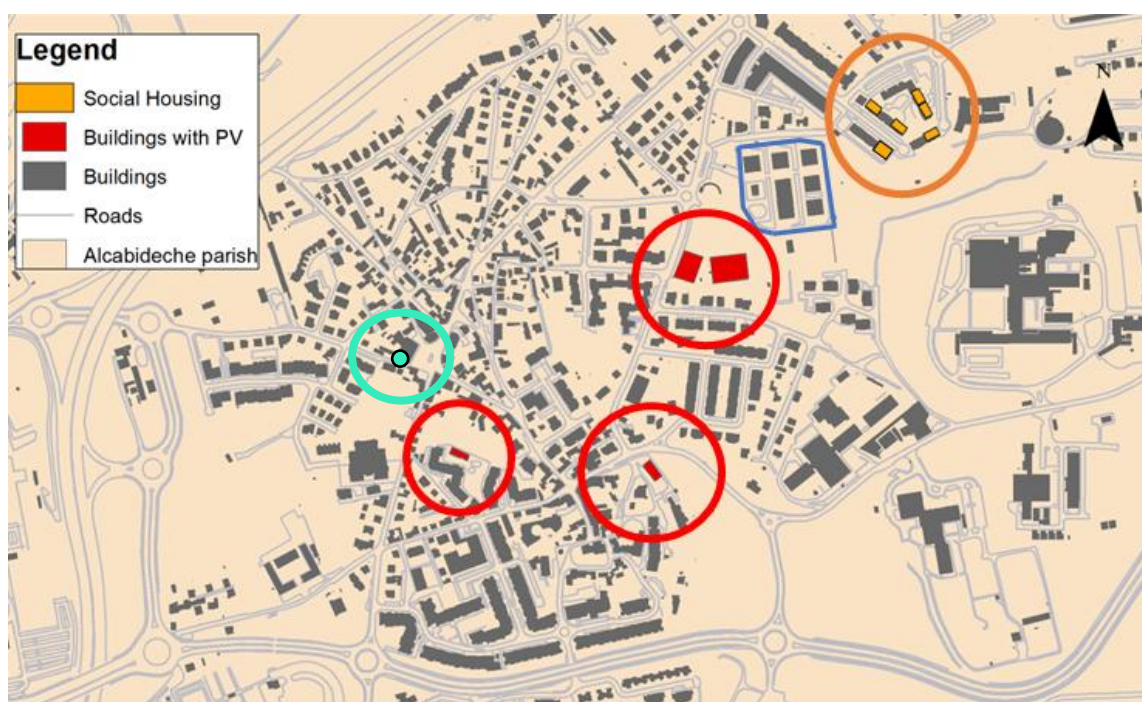
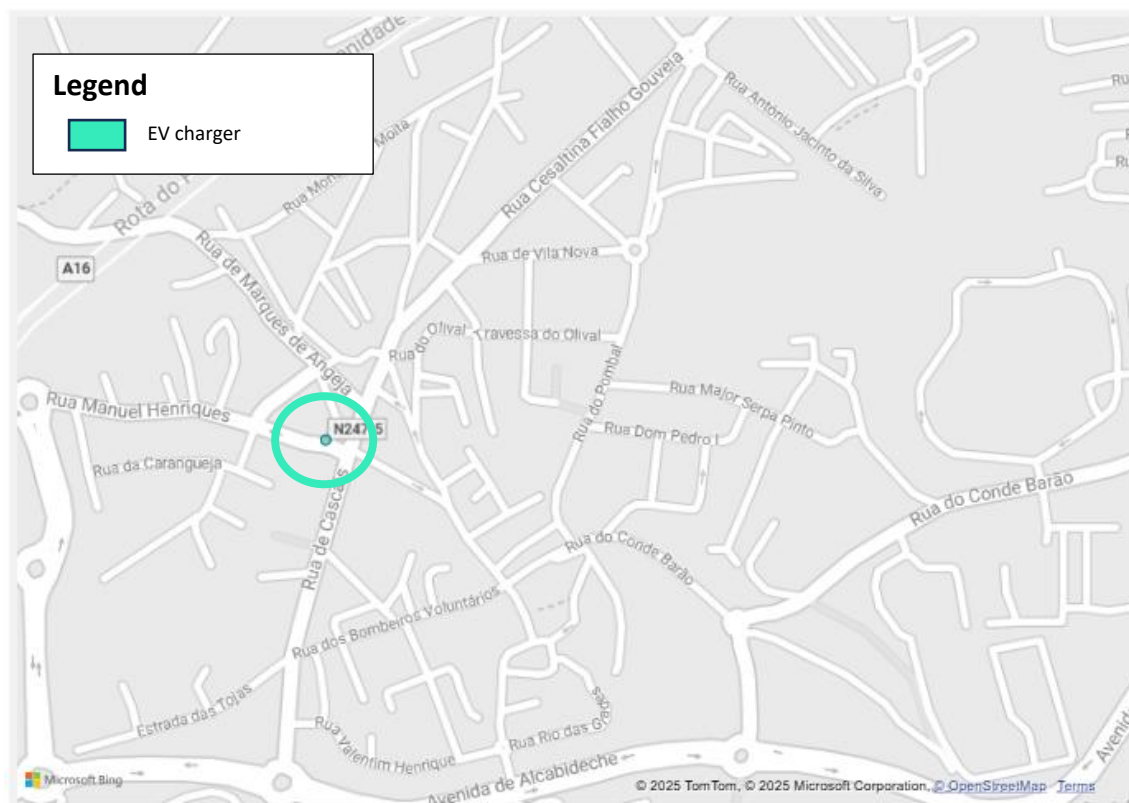


Figure 27 – Map of EV chargers in the demo area (data from 2022)¹⁷ and map with the demo buildings

¹⁷ <https://data.cascais.pt/geral/arquivo-mob/carregamento-veiculos-eletricos>

The third task is the Development of a framework for urban regeneration with input from the Innovation Hub (A2.3).

A post-intervention assessment will be conducted, focusing on the populations and buildings that will be affected by the project, by measuring the same selected indicators in A2.1. These indicators will be compared with the ex-ante evaluation, to measure the impact of the intervention.

With the proposed interventions, namely the creation of the energy community in Alcabideche and the citizen engagement activities with the help of digital tools development, we expect the WeGenerate project to impact energy poverty levels in two ways:

- By contributing to the reduction of resident's energy bills, thus contributing to the reduction of the proportion of income spent in the energy costs, or increasing the possibility of having access to additional sources of heating
- By sharing information that will increase energy literacy, which we expect to also have an impact in the reduction of residents' energy bills

Table 6 describes the specific tasks that will be undertaken within action 2.

Table 6 –Action 2 planning

Transformation Action	Description of Tasks	Responsible partners	Months (start-end)	Innovation Hub Interaction				Related KPIs
				2.1	2.2	2.3	2.4	
A2 - Evaluation of energy poverty level, of the built environment quality and indoor comfort conditions	Task A2.1 - Characterization of the population involved, and evaluation of energy poverty and energy literacy level. Select relevant indicators (T. A2.1.1), Collect data pre-intervention, from available sources and through survey development (T.A2.1.2), Data analysis:	NovaSBE	03.2024-04.2025		X	X	X	AFFORDABILITY OF ENERGY THERMAL COMFORT AVAILABILITY

	Identification and characterization of the citizens involved (T.A2.1.3). Data analysis: calculate selected indicators (T.A2.1.4)							
	Task A2.2 - Evaluation of the residents' transportation needs to connect with mobility policies and evaluate where the EV chargers will be more useful	NovaSBE, EMAC	09.2024-04.2025		X		X	MODAL SPLIT CAR OWNERSHIP ACCESS TO SUSTAINABLE MOBILITY WALKING SPACE & CYCLING PATH SUPPLY
	Task A2.3 - Development of a framework for urban regeneration with input from the Innovation Hub	LNEG	09.2024-04.2025	X	X	X	X	

Action A3 – Implement an active citizen energy community in the neighbourhood, which shares the energy between ‘prosumers’, working as an urban energy lab

Solar Resource Assessment

The average yearly Global Horizontal Irradiation (GHI) at ground level and in buildings' rooftops was assessed for Cascais municipality (Task A3.1) considering the terrain's slope and the buildings' shape and height by using an urban digital terrain model (U-DTM). This methodology strongly reduces the computational effort to simulate groups of buildings; it simplifies the geometry of the urban mesh and allows to extend the area of simulation to a city scale. The GIS solar radiation analysis tools calculate insolation across a landscape, based on methods from the hemispherical viewshed algorithm developed by Rich et al.¹⁸ (1995) and further developed by Fu and Rich¹⁹ (2000). The total amount of radiation calculated for a particular location or area is given as global radiation. The calculation of direct, diffuse, and global insolation is repeated for every location on the topographic surface, producing insolation maps for an entire geographic area. The picture below shows the resulting map.

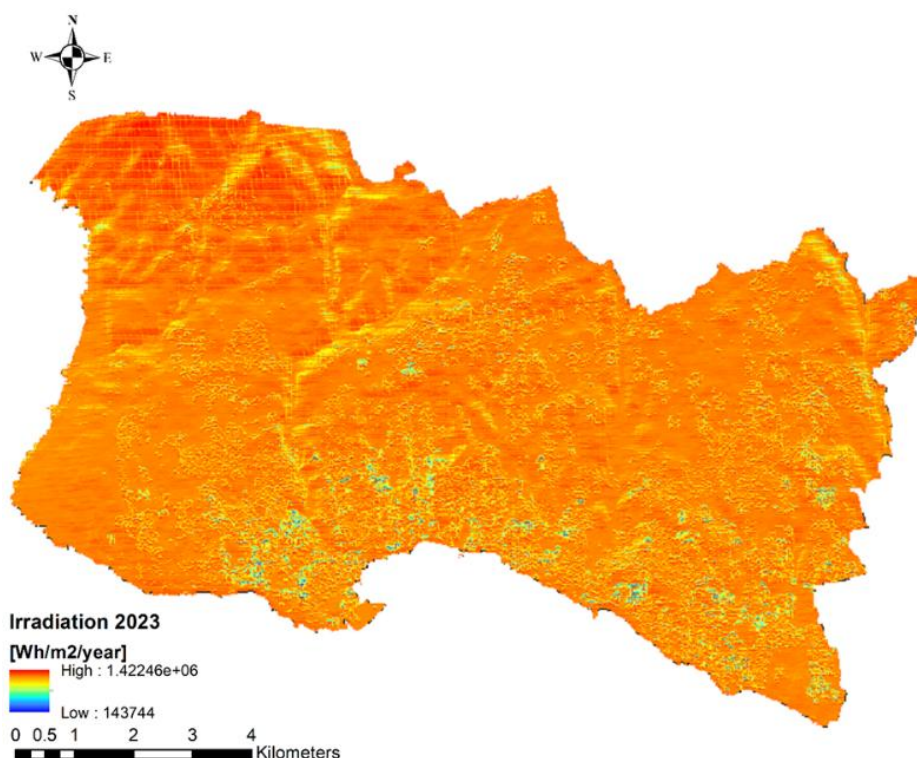


Figure 28 - Average yearly Global Horizontal Irradiation (GHI) in Cascais municipality

¹⁸ Rich, P.M., W.A. Hetrick, and S.C. Saving. 1995. Modeling Topographic Influences on Solar Radiation: a manual for the Solarflux model. Los Alamos National Laboratory Report LA-12989-M.

¹⁹ Rich, P.M., Fu P., 4th International Conference on Integrating GIS and Environmental Modeling (GIS/EM4): Problems, Prospects and Research Needs. Banff, Alberta, Canada, September 2 - 8, 2000.

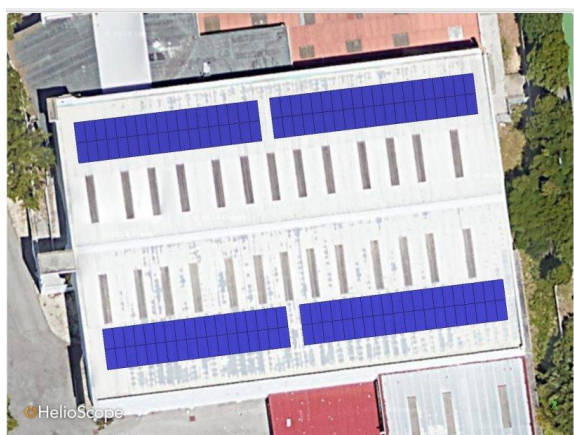
Within the buildings managed by the municipality, **five key buildings** were identified as suitable for the installation of PV systems, providing a practical foundation for the energy community. These buildings include the **Municipal Swimming Pool, Sports Hall, Parish Office, Elderly Day-care Centre, and Music School**. An initial evaluation of the PV power that can be installed in the rooftops, expected self-consumption ratio and grid independence was done (Task A3.2) and is shown in the following tables.

Municipal Swimmingpool



Metrics	Nominal Power [kWp]
Potential capacity installed	66,6 kWp
Self-consumption ratio	44,23%
Grid Independence	40,51%

Sports Hall



Metrics	Nominal Power[kWp]
Potential capacity installed	84,3kWp
Self-consumption ratio	36,52%
Grid Independence	54,44%

Parish Office



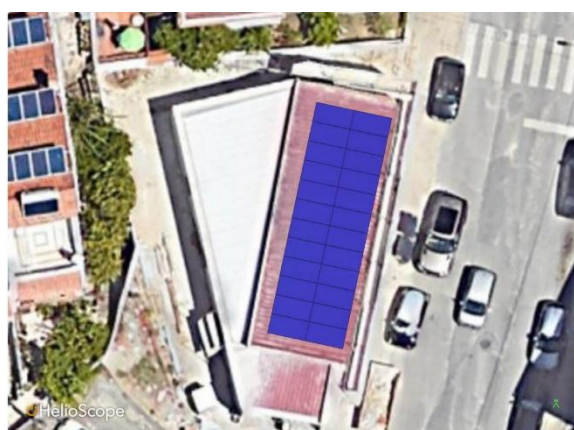
Metrics	Nominal Power[kWp]
Potential capacity installed	12,21kWp
Self-consumption ratio	49%
Grid Independence	60,12%

Elderly Day-care Centre



Metrics	Nominal Power[kWp]
Potential capacity to be installed	2,2 kWp
Self-consumption ratio	7%
Grid Independence	56,6%

Music School



Metrics	Nominal Power[kWp]
Potential capacity installed	13,32 kWp
Self-consumption ratio	56%
Grid Independence	58,06%

The actual initial installed power was lower than the potential capacity calculated above. An expansion of the initial PV installed capacity is planned to be done during the project's timeframe. In Table 7 a comparison between potential and initial installed capacity is shown.

Table 7 - Summary of the capacity of the buildings with PV systems

Building	Potential Capacity [kWp]	Initial Installed Capacity [kWp]
Alcabideche's Parish Office	12,2	10,0
Alcabideche Municipal Swimmingpool	66,6	27,0
Alcabideche's Elderly Day-care Centre	2,2	2,0
Alcabideche's Music School	13,3	1,5
Alcabideche's Sports Hall	84,3	40,0

In Figure 29 images of the 5 installed systems are depicted.



Figure 29 – PV systems in the 5 building's rooftops

The project leverages these municipal buildings as anchor points for energy production. By installing PV systems on these rooftops, the buildings will act as primary energy producers within the energy community, contributing with a significant portion of the renewable energy

consumed locally. However, the project doesn't stop at the municipal level—residents and businesses can also be integrated as prosumers, further increasing the community's capacity to produce and share renewable energy.

The energy produced by these installations will be:

- Consumed locally by the buildings themselves (self-consumption).
- Distributed across the community to cover the energy needs of other participants.
- Any surplus will be injected into the grid, benefiting from favourable grid tariffs under the Renewable Energy Communities (REC) framework.

By implementing this energy community, Cascais will advance several key sustainability objectives:

- Climate neutrality through increased use of renewable energy and reduced reliance on fossil fuels.
- Social cohesion by fostering community ownership of energy resources and engaging residents in the energy transition.
- Economic sustainability by lowering energy costs and stimulating the local economy through energy production and consumption.

In line with the WeGenerate project principles, this action will place citizens at the heart of the energy transition. Residents will be involved in decision-making around energy production, sharing, and consumption, ensuring that the benefits of the energy community are distributed equitably.

Self-Consumption and Renewable Energy Communities Legislation

Decree-Law No. 162/2019 recognizes the importance of self-consumption of renewable electricity and defines the concepts and legal regimes applicable to individual and collective self-consumers of renewable energy, as well as renewable energy communities (CER). Order No. 6453/2020 establishes the charges corresponding to costs of general economic interest (CIEG) that can be deducted from network access tariffs to be applied to self-consumption.

Renewable energy projects, which involve the use of the public network and which begin activity by the end of 2021, benefit from an exemption from CIEG charges that affect network

access tariffs corresponding to: a) 50% of the total CIEG for individual self-consumption projects; b) to all CIEG for collective self-consumption projects and/or REC.

The eligibility conditions are verified by the Directorate-General for Energy and Geology (DGEG), after the applicant submits an exemption request, in the case of self-consumption projects with an installed power equal to or less than 30 kW.

The planning of the energy community was done according to this legislation (Task A3.3) and the sharing scheme will be defined according to one of the possible schemes: i) Fixed Coefficients - the fixed coefficients associated with each participating installation, which can be differentiated in time, must be communicated in advance to the Distribution System Operator (DSO); ii) Coefficients Proportional to Consumption- energy is shared among the participating installations according to coefficients proportional to the consumption and injection measured in each 15-minute period, which the DSO is responsible for determining; iii) Hierarchical Sharing – a communication is made to the DSO in advance, informing the hierarchical structure to be considered in the self-consumption system, defining the priorities for each consumer or group of consumers; iv) Dynamic Sharing – the REC communicates to the DSO at a later date and within a period compatible with the monthly billing cycle for grid access and consumption readings, the shared energy or the energy sharing coefficients between each installation that injected energy into the grid, and each installation that received energy from the grid.

Energy Community Management Tool

The digital platform (GreenVolt Comunidades (GVC) platform) that will be used is designed to provide a holistic experience aimed at empowering REC users. It offers real-time insights into energy consumption and production, enabling historical analysis to optimize energy usage for a more sustainable and cost-effective approach.

To enhance community engagement, the platform features a Communities menu that displays an overview of all community members and the energy available for sharing in real time. This fosters a sense of belonging and collaboration among users.

The Electric Mobility feature improves the management of electric vehicle (EV) fleets, optimizing charging by leveraging solar power generation, ensuring both efficiency and sustainability.

To further elevate the user experience, the following features are provided:

- **Energy Visualization:** A clear display of your energy production and consumption.
- **Community Overview:** A snapshot of your community's energy landscape, helping the users to stay connected.
- **Energy Flow and Impact Analysis:** Tools for analyzing energy flows and monitoring impact metrics.
- **Centralized Documentation:** Easy access to important documents like invoices, all in one place.
- **Notifications and Tailored Messages:** Relevant updates and messages customized to user preferences.

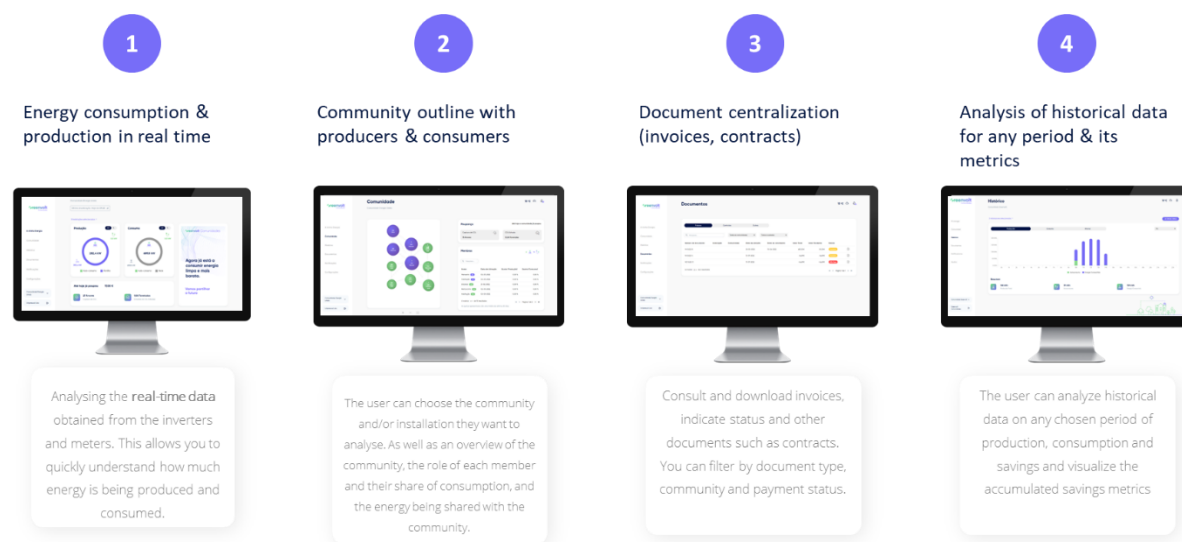


Figure 30 – REC management tool

Community Management

- The platform ensures the energy community management process, via the back-office;
- The client portal allows users to visualize in real-time the impact of the community they belong to (awareness raising).

Impact Tracking

- Data from energy flows from 3 different sources can be integrated to measure the impact;
- Data from client portal usage can be used to track the awareness raising.

Digital Twin support

- Availability of data layers such as energy consumption/production and tariffs paid;
- Outlining the overall product.

To streamline operations and improve client service, several other key functionalities were implemented:

- Data Hub: Integrating three different data sources for production and consumption.
- Client Information Centralization: Utilizing CRM systems for effective management of member information.
- Automated Invoicing: Facilitating the generation and distribution of invoices efficiently.
- Proposal Generator: Accelerating the proposal process by allowing proposal for potential users to be sent five times faster.
- Electric Mobility Model: Supporting load management and fleet optimization.
- Simplicity ensures that important documents, such as invoices, and timely notifications are easily accessible to users.

This action specific steps are the inauguration of the PV systems already installed in the 5 public building, that occurred in September 2024 (Task A3.4), the recruiting of members for the REC, which is ongoing (Task A3.5) but will be more effective when coordinated with the community communication and engagement, and the in-person surveys (Task A5.1 and Task A2.1). When the structure and members of the REC are defined, permits will be requested to the responsible authorities (DGEG) (Task A3.6) in order to create the REC and the response should be received within a period of 4 months. To complement the REC, in Task A3.7, batteries will be installed in the 2 PV systems with higher capacity and 3 EV chargers will be installed in the locations determined by task A.2.2.

Table 8 describes the specific tasks that will be undertaken within action 3.

Table 8 - Action 3 planning

Transformation Action	Description of Tasks	Responsible Partners	Month (Start-End)	Innovation Hub Interaction				Related KPIs
				2.1	2.2	2.3	2.4	
A3 - Implement an active citizen energy community with a customised smart energy metering and management platform that allows the sharing of energy between 'prosumers', working as an urban energy lab	Task A3.1 - Assessment of Cascais' Global Horizontal Irradiation in the ground and in building rooftops	LNEG	01.2024-03.2024	X		X		
	Task A3.2 - Evaluation of the potential capacity to be installed in the 5 municipal buildings and of the percentage of excess energy that can be shared with the social housing buildings	Greenvolt Com	03.2024-06.2024	X		X		RENEWABLE ENERGY RATIO (RER) LIFE-CYCLE GHG EMISSIONS
	Task 3.3 - Planning of the energy community according to existing policies and regulations	Greenvolt Com	04.2024 - 10.2024	X		X		NET ENERGY / NET POWER GRID DELIVERED FACTOR
	Task 3.4 - Inauguration of the first PV systems giving information to the residents about how an energy community works, how they can join and what they can benefit from it	EMAC, Greenvolt Com, NovaSBE, LNEG	09.2024		X			SOCIAL ENGAGEMENT

	Task 3.5 - Recruiting members for the REC	EMAC, Greenvolt Com	11.2024-05.2025		X			SOCIAL ENGAGEMENT
	Task 3.6 - Ask for the permits to create the REC to the responsible authorities (DGEG) and receive the response (4 months waiting period)	Greenvolt Com	06.2025-10.2025					
	Task 3.7 – Installation of batteries in 2 higher capacity PV systems and of 3 EV chargers in the most useful locations	EMAC	01.2026-12.2026				X	ACCESS TO SUSTAINABLE MOBILITY

Action A4 – Develop and test the use of Digital Twin in assessing the potential of creating a citizen energy community in the neighbourhood

A Digital Twin is a tool to be developed in the context of the WeGenerate project, to assist the raising of awareness towards energy communities, to raise energetic literacy and to lead to action from citizens (to belong or to create energy communities and save money in electricity bills doing so).

The objective is to obtain a user friendly tool able to portray the map of the pilot area (Alcabideche) on an app/web-based platform that allows citizens to visualize the impact area of the energy communities created in the project, and the potential energy communities to be created in the future. The platform will account for several layers of data, such as energy production, energy consumption, grid independence, self-consumed energy, etc, and the citizens will have free access to explore and learn through it (Task A4.3).

Prior to the development of this user friendly tool, a Digital Twin with a calculation tool to determine the available solar radiation and energy needs of the buildings considering their 3D characteristics will be done in Task A4.1, which will feed data to the final platform.

Greenvolt Comunidades (GVC) platform will be used to manage the community(ies) created, and it will collect consumption/production data. An API will be developed to read the data from GVC's platform and to pass it onto the Digital Twin (Task A4.2). Furthermore, it will be possible to visualize the outline of the community as well as the percentage of energy that will be distributed between the members, and to also pass that data from GVC's platform to the new tool created.

Several initiatives will be developed to educate the citizens on how to utilize the tool, such as workshop sessions and a user manual. Additionally, a fine tracking of performance will be done to assess the user experience, effectiveness and impact of the tool, and through that analysis a future roadmap of developments and improvements for the tool will be prepared.

Table 9 describes the specific tasks that will be undertaken within action 4.

Table 9 - Action 4 planning

Transformation Action	Description of Tasks	Responsible Partners	Month (Start-End)	Innovation Hub Interaction				Related KPIs
				2.1	2.2	2.3	2.4	
A4 - Develop and test the use of Digital Twin in assessing the potential of creating a citizen energy community in the neighbourhood	Task A4.1 - Development of a 3D model of the neighbourhood buildings to incorporate in the Digital Twin	IREC	06.2024 - 12.2024	X	X			UPTAKE OF DIGITAL APPLICATIONS
	Task A4.2 - Integration of the production and consumption data in the Digital Twin	Greenvolt Com, IREC	01.2025- 12.2025	X	X			UPTAKE OF DIGITAL APPLICATIONS
	Task A4.3 - Development of an App or web based platform to be used by citizens and inform them of	IREC, Greenvolt Com, Outsourcing	03.2025- 03.2026	X	X	X		ENERGY & ENVIRONMENT

	the potential and benefits of being part of an energy community in Cascais	company to be chosen						CONSCIOUSNESS SOCIAL ENGAGEMENT UPTAKE OF DIGITAL APPLICATIONS
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Action A5 – Promoting campaigns for awareness raising and capacity building of citizens about multi-benefits of sustainable, inclusive and accessible neighbourhoods

The successful implementation of the Cascais Demo requires the active involvement of the citizens of the Alcabideche neighbourhood. This is described with detail in the stakeholder engagement section, and the specific tasks and sub-tasks that will be implemented are described in detail in Table 10 below. The first task in Action 5 includes developing an information campaign before the implementation of the PV systems and the creation of the energy community, presenting their benefits (A5.1). This will be done, first by engaging with project stakeholders (A5.1.1), and also targeting specific population groups that can reach out to and help on spreading the message to the rest of the community, including the selection of a “neighbourhood tutor” in the social housing neighbourhood that will be part of the pilot energy community (A5.1.2). The first event within this task is the official launching of the project for the community, where stakeholders were invited for a first presentation of the project implementation, the context and its objectives. The goal of this event is also to promote a first interaction with the key stakeholders who will be the focal point of contact with the different community groups to be involved. Finally, an information campaign targeted to social housing residents, through available digital tools, flyer distribution and face-to-face events will be held, to spread awareness on the project’s activities, and to reach the residents interested in being part of the community (A5.2.1.3).

The second task of this action consists in developing workshops for co-creation with the different groups of citizens involved in the project (A5.2). These participative events will allow the residents to be an active part of the project, increasing the impact of the project's implementation. Participants will be more informed on how they can benefit from the project's activities, will be an active part in the design of the digital tools that will be developed to accommodate their needs and increasing participation. Also, encouraging the active collaboration of citizens in the development of further sustainable energy solutions.

The third task consist in the promotion of energy literacy, through education and awareness campaigns, creating an environment that facilitates households living in energy poverty to adopt and sustain energy-saving practices (A5.3). This will include spreading information about energy production and savings in public infrastructures, with the support of the digital tools developed within the project.

Following the launching event, more targeted and interactive actions will be held to reach specific groups and targeted objectives. These are described in Table 10. Besides these events, the project will communicate with the citizens involved through the available online communication platforms.

Table 10 - Matrix of planned events and campaigns

Event	Date	Topic	Target group	Stakeholders involved	Type	Format (presentation, quizzes, gamification, ...)
Launching event and technical visit	September 2024	AWARENESS RAISING Project presentation; Main objectives; Technical description of the implemented systems	Stakeholders: Municipality of Cascais, Junta de freguesia de Alcabideche, managers of buildings that are part of the intervention, focal points of contact with community members	EMAC LNEG Greenvolt Nova SBE	Informative event, official launching event	Presentation
Engagement meetings with stakeholders	October 2024 – February 2025	CO-CREATION Bilateral meetings with stakeholders, to plan interaction steps with community groups	Stakeholders / focal points of contact with community members	Nova SBE LNEG EMAC	Meetings	Online and face-to-face meetings

Workshop "Energy Communities to lower energy bills and contribute to a greener future"	February 2025	AWARENESS RAISING Explain what is needed to be a part of an energy community and its advantages; Give examples of energy communities	Alcabideche Residents, business owners; Other external stakeholders;	Greenvolt Nova SBE EMAC	Informative and educational event	Presentation and interactive event
Communication on how to join the energy community + "energy café"	April-May 2025	AWARENESS RAISING Information campaign through the different channels of communication	Alcabideche Residents, business owners; Other external stakeholders;	Greenvolt Nova SBE EMAC	Informative and educational event	Presentation and interactive event
Workshop "Impact of energy communities and transport electrification in Cascais decarbonization"	March 2026	EXPERIMENTATION Show possible evolution scenarios and collect opinions from participants	External stakeholders & CMC technicians	LNEG Greenvolt EMAC	Theme Workshop	Interactive workshop
Workshop "How do you envision a useful platform that gives information about energy communities?"	February 2026	EXPERIMENTATION Raising ideas to inform the design of the digital twin platform. Present the demo platform and collect feedback	External stakeholders; CMC technicians; Alcabideche Residents and business owners	EMAC LNEG Greenvolt Nova SBE	Theme Workshop	
Workshops directed to young people in the schools and elder population	September – December 2026	CO-CREATION Raising ideas on how to decarbonize Cascais and improve the indoor quality in Cascais' buildings	Alcabideche students	EMAC LNEG GreenVolt Nova SBE	Theme Workshops	Interactive workshop
Workshop "How to replicate the Alcabideche energy community in other social neighbourhoods"	January 2027	EXPERIMENTATION Raising ideas on how to follow this neighborhood's example; Obstacles identification	External stakeholders; CMC technicians; Cascais Residents and business owners; other municipal representatives	EMAC LNEG GreenVolt Nova SBE	Theme Workshop	Presentation and interactive event

The proposed specific actions are innovative in several ways:

- The fact that the targeted citizens will or may be directly involved in the energy community created, means that they will experience the benefits involved, instead of only being informed about them
- The creation of a digital twin platform that will simulate the benefits of an energy community is an innovative way of showing these benefits in a more tangible way

- The workshops and information campaigns will use social innovation tools, based on the examples provided in the Cookbook

The impact monitoring and evaluation of the proposed specific actions will be done through the KPIs defined in the project's impact model, namely those included in the social inclusion and citizen participation category.

Table 11 describes the specific tasks that will be developed within Action 5.

Table 11 - Action 5 planning

Transformation Action	Description of Tasks	Responsible Partners	Month (Start-End)	Innovation Hub Interaction				Related KPIs
				2.1	2.2	2.3	2.4	
A5 - Promoting campaigns for awareness raising and capacity building of citizens about multi-benefits of sustainable, inclusive and accessible neighbourhoods	Task A5.1. Developing an information campaign before the creation of the energy community, presenting their benefits. Engaging with project stakeholders with a first presentation of the project followed by bilateral meetings (T.A.5.1.1). Targeting specific intervenient that can reach out to and help on spreading the message to the rest of the community and creating a neighbourhood tutor that is the contact point with social housing residents (T.A.5.1.2) Information campaign targeted to social housing residents, through available digital tools, flyer distribution and face-to-face events (A5.1.3)	EMAC, NovaSBE	09.2024-08.2025	X	X	X		KPI 3.1-3.4
	Task A5.2 - Developing workshops for co-creation with the different groups of citizens involved in the project	EMAC, NovaSBE		X	X	X	X	KPI 3.1-3.4

	Task A5.3 - Education and awareness campaigns: creating an environment that facilitates households living in energy poverty to adopt and sustain energy-saving practices. This involves enhancing energy literacy through community programmes and fostering social networks that promote collective action.	EMAC, NovaSBE				X	X		KPI 1.1-1.4; 3.6; 4.1.-4.3
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Action A6 – Replicate the regeneration model towards all social neighbourhoods in Cascais as well as the Lisbon Metropolitan Area in collaboration with other 17 municipalities

Replication will be possible if these 3 pillars are applied and executed:

- Dissemination, education and awareness raising: It is essential that citizens from the pilot area follow the creation of the energy community(ies) implemented within the project, to understand their structure, the benefits associated to them and how easy it can be for citizens to belong to an energy community (Task A6.1).
- Analysis of impact: evaluating the performance of the newly created platform, the usage of the pilot residents and understanding their overall opinion before and after the implementation of the energy literacy improvement plan.
- Outlining a plan for future implementation around Cascais' area, identifying possible potential producer members for new energy communities that may serve other social neighbourhoods around the studied area.

This will clarify the next steps to be taken in the energy community model replication to maximize social impact and reduce energy poverty around the pilot area, and to become a good practice example to be followed by other municipalities (Task A6.2).

Table 12 describes the specific tasks that will be undertaken within action 6.

Table 12 - Action 6 planning

Transformation Action	Description of Tasks	Responsible Partners	Month (Start-End)	Innovation Hub Interaction				Related KPIs
				2.1	2.2	2.3	2.4	
A6 - Replicate the regeneration model towards all social neighbourhoods in Cascais as well as the Lisbon Metropolitan Area in collaboration with other 17 municipalities	Task A6.1 - Writing of a “Good Practices Manual” to be used as a guide for the replication in other neighbourhoods (with the description of obstacles and how they were overcome)	EMAC, LNEG, Greenvolt Com, IREC, CVUT, NovaSBE	11.2026-05.2027	X	X	X	X	
	Task A6.2 - Characterization of the different social neighbourhoods in Cascais and the Lisbon Metropolitan Area, and Identify social neighbourhoods with similar characteristics to Alcabideche	EMAC	06.2027-11.2027	X	X	X	X	

Summary of the Pilot Transformation Activities

The following table summarises the actions and activities previously defined, which partners will participate and their timeframe.

Transformation Action	Description of Tasks	Responsible Partners	Month (Start-End)	Innovation Hub Interaction ¹³				Related KPIs
				2.1	2.2	2.3	2.4	
A1 - Contextualization planning, impact assessment of the intervention measures	Task A1.1 - Assess the energy use and provide a set of retrofitting solutions	LNEG	11.2023-12.2024	X	X	X	X	NON-RENEWABLE PRIMARY ENERGY LIFE-CYCLE GHG EMISSIONS
	Task A1.2 - Evaluation of the related ongoing actions in Cascais and planning of the actions to be taken within the framework of the project	LNEG, EMAC	08.2024-02.2025	X	X	X	X	LIFE-CYCLE GHG EMISSIONS (expected after the measures implementation)
A2 - Evaluation of energy poverty level, of the built environment quality and indoor comfort conditions	Task A2.1 - Characterization of the population involved, and evaluation of energy poverty and energy literacy level. Select relevant indicators (T. A2.1.1), Collect data pre-intervention, from available sources and through survey development (T.A2.1.2), Data analysis: Identification and characterization of the citizens involved	NovaSBE	03.2024-04.2025		X	X	X	AFFORDABILITY OF ENERGY THERMAL COMFORT AVAILABILITY

Transformation Action	Description of Tasks	Responsible Partners	Month (Start-End)	Innovation Hub Interaction ¹³				Related KPIs
				2.1	2.2	2.3	2.4	
	(T.A2.1.3). Data analysis: calculate selected indicators (T.A2.1.4)							
	Task A2.2 - Evaluation of the residents' transportation needs to connect with mobility policies and evaluate where the EV chargers will be more useful	NovaSBE, EMAC	09.2024-04.2025				X	MODAL SPLIT CAR OWNERSHIP ACCESS TO SUSTAINABLE MOBILITY WALKING SPACE & CYCLING PATH SUPPLY
	Task A2.3 - Development of a framework for urban regeneration with input from the Innovation Hub	LNEG	09.2024-04.2025	X	X	X	X	
A3 - Implement an active citizen energy community with a customised smart energy metering and management platform that allows the sharing of energy between 'prosumers', working as an urban energy lab	Task A3.1 - Assessment of Cascais' Global Horizontal Irradiation in the ground and in building rooftops	LNEG	01.2024-03.2024	X		X		
	Task A3.2 - Evaluation of the potential capacity to be installed in the 5 municipal buildings and of the percentage of excess energy that can be shared with the social housing buildings	Greenvolt Com	03.2024-06.2024	X		X		RENEWABLE ENERGY RATIO (RER) LIFE-CYCLE GHG EMISSIONS
	Task 3.3 - Planning of the energy community according to existing policies and regulations	Greenvolt Com	04.2024 - 10.2024	X		X		NET ENERGY / NET POWER GRID DELIVERED FACTOR

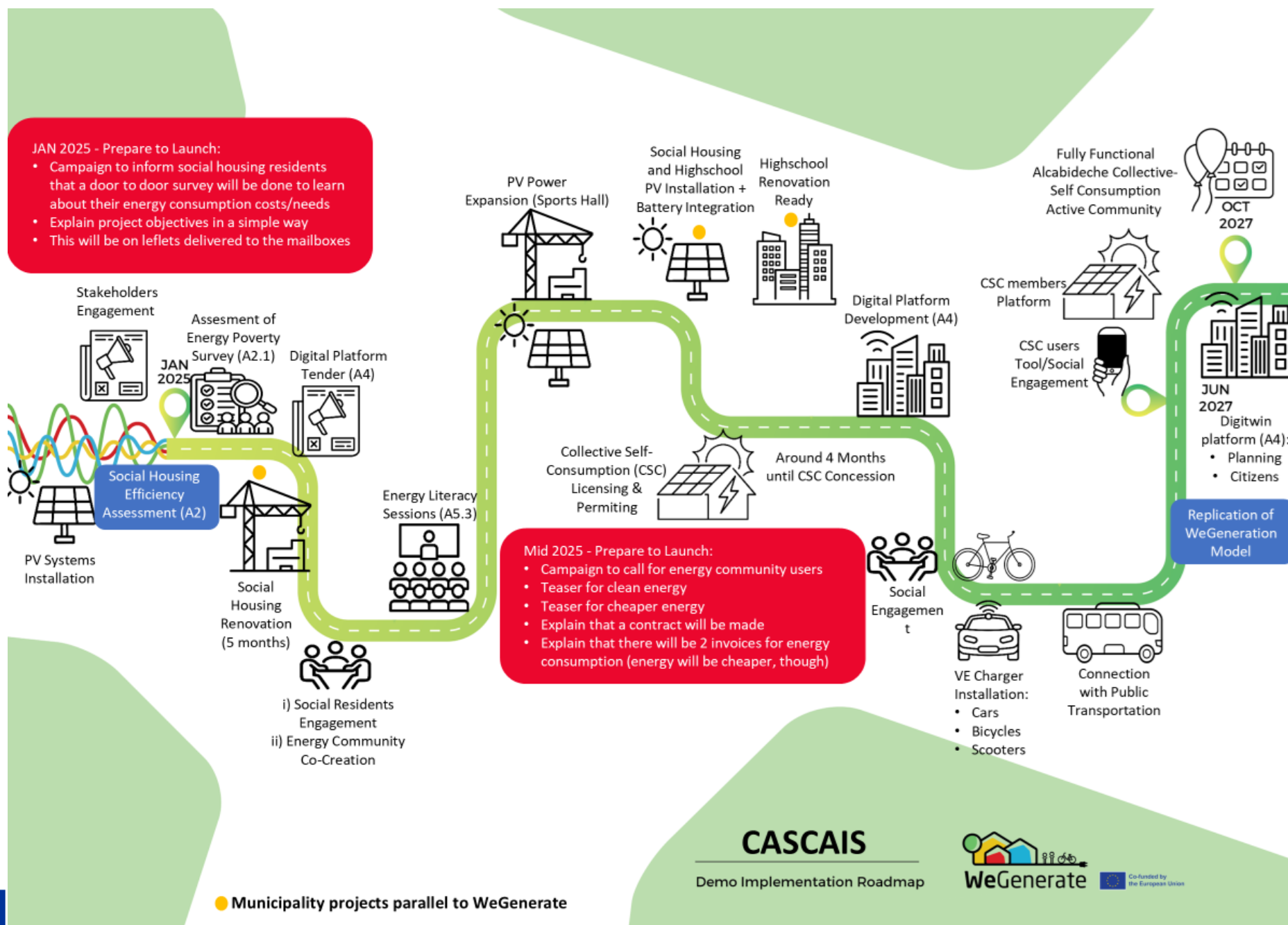
Transformation Action	Description of Tasks	Responsible Partners	Month (Start-End)	Innovation Hub Interaction ¹³				Related KPIs
				2.1	2.2	2.3	2.4	
	Task 3.4 - Inauguration of the first PV systems giving information to the residents about how an energy community works, how they can join and what they can benefit from it	EMAC, Greenvolt Com, NovaSBE, LNEG	09.2024		X			SOCIAL ENGAGEMENT
	Task 3.5 - Recruiting members for the REC	EMAC, Greenvolt Com	11.2024-05.2025		X			SOCIAL ENGAGEMENT
	Task 3.6 - Ask for the permits to create the REC to the responsible authorities (DGEG) and receive the response (4 months waiting period)	Greenvolt Com	06.2025 - 10.2025					
	Task 3.7 – Installation of batteries in 2 higher capacity PV systems and of 3 EV chargers in the most useful locations	EMAC	01.2026-12.2026				X	ACCESS TO SUSTAINABLE MOBILITY
A4 - Develop and test the use of Digital Twin in assessing the potential of creating a citizen energy community in the neighbourhood	Task A4.1 - Development of a 3D model of the neighbourhood buildings to incorporate in the Digital Twin	IREC	06.2024 - 12.2024	X	X			UPTAKE OF DIGITAL APPLICATIONS
	Task A4.2 - Integration of the production and consumption data in the Digital Twin	Greenvolt Com, IREC	01.2025-12.2025	X	X			UPTAKE OF DIGITAL APPLICATIONS
	Task A4.3 - Development of an App or web based platform to be used by citizens and inform them of	IREC, Greenvolt Com, Outsourcing	03.2025-03.2026	X	X	X		ENERGY & ENVIRONMENT CONSCIOUSNESS

Transformation Action	Description of Tasks	Responsible Partners	Month (Start-End)	Innovation Hub Interaction ¹³				Related KPIs
				2.1	2.2	2.3	2.4	
	the potential and benefits of being part of an energy community in Cascais	company to be chosen						SOCIAL ENGAGEMENT UPTAKE OF DIGITAL APPLICATIONS
A5 - Promoting campaigns for awareness raising and capacity building of citizens about multi-benefits of sustainable, inclusive and accessible neighbourhoods	Task A5.1. Developing an information campaign before the creation of the energy community, presenting their benefits. Engaging with project stakeholders with a first presentation of the project followed by bilateral meetings (T.A.5.1.1). Targeting specific intervenient that can reach out to and help on spreading the message to the rest of the community and creating a neighbourhood tutor that is the contact point with social housing residents (T.A.5.1.2) Information campaign targeted to social housing residents, through available digital tools, flyer distribution and face-to-face events (A5.1.3)	EMAC, NovaSBE	09.2024-08.2025	X	X	X		KPI 3.1-3.4
	Task A5.2 - Developing workshops for co-creation with the different groups of citizens involved in the project	EMAC, NovaSBE		X	X	X	X	KPI 3.1-3.4
	Task A5.3 - Education and awareness campaigns: creating an environment that facilitates households living in energy poverty to adopt and sustain energy-	EMAC, NovaSBE			X	X		KPI 1.1-1.4; 3.6; 4.1.-4.3

Transformation Action	Description of Tasks	Responsible Partners	Month (Start-End)	Innovation Hub Interaction ¹³				Related KPIs
				2.1	2.2	2.3	2.4	
	saving practices. This involves enhancing energy literacy through community programmes and fostering social networks that promote collective action.							
A6 - Replicate the regeneration model towards all social neighbourhoods in Cascais as well as the Lisbon Metropolitan Area in collaboration with other 17 municipalities	Task A6.1 - Writing of a “Good Practices Manual” to be used as a guide for the replication in other neighbourhoods (with the description of obstacles and how they were overcome)	EMAC, LNEG, Greenvolt Com, IREC, CVUT, NovaSBE	11.2026-05.2027	X	X	X	X	
	Task A6.2 - Characterization of the different social neighbourhoods in Cascais and the Lisbon Metropolitan Area, and Identify social neighbourhoods with similar characteristics to Alcabideche		06.2027-11.2027					

IMPLEMENTATION ROADMAP

Below we present an infographic illustrating the implementation roadmap of the planned transformation activities, which Cascais will use to communicate to local policy makers, communities and other relevant stakeholders in the engagement processes.



CONCLUSIONS

The presented action plan and implementation roadmap were developed to define the several steps to be taken during the project in order to achieve the proposed objectives and reach the final goal of an active renewable energy community involving the social housing residents, the Alcabideche citizens and stakeholders, and the municipality.

Actions were planned to assess the social housing buildings efficiency, the residents comfort levels, their energy literacy, mobility patterns, etc. With that information, steps will be taken in order to provide them with information to lower their energy bills and provide them more comfort in their homes along with a more heightened sense of community, for they will be part of something bigger – an Energy Community – that will be mutually beneficial for consumers and producers. The REC consumers will be able to pay less for the energy and the producers (in this case, Cascais Municipality) won't have to invest in high capacity batteries to storage all of the excess energy produced that isn't self consumed. The gathered information will also help the municipality to improve and update their plans of mobility and accessibility for this neighbourhood, for example, increase the frequency of buses in the most used routes and install electric chargers where they are most needed.

The workshops and dissemination activities will also help the community increase their energy literacy and raise awareness regarding sustainability and beneficial behavioural changes, such as possible energy savings, the use of renewable energy, of light mobility and public transportation, from youngsters to elderly.

The success of this living lab will showcase and allure other neighbourhoods to replicate it, firstly within Cascais Municipality and secondly throughout Lisbon Metropolitan Area. The tool to be developed in order to share this REC information with its members and other citizens, will be crucial to raise awareness regarding energy efficiency, local renewable generation, consumption and sharing, Green House Gas (GHG) emissions mitigation, and the benefits that can come from a sustainable energy transition (financial, environmental, etc).

PARTNERS LOGOS

