Inspiring Cases for citizen-led renovation projects - Phase II

The CE Salto del Calderón

1. Descriptive Analysis

1.1 Inspiring cases author and organisation

This inspiring case study was written by Christopher Burrough of Ricardo Energy and Environment, based on interviews carried out by Francesco Lecchi. The Salto del Calderón Energy Community is recognised as a leading example of success in renewable energy deployment and building renovations, providing clean energy to an ageing population, and promoting gender equality, women's empowerment, and equitable access to renewable energy. Ana M. Moreno Vicente, vice president of the Salto del Calderón Energy Community provided materials to support the development of this case, which culminated in a final interview.

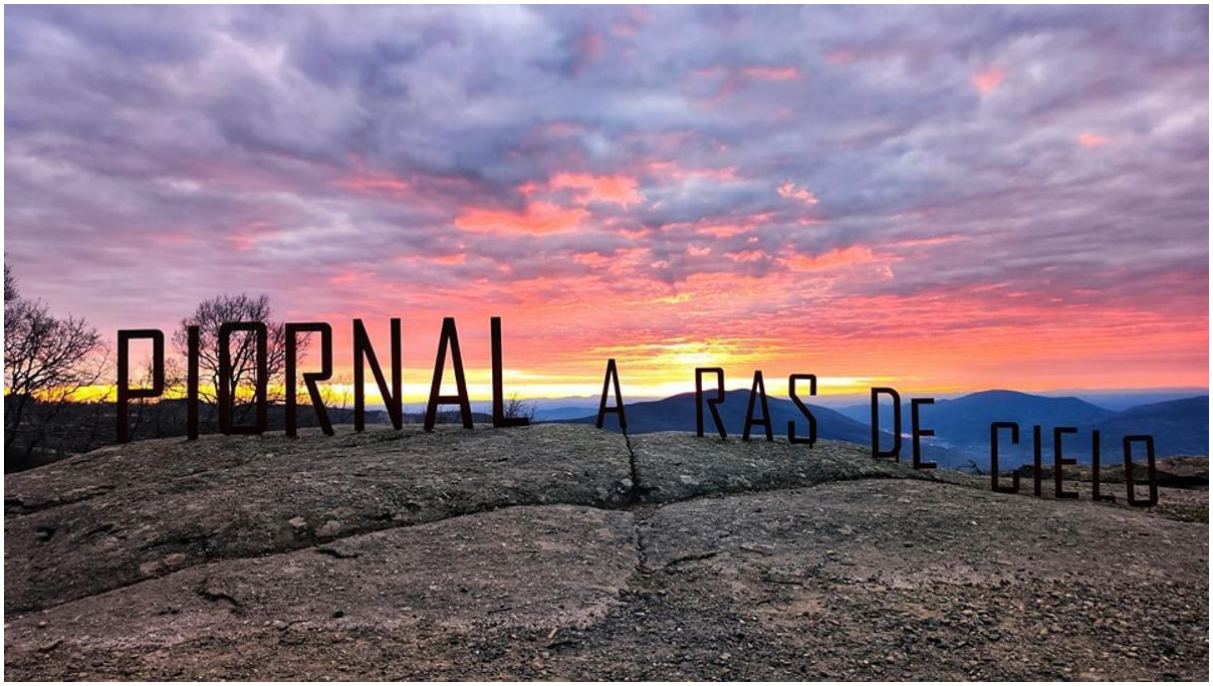
1.2 Executive overview

The Salto del Calderón Energy Community is a citizen-led cooperative based in Piornal, Cáceres, Spain, within the Jerte Valley. It brings together 226 members, including 221 families, 4 small and medium-sized enterprises, and the municipal council. The organisation was established to promote a fair and socially inclusive energy transition in a rural mountain area facing challenges such as an ageing population, cold winters, depopulation, and outdated housing requiring energy-efficiency improvements. Its mission extends beyond renewable energy generation to environmental protection, social equality, local job creation, and the eradication of energy poverty. Their success can be measured by the fact that 20% of the population aged 65 and older has gained access to clean energy. The community places strong emphasis on democratic participation, transparency, and gender equality, with women holding key roles within its governing structure.

The cooperative operates a 100-kilowatt photovoltaic installation, supplying clean electricity to approximately 210 households, representing around 45% of the municipality. Salto del Calderón is confident that it can achieve full participation of all inhabitants within the next seven years through its agenda, 'A Town Without Smoke'. This ambitious initiative (A Town Without Smoke) integrates solar, mini-wind, hydraulic, aerothermal, biomass, and electric-vehicle infrastructure to replace fossil-fuel use across households, public buildings, and local businesses.

Alongside this, its pilot rehabilitation project, which focuses on renovating four homes, aims to develop a replicable model to improve insulation, reduce fossil fuel consumption, enhance thermal comfort, and lower household energy costs. The long-term goal is the comprehensive decarbonisation of Piornal, supported by community engagement, accessible technical guidance, and coordinated applications for public funding. The project aims to strengthen the local economy, address rural depopulation, and create a replicable model for other municipalities in Extremadura by leveraging natural resources and a cooperative governance structure.

The main purpose of this energy community is to promote the full decarbonisation and energy independence of Piornal. This is accomplished through a citizen-led cooperative that seeks to enhance the efficiency of housing, foster local green re-industrialisation, and shift the municipality away from fossil fuels and nuclear energy towards local renewable energy sources.



1.3 Relevance and applicability vis-à-vis the CLR component

Salto del Calderón fulfils several integrated roles across the energy supply chain, making it a relevant practical model for advancing citizen-led renovation (CLR) in a rural environment facing challenges associated with regional disparities. Firstly, the cooperative manages shared self-consumption projects, such a 120 kWp photovoltaic plant, which provides clean energy to households that might otherwise lack the resources or suitable roof conditions for individual installations. The community also spearheads an energy-efficiency initiative to upgrade existing housing stock by improving insulation and replacing inefficient diesel boilers with cleaner technologies, such as aerothermal systems. Beyond this, the community aims to act as an economic catalyst to combat rural depopulation by creating local jobs in construction and energy management while prioritising gender quality in its leadership.

From a social perspective, the community functions as a mechanism to democratize energy access and ensure 'energy justice' by reducing household electricity bills and aiming to eradicate energy poverty. It also serves as an educational platform, partnering with local schools on programmes such as 'Agents Against Energy Waste' to raise awareness of climate change and the Sustainable Development Goals (SDGs).

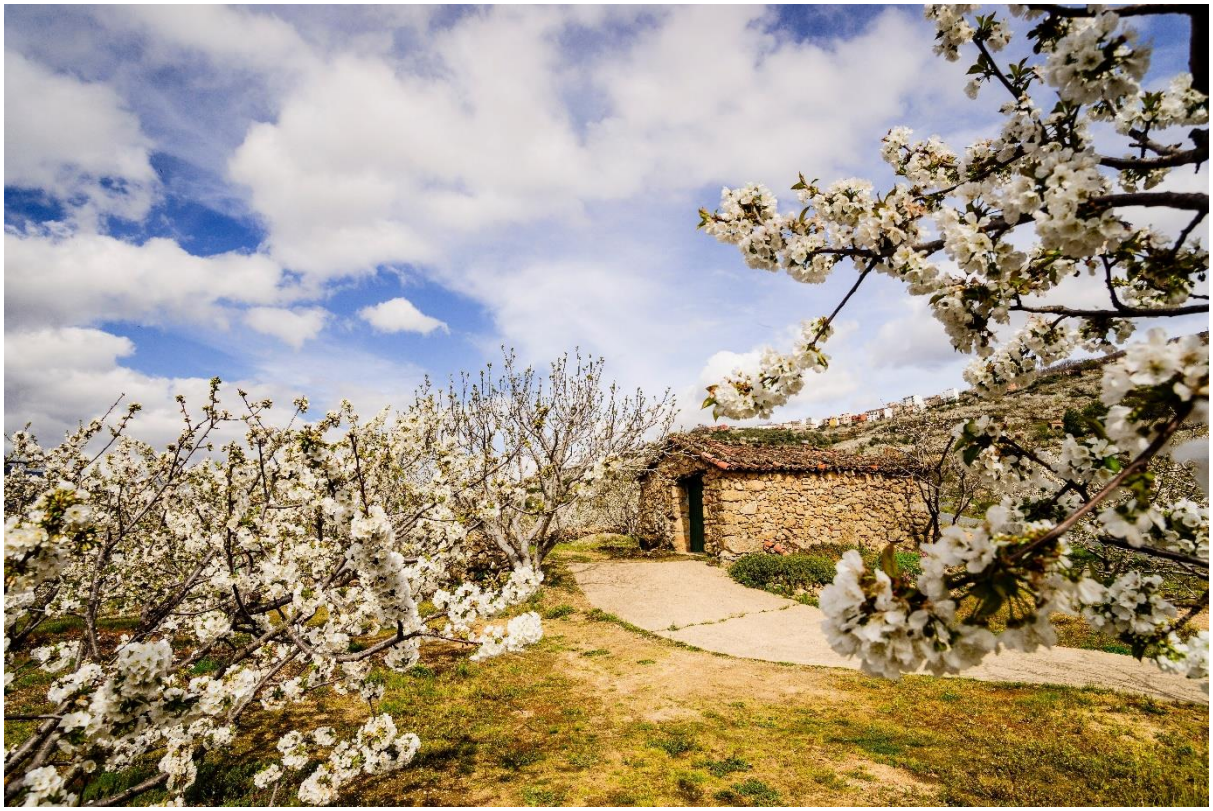
Ultimately, the community hopes to function as a replicable model for other rural areas, demonstrating how a democratic, assembly-based organisation can manage natural resources for the collective environmental, social, and economic benefit of its residents. Two outstanding efforts are the 'Residential Energy Rehabilitation Project', a practical pilot for renovation activities with scalability, and 'A Smoke-Free Town', a local clean energy generation to achieve zero emissions by 2030.

1.4 Name of CLR initiative and geographical scope

Founded on 28 November, 2022, the Local Energy Community Salto del Calderón is a citizen-led cooperative society based in Piornal, Cáceres (Spain), located in the Jerte Valley at an altitude of

approximately 1,200 meters, which is the highest village in the region, and has a mountain climate with cold winters. It takes its name from the Calderón waterfall where there was formerly a light factory that provided energy to the municipality.

Whilst the primary geographic scope of this initiative is the municipality of Piornal, the organisation views its local work as a part of a far broader vision. It aims to achieve regional expansion, serving as a pioneering model that can be generalised across the entire Extramadura region. Specifically, the community aims to establish a network of energy communities in other northern regions of the province, namely La Vera, Ambroz, Gata, and Hurdes, which share similar geography and access to resources.



1.5 Citizen-Led Renovation focus, services and technologies

Salto del Calderón serves as the driving force behind the development of an energy and rehabilitation model, capitalising upon the region's local energy resources, whilst creating a strategy to address the region's socio-economic challenges. It achieves this through the deployment of renewable energy technologies and the renovation of energy inefficient buildings. These two initiatives work in tandem to facilitate shared ownership of clean energy assets, alongside light and deep renovation activities, improving the quality of the municipality's housing stock.

The Residential Energy Rehabilitation Project

This initiative includes a pilot phase to identify best practices and build a replicable model to facilitate the replication and scaling of renovation activities to the wider municipality. The pilot phase focuses on renovating four houses that represent distinct construction realities: old wooden roofs or

roofs without sufficient insulation, uninsulated facades, windows without thermal breaks, and heating systems primarily based on heating oil. The pilot enables a real-world study of which solutions are most effective in a rural mountain home and what energy and economic returns they yield.

The planned rehabilitation work covers various elements of the building envelope and thermal systems:

- Replacement of old roofs (wood or masonry) with new roofs with thermal insulation.
- Placement of insulation between the existing façade and a new stone cladding, respecting the local aesthetics of the municipality.
- Replacement of old windows with windows with thermal break and double glazing, to prevent heat loss and improve comfort.
- Replacement of heating systems based on diesel fuel with more efficient technologies, especially aerothermal systems.
- Reduction of air infiltration and improvement of thermal sealing at critical points of the home.

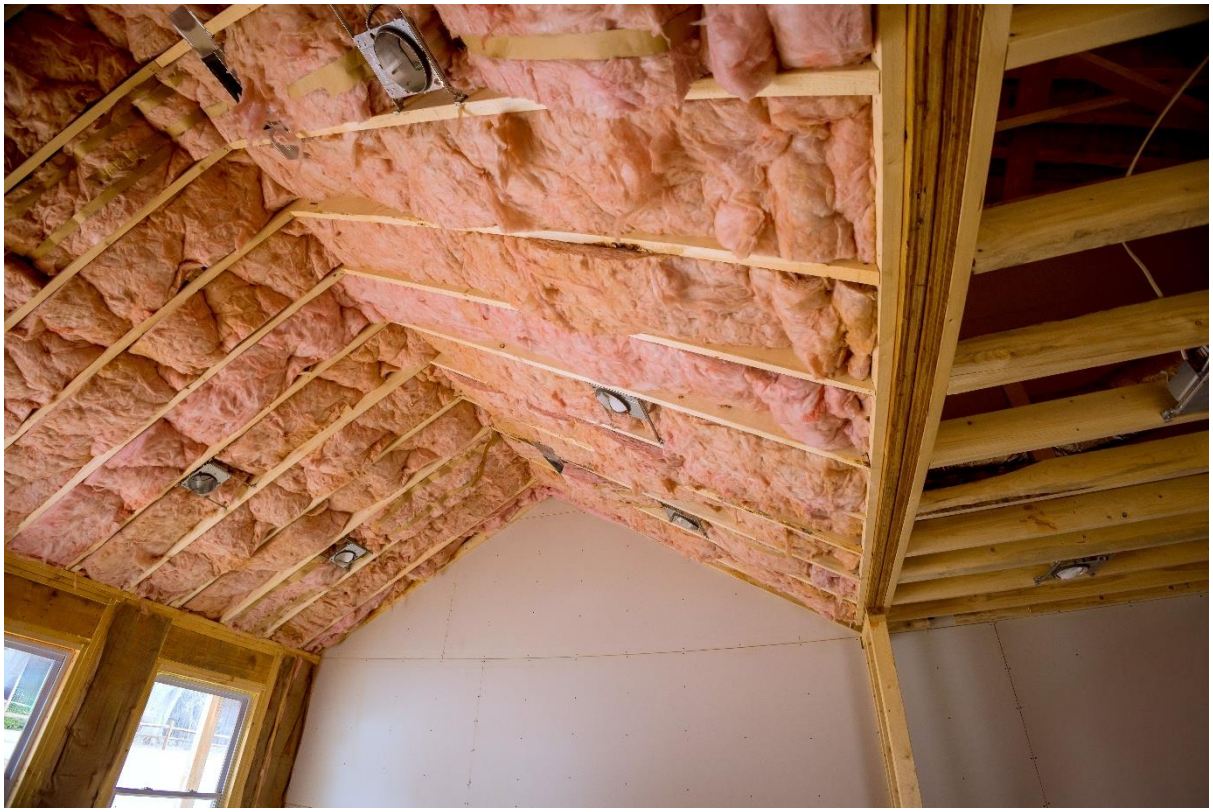
The initiative is designed to scale significantly after the pilot phase. The community has established an annual intervention plan to rehabilitate 40 homes, with the ultimate goal of reaching 160 single-family homes. However, replicating this activity across the municipality requires adapting the lessons learned to the municipality's broader characteristics.

The main objective of the intervention is to improve the energy performance of the thermal envelope and to upgrade the air-conditioning systems with efficient technologies, thereby achieving a significant reduction in energy consumption and an increase in thermal comfort.

The houses in the municipality are primarily two- or three-story structures (with a garage and two floors of living space), which increases the rehabilitation budget; it would be lower if they were apartment buildings. The homes have the following characteristics:

- **Floor area:** 60 m²
- **Layout:** two floors per dwelling
- **Envelope:** two exterior facades per dwelling.
- **Carpentry:** 8 windows per housing unit.

The wider renovation plan is governed by a social prioritisation system. The community intends to map ‘potentially vulnerable housing’ to ensure that families with the greatest energy poverty, low-income seniors, and those living in the poorest conditions receive assistance and renovations first. This approach is designed to ensure a ‘just energy transition’ that improves the health and well-being of the most at-risk residents



A Smoke-Free Town

This initiative is a comprehensive citizen-led project promoted by Salto del Calderón, aimed at achieving zero carbon dioxide emissions and total energy self-sufficiency by the year 2030. It leverages Piornal's unique geographical location as the highest village in the region to utilise diverse natural resources.

- **Solar Energy:** This is the project's most advanced phase. A 120 kWp photovoltaic plant was installed in June 2024, funded by cooperative members, which currently provides clean energy to 210 families. Two future phases are designed to add an additional 400 kWp of generation and substantial storage capacity.
- **Mini-Hydraulic Power:** The community is exploring three lines of hydraulic energy: Utilising the water flow to the local treatment plant, using irrigation ponds as "natural batteries" for storage, and rehabilitating historical sites like the Calderón waterfall, which supplied power to the region in the 1950s.
- **Wind and Biomass:** The plan includes domestic-scale wind turbines on public buildings (schools, sports halls) and larger turbines in areas with zero visual impact. Local forest resources will provide biomass to replace inefficient diesel heating systems.

These shared renewable initiatives are largely self-funded, with the first major project (120 kWp photovoltaic plant installed in June 2024) being fully self-funded by the cooperative members themselves. Beyond this, this infrastructure is shared in ownership and consumption. The first solar plant was installed on the roof of one of the cooperative's members, yet it provides energy to 210 families. This shared model specifically benefits families whose roofs are in shaded locations, making

individual solar installations infeasible. The system is designed for shared self-consumption, with compensation for surplus energy, enabling the community to manage and collectively benefit from excess energy.

1.6 Objectives, motivations, and establishment process

The Salto del Calderón energy community was established with the aim of achieving diverse environmental, social, and economic goals, rooted in the need to revitalise a rural territory, improve residents' quality of life, and transition to clean energy. This community intends to capitalise on the green transition and leverage potential growth areas to generate social and economic value, while achieving environmental objectives.

General strategic objectives

The primary objective of this community is to achieve the municipality's comprehensive decarbonisation in the medium term, promoting a fair, participatory, and socially inclusive energy transition. This objective was defined in the initiative ‘A Town Without Smoke, Agenda 23/30’, which outlined the goal of achieving total decarbonisation and energy self-sufficiency by 2030. This will be achieved by developing an energy and rehabilitation model based on local resources, including solar, wind, biomass, hydropower potential, and community energy. The final output of this should be a replicable model that can be adapted to other rural municipalities with similar problems and resources.

Social objectives

This community places social sustainability and gender quality at the heart of its just energy transition model. In addition to the aforementioned decarbonisation and energy goals, the project

aims to have direct impacts on social cohesion, equity, and the municipality's well-being. The four main social goals are:

- To eradicate energy poverty in the municipality, ensuring that families with fewer resources have access to homes with adequate thermal conditions, reducing energy expenditure, and improving health and well-being.
- To work towards gender equality by promoting the participation of women in decision-making within the energy community, fostering economic and social empowerment.
- To combat depopulation and rural unemployment by creating local jobs associated with rehabilitation works, community management, monitoring and the implementation of new energy solutions.
- Promote networking with social entities, cooperatives, companies, local and regional administration, generating alliances and support mechanisms that strengthen the resilience of the territory.

Environmental Objectives

In addition to these general and social objectives, this community hopes to develop an environmental consciousness which will inform the region's behaviour. These environmental objectives are:

- To promote a civic culture of environmental awareness based on conservation energy, efficiency, and the rational use of resources.
- To promote the use of renewable energies, especially solar and biomass, available in the natural environment of the Jerte Valley.
- To achieve the progressive decarbonisation of the municipality through the reduction of fossil fuels, especially by eliminating or replacing oil heating systems with aerothermal or other clean technologies.
- Reduce CO2 emissions by improving the insulation of homes, thermal envelopes, roofs and windows with thermal breaks.

Economic Objectives

The population of rural areas tends to move to cities in search of greater job and educational opportunities, leading to depopulation. To reverse this trend, the aim is to diversify the local economy, which is heavily focused on agriculture, and to improve and expand services to encourage the arrival of new families. In this context, low-cost energy can become an important incentive for rural development. The energy community hopes to capitalise on the energy transition to combat this decline. Its objectives are:

- To reduce household electricity bills through energy saving and shared self-consumption.
- Promote energy efficiency proposals based on modern technical solutions (insulation, efficient ventilation, aerothermal energy, sustainable roofs).
- Strengthen a green economy by generating local employment in rehabilitation, maintenance, installation of renewables, and energy services.

The community's efforts towards these goals are already yielding positive results, with the region progressing toward meeting its social, environmental, and economic targets. The Equality Committee and Equality Plan have established ideal conditions for fair partnerships, inclusive communication, collective responsibility, and diverse representation. Additionally, their self-consumption projects have lowered household electricity costs by approximately €100-€120 each year, while promoting local industrial growth that generates employment and reduces youth unemployment.

1.7 Key actors and stakeholders

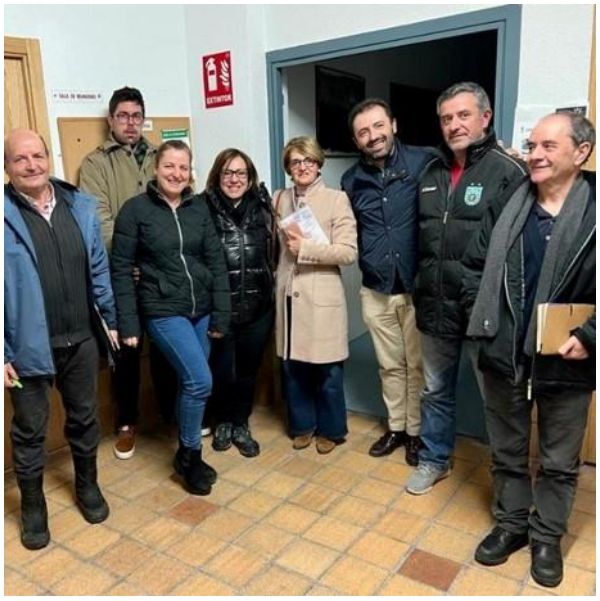
This community comprises 226 members, including 221 families, 4 small businesses, and the local town council, with a governing council of 7 featuring gender balance. Although the municipality is a member and key strategic partner, providing support and leading the installation of renewable energy systems on public buildings' roofs, it is considered one member among others. The most important actor in the community is the citizens themselves.

Alongside these actors, several strategic and technical partners support the community. The University of Extremadura (specifically the Polytechnic School of Cáceres) provides technical studies for renewable projects, such as mini-hydraulic energy. The Extremadura Energy Agency supports the initiative through projects like Transcom, which looks to strengthen local energy governance through improving institutional capacity, supporting implementation, and enabling knowledge transfer. The Provincial Council of Cáceres and Junta de Extremadura provide environmental technical advice and access to public grants for residential rehabilitation.

Additionally, numerous community and social stakeholders work alongside the community to share resources and educate residents on the topic of community energy. Notable stakeholders are CEIP Máximo Cruz Rebosa, whose programme ‘Agents against Energy Waste’ educates children on environmental sustainability. The Local Irrigation Community collaborates with the community on projects using irrigation pounds for mini-hydraulic pumping and energy storage. Architecture first have further acted as catalysts for change by conducting public information sessions to has also acted as a catalyst for funding and technical solutions for home energy efficiency.

1.8 Organisational structure

This community has been organised as a citizen-led cooperative, with a gender-balanced Governing Council in which the main positions are held by women. The community was established as a 'cooperative society' following a constituent assembly on 28 November 2022. It comprises 226 members, including 221 families, 4 small businesses, and the local Town Council. Each member contributed €100 to fund the organisation. The organisation has a horizontal, assembly-based model that ensures democratised decision-making through the principle of 'one person, one vote'. Beyond this, the community pioneers strong public engagement, including open information sessions at the local House of Culture to present grant opportunities and recruit residents for pilot projects, ensuring the project remained a transparent, community-wide effort rather than a private venture.



1.9 Financing

This community uses a combination of member share capital, member-directed funding, and public grants and subsidies to finance itself. As mentioned above, upon joining, each member contributes a share capital of €100. Beyond this, the community funds infrastructure projects through its cooperative members, raising capital when required. This model ensures that shared self-consumption is funded by direct citizen investment, rather than a project dependent on external loans.

Beyond this, the community's strategic 'roadmap' involves seeking financial aid from regional and national administrators. These include subsidies from the Regional Government for residential energy rehabilitation, specifically programmes to support building-level rehabilitation projects, an aid programme for actions to improve energy efficiency in housing, a programme to assist in preparing the existing building's logbook, and a programme to assist in drafting comprehensive rehabilitation projects.

The community's wider network provides additional technical and administrative support to navigate the complexities of public funding (the Provincial Council of Cáceres and the Extremadura Energy Agency (Agenex)).

Whilst the community has seen early success with self-funding, long-term financing has been identified as a major hurdle for its more ambitious goals. Additional funding is needed to break ground on projects that exist only as concepts, specifically the €4.96 million estimated cost for the comprehensive rehabilitation of 160 homes.

1.10 Customer journey

The goal of this community is to ensure that citizens participate in transparent decision-making, have equal access to rehabilitation/electricity, receive technical assistance and support during the processing of aid applications, and are not excluded from the process because of limited economic capital.

A member of this community who looks to join a shared energy asset can expect to:

- Attend assemblies and information sessions,
- Make a financial contribution to the plant,
- Participate in collective decision-making through the general assembly,
- Receive ongoing information via email and WhatsApp groups, and
- Attend workshops to understand electricity tariffs and bills.

Each member generates approximately 800 kWh per year from the shared plant, covering about one-third of average household consumption.

The Residential Energy Rehabilitation Project is currently in its pilot phase, during which four homes have been prepared. This pilot provided architectural studies and technical documents. However, regional funding was exhausted before implementation. Whilst technical preparation is complete, further financial support is needed to execute the renovations.

While the grants and business plan are being finalised, partners will be encouraged to adopt temporary solutions, such as thermal curtains, insulating sheets under the roof tiles, smart

programmers or thermostats, transparency in decision-making, and progressive replacement of luminaires with LEDs. As the project progresses, new meetings, workshops and consultations will be convened.

2. Impact Analysis

2.1 Environmental, economic, and social benefits

This community has made a significant impact on the environmental, economic, and social spheres in which it operates. These benefits are clear in tangible results such as reduced emissions and annual savings, as well as in intangible outcomes such as culture, behaviour, and social inclusion.

Environmental benefits

- Reduction in carbon footprint.
- Increased environmental awareness.
- Creation of a local 'energy culture'.

Economic benefits

- Around €100 annual savings per member from shared solar production.
- Investment expected to be recovered in approximately four years.
- Additional savings through better tariff selection.
- Increased understanding of electricity bills and pricing.

Social benefits

- Inclusion of residents without suitable roofs for solar panels.
- Strong participation from elderly residents.
- Community-building activities and training sessions.
- Collaboration with the local school to educate children on energy use.
- Creation of citizen working groups (e.g., heating alternatives).

3. Highlights of drivers and success factors

The main drivers behind this community were to create a cooperative that benefits consumers, operating with a transparent and democratic structure. This has achieved great success, with the established organisational framework promoting citizen engagement. Some of the best indicators of success are in the fields of:

- **Gender:** The creation of the Equality Committee and the Equality Plan.
- **Economic:** The reduction of household energy bills and increased annual savings.
- **Social:** A reduction in energy poverty, targeted support for vulnerable households, and the creation of a culture of energy consciousness.
- **Environmental:** The creation of a culture of environmental consciousness, and reduced emission from unclean fuels.
- **Local employment:** To generate a local supply chain, combatting youth unemployment and capitalising upon green growth opportunities.

4. Lessons learned and practical recommendations

Unique to the Salto del Calderón Energy Community, a series of learned lessons have been identified, defining best practices for communities in a similar context. From these lessons, a series of recommendations has been generated based on an analysis of their key projects and interviews with their officers.

Lessons Learned

- Having all members contract electricity with the same retailer accelerates administrative procedures.
- Building a strong, diverse, and committed core team ('grupo motor') is essential.
- Including the municipality increases credibility and trust.
- Energy communities should be viewed as long-term development tools, not just technical projects.
- Renewable energy can be a powerful driver of rural economic development.

Recommendations

- Start with a strong and trusted core group.
- Involve the local municipality from the beginning.
- Ensure transparency and continuous communication.
- Simplify administrative processes (e.g., align electricity retailers).
- Invest in awareness and education.
- Treat the initiative as a social and economic development opportunity.

5. Where to learn more

You can follow along with the community on their Facebook page, CEL Salto del Calderón | Piornal | Facebook. Whilst they have yet to release any official guidance, they are eager to do so in the future and have already prepared a PowerPoint presentation on the project, a video about the initiative, and communication materials for workshops and events. You can contact the community at celsaltodelcalderon@gmail.com.