Ayuntamiento de Pamplona | Iruñeko Udala

GO GREEN PAMPLONA

FEBRUARY 2023

ENERGY COMMUNITIES TO ADVANCE TOWARDS POSITIVE ENERGY DISTRICTS AS A STRATEGY TOWARDS DECARBONISATION

EUROPEAN CITY FACILITY
EXECUTIVE SUMMARY

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This Executive Summary has been developed from the work carried out in the framework of the European City Facility: *Pamplona: Local Energy Communities fostering Energy Positive Districts.*

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1. INTRODUCTION

Currently, the sectors with the highest energy consumption in the city of Pamplona are:

Mobility, whose demand comes practically entirely from oil-derived fuels

The residential sector, with natural gas being the energy most consumed

This is why both the electrification of the vehicle fleet in the districts and the energy rehabilitation of housing are key in reducing emissions in the city.

In addition to reducing emissions, it is necessary **to reduce dependence on fossil fuels**, in line with the European Union's commitment to a new energy model based on increasing the generation of renewable energies, energy saving and efficiency, and citizens' participation in the electricity market. The current common framework offers the possibility for citizens and companies to participate in different activities, such as the production of renewable energy, both electrical and thermal, leading to **renewable energy self-consumption**.

In order to achieve the **objectives defined** in the 2030 Energy Transition and Climate Change Strategy for the city of Pamplona and with a view to **decarbonising the city**, the size of Positive Energy Districts is seen as the most appropriate. This definition of **Positive Energy Districts (PED)** facilitates dimensioning the need for reduced energy demand, precisely defining the potential of renewable energy generation on a local scale and from a social point of view, taking advantage of the sense of belonging that exists in the districts.

The roadmap towards decarbonisation must be driven both by promoting existing initiatives and models and by involving a community model, encouraging in this way the **creation of energy communities** as tools that will allow citizens, entities and enterprises in the districts to unite around energy projects in order to make progress towards these positive energy districts.

Renewable Energy Communities are defined as "*legal entities based on* **open and voluntary participation**, *autonomous and effectively controlled by partners or members that are located in the vicinity of the renewable energy projects that are owned and developed by such legal entities, whose partners or members are* **natural persons, SMEs or local authorities**, *including municipalities, and whose primary purpose is to provide environmental, economic and social benefits to their partners or members or to the local areas where they operate, rather than financial gain*". (Law 24/2013)

From a **social point of view**, this sense of **belonging to a district** is very strong in the city, and would help to mobilise citizens and other actors in the district towards common objectives: namely, energy transition and decarbonisation objectives.

The interaction of the following **three pillars** is required for the development of Positive Energy Districts:

City Council

as the driving force behind districts promoting the mobilisation of funds and actors.

Energy communities

as developers of energy services.

Individual - private investors

projects not linked to energy communities.

- The **City Council** with a key role as the driving force of the districts, taking advantage of its neutral role in the market to encourage and promote the mobilisation of funds and actors towards a fair energy transition. It would provide the necessary investments in material and human resources, including the creation of offices such as Energy Information Centres that would bring citizens, small businesses, SMEs and other local agents closer together, guide and accompany them throughout the process.

- The **Energy Community** being a newly created legal entity that would develop the energy services defined by its members who will demand

investments and their management. In this case, renewable energy generation projects (electric and thermal) and sustainable mobility, both in vehicles and infrastructure, are assessed.

- **Individual - private investors**, taking into account investments not linked to energy communities, whether made by individuals or entities such as communities of owners and enterprises. The investments would be in housing rehabilitation projects, small-scale renewable energy generation (electricity and thermal) and sustainable mobility both in vehicles and in infrastructure for private use.

1.1. METHODOLOGY

Thanks to the technical and financial support provided by the European City Facility (EUCF), Pamplona City Council was able to carry out a series of **preliminary studies** for the development and implementation of the various energy projects required (both in terms of generation and energy efficiency and mobility) to advance towards Positive Energy Districts, taking advantage of the driving potential of energy communities and the role of the local administration.

So, together with a series of expert entities, the following technical, legal, economic and social studies were carried out:

Study of potential **project developers** in the city, taking into account the activities envisaged for the profiles indicated. This study was led by Olivo Energy Strategy Consulting.

Study of the **mobilisation of actors** for the implementation and proper functioning of the projects, especially for the implementation of energy communities and for the creation of **Energy Information Offices**. Artelan and the Asociación Ecoserveis participated in development of these studies.

Study of the situation of existing **heating installations** in the districts and possibilities for improvement. This study was led by GE&Asociados S.L..

Study of the **legal viability** of the projects, including the potential legal precept in each case. This study was led by Arankoa Despacho Jurídico.

Study of the **economic viability** of the projects, taking into account both public and private investments and indicators such as the amortisation period and the internal rate of return, among others. This study was led by Ascellence Consulting.

In turn, Pamplona City Council led the **technological studies** necessary for the rest of the technical vectors proposed, such as sustainable mobility, rehabilitation and the generation of renewable electricity, and actively participated in the rest of the work, both through the Municipal Energy Agency of Pamplona (AEMPA) and the city's Participation and Revitalisation service.

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It should be noted that the studies were carried out taking into account the implementation of projects in **three districts** of Pamplona: Rochapea, Ensanche and Milagrosa, which were chosen for several reasons. On the one hand, **Milagrosa** and **Ensanche** are in the process of developing their Strategic Urban Action Plans, so it is a good time to act on them. Moreover, the analysis carried out for these areas can easily be extrapolated to districts where it will be necessary to take similar action in the future.

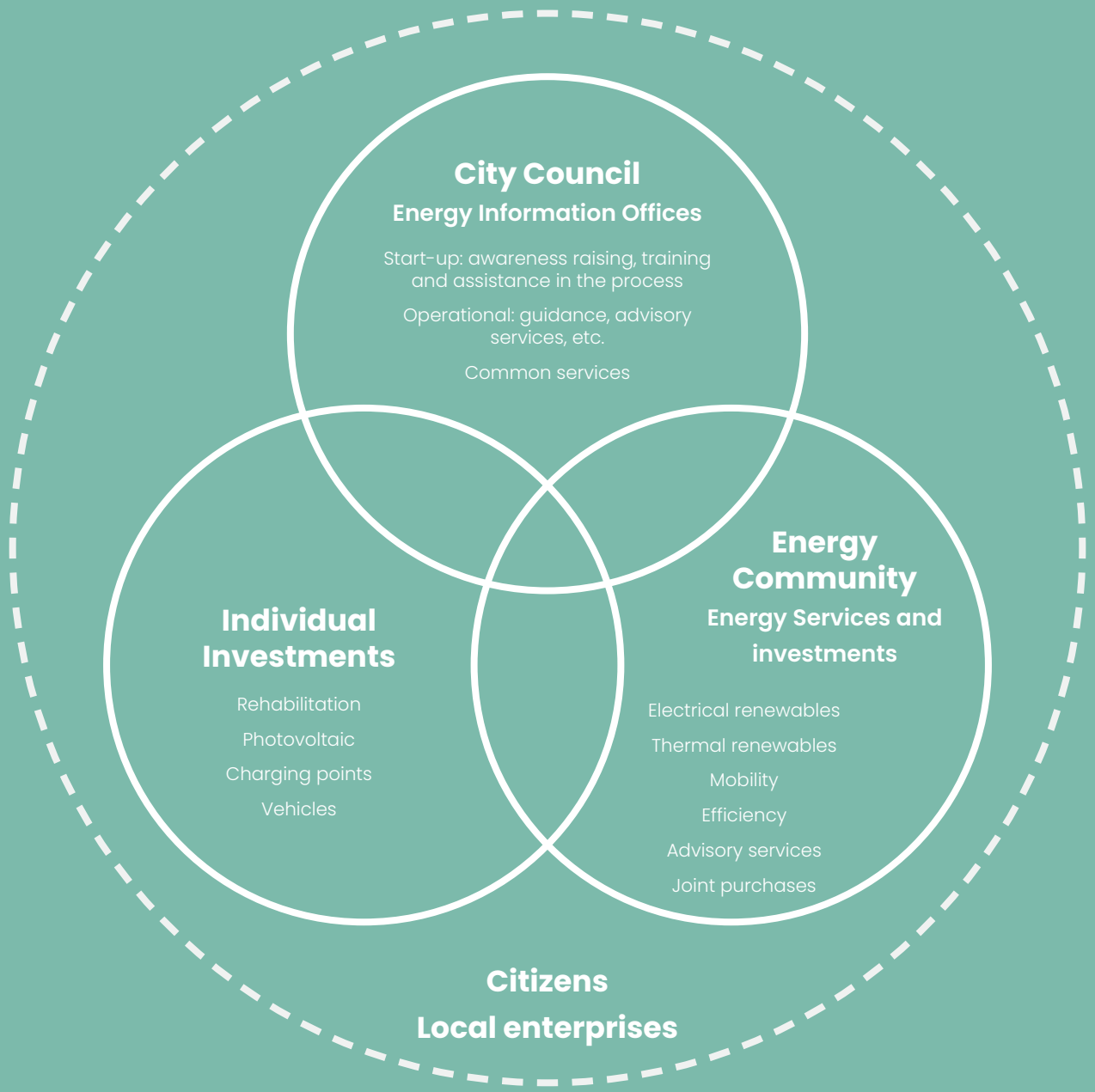
On the other hand, **Rochapea**, a relatively young district, is a district in which investment is already being made with the aim of transforming it into a Positive Energy District thanks to the oPEN Lab project, so the studies carried out complement the work being conducted and will allow the process to be accelerated.

These studies resulted in the design of different business models for the key vectors in the local energy transition: rehabilitation, energy advice, renewable energies (thermal and electrical) and sustainable mobility.

This document is presented as a result of the studies carried out in the framework of the EUCF. It is a proposal towards the implementation of the business models designed to advance in the creation of Positive Energy Districts with Energy Communities as a key tool to achieve this end and the fundamental role of the City Council in its development. It presents a model that can help meet the decarbonisation targets set for the City, but whose implementation must be validated internally and provided with the necessary resources.

2. IMPLEMENTATION STRATEGIES

In order to develop **Positive Energy Districts**, Pamplona City Council, together with the participation of local agents and citizens, aims to act in various areas by implementing projects which have a direct impact on reducing both energy demand and dependence on fossil fuels. The aim is to encourage **interaction between public and private investors** with a common goal - **the decarbonisation of the city**.



2.1. THE ROLE OF THE CITY COUNCIL AND THE CREATION OF ENERGY INFORMATION OFFICES

Pamplona City Council aims to create **Energy Information Offices** to approach and guide citizens towards a **cultural change** of the magnitude required to transform neighbourhoods into Positive Energy Districts.

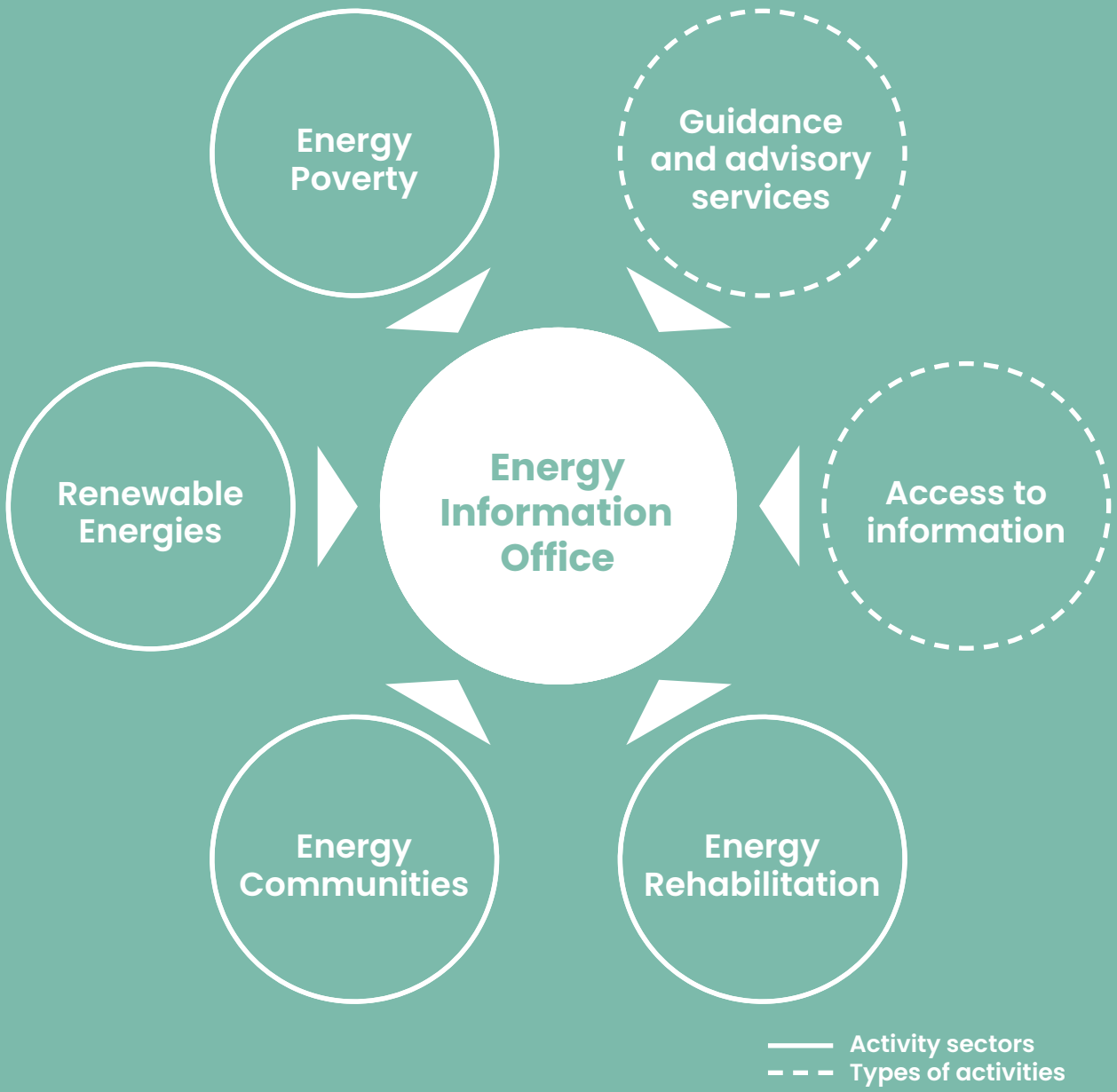
These offices would be set up in collaboration with the existing City Council Rehabilitation Office, which has already been working with the public for many years with very good results.

The proposal is **to create an Energy Information Office** in each district, Ensanche, Milagrosa and Rochapea, to **guide and advise** individually and collectively (promoting energy communities) and to ensure **mass access to impartial and quality information** in order to make investment decisions on efficiency and renewables. The aim is to involve not only the most pioneering individuals and groups in this type of investment, but also all possible profiles.

The City Council would use this strategy based on **proximity at district level** to stimulate, above all, investments of energy communities and investments at an individual level.

Through the implementation of the Energy Information Offices, the aim is to provide **30,000 energy advice services** to households and businesses in the Rochapea, Milagrosa and Ensanche districts during the first 10 years of implementation. In addition, besides energy advice, the aim is to reach **15,000 rehabilitated homes** over the next 15 years. The City Council also intends to concentrate on actions focused on:

- Energy Rehabilitation, together with existing initiatives (Pamplona Centro Histórico (PCH), Rehabilitation Office, Efidistric office)
- Renewable energies, promoting their implementation.
- Energy Communities, encouraging their creation and supporting their correct management in the long-term.
- Guaranteeing citizens' basic supplies as part of the fight against energy poverty.



2.2. REHABILITATION

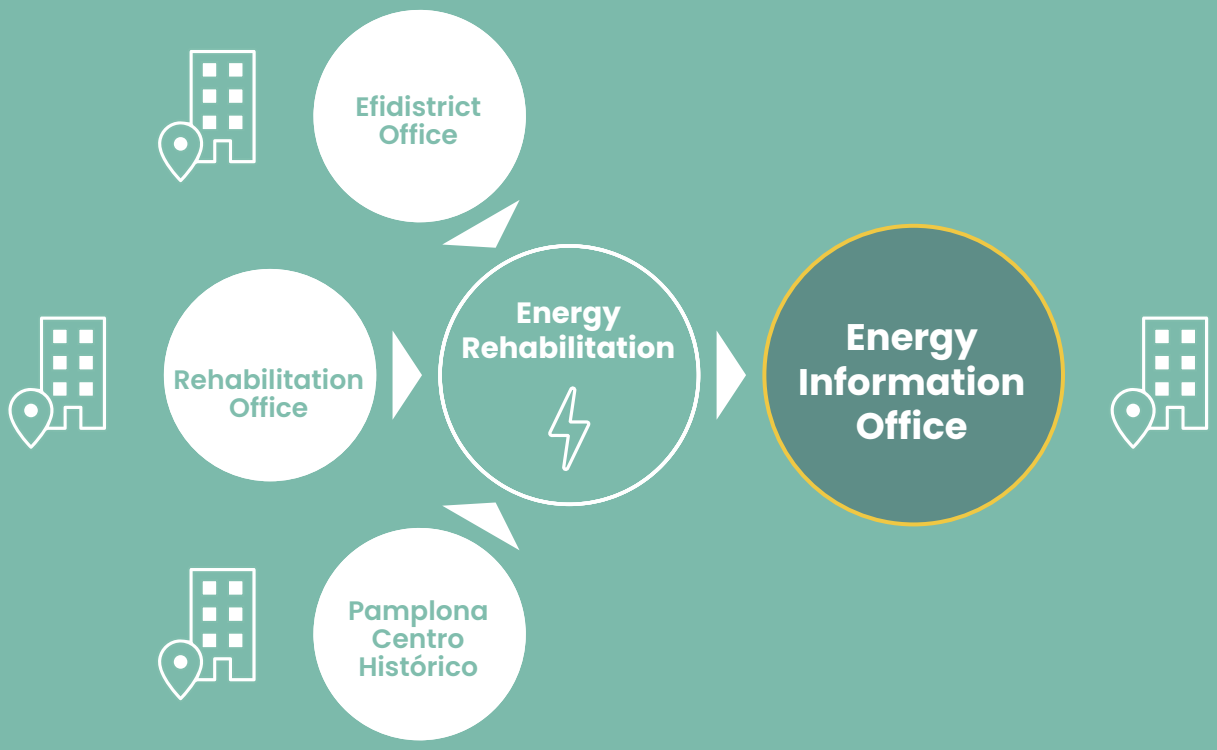
The aim here is to promote above all projects of a private nature, addressing primarily the energy consumption of the **residential sector** (the second largest energy consumer after transport in the city), without forgetting **municipal facilities** as an exemplary sector on energy matters. In order to continue making progress in energy rehabilitation in the city, and bearing in mind that investments in this sector depend mainly on a particularly diversified private sector as is the residential sector, Pamplona City Council plans to promote the **mobilisation of resources**, building on the work already being done in this area by PCH, the Rehabilitation Office and the Efidistrict office.

- **Pamplona Centro Histórico**, a public company dedicated to rehabilitation, including the demolition and re-construction of buildings in the old part of the city. Always with high energy standards.

- **Rehabilitation Office**, financed by both the City Council and the Government of Navarre, has a multidisciplinary team of professionals who help in the whole rehabilitation process, from the management of grants to the processes necessary for the development of reports and studies such as the GIPs (Global Intervention Plans). Their work has evolved from the rehabilitation of individual dwellings to these plans that promote intervention in buildings, blocks of buildings and at district level.

- **Efidistrict Office**, a district office opened in March 2014 in the Chantrea district to meet the needs of residents and encourage participation in the development of rehabilitation projects.

Although the number of rehabilitation projects in the city of Pamplona has been growing in recent years, a considerable scale-up is necessary to achieve the city's objectives, promoting the elimination of the use of fossil fuels and the integration of renewables in households, going beyond the thermal rehabilitation of dwellings (affecting cladding) before we can speak of **Integral Energy Rehabilitation**. To this end, rehabilitation plans will have the additional support of the new Energy Information Offices.



2.3. THERMAL RENEWABLES

In order to expand knowledge about the existing types of thermal installations in the city and their age, condition and possibilities for improvement, a series of studies have been carried out. As part of the strategy to move towards Positive Energy Districts in the city of Pamplona, the aim is to integrate **renewable thermal energy generation** to obtain heat, recommending both biomass (burning organic matter) and aerothermal (heat pump) thanks to the various benefits and facilities offered by both systems.

Biomass offers environmental and economic benefits to the community, especially the sale of thermal energy through heat networks (*district heating*).

Aerothermics offer ease of installation, high energy efficiency and performance, low maintenance and year-round operation, as well as facilitating the integration of renewable electrical energy and providing heat demand flexibility.

The proposals for new installations and improvements to existing installations are determined by the specific characteristics of each of the districts, including **individual and collective installations** (*district heating*). Pamplona City Council, therefore, foresees the potential for reform and upgrade of the following thermal installations:

- **Ensanche:** most boiler rooms are small in size. The complexity of the implementation of *district heating* requires a strategy based on aerothermics (in buildings to be rehabilitated) and biomass in community boilers. The objective is to reach a total of **4,000 households** (2,000 individual aerothermal, 1,500 community biomass and 500 district biomass).

- **Milagrosa**: the widespread implementation of district heating will facilitate the incorporation of district biomass plants. In this district, the aim is to reach a total of **5,500 households** (2,750 individual aerothermal, 500 community biomass and 2,250 district biomass).

- **Rochapea**: individualised installations predominate here, especially suitable for aerothermal installations as well as individual. The aim is to reach a total of **5,500 households** (2,750 individual aerothermal, 2,500 community biomass and 250 district biomass).

POTENTIAL FOR REFORM AND UPGRADING OF THERMAL INSTALLATIONS (AFFECTED HOUSEHOLDS)

	District		
	Ensanche	Milagrosa	Rochapea
Aerothermics	2.000	2.750	2.750
Community Biomass	1.500	500	2.500
District biomass	500	2.250	250

2.4. SUSTAINABLE MOBILITY

The strategy in relation to sustainable mobility in the city has been developed on the basis of the City Council's own knowledge and also thanks to the support of shared mobility cooperatives at national level.

The aim is to promote the implementation of private **charging infrastructure**, as Pamplona City Council is actively working on the implementation of this type of infrastructure in public spaces. With regard to private charging points, the aim is to provide the necessary tools for both private individuals and energy communities to promote this type of installation.

On the other hand, as part of the strategy towards Positive Energy Districts and in order to meet the objectives set by the European Union, the **electrification of the economy** is fundamental.

Consequently, the **purchase of electric vehicles** is one of the activities most recommended to be undertaken by the energy community, in addition to shared mobility, helping to reduce traffic and parking congestion, reduce pollution, and promote social and economic benefits for those persons who cannot afford to purchase a personal vehicle.

At present, thanks to the evolution and improved range of electric vehicles, there is a greater choice on the market at **more affordable prices**, a fact that is reflected in a greater number of electric vehicles in the city in recent

years. However, the increase in electric vehicles is still insufficient to achieve the targets set. Pamplona City Council intends therefore to encourage both **private** and **collective investment** in electric vehicles and the corresponding charging points in private car parks.

The objective, over the next 15 years, is to reach **680 electric vehicles in terms of private investment and a further 680 electric vehicles of a collective nature**, through the energy communities, in both cases accompanied by the relevant charging point installations.

It should be noted that the success of shared mobility requires significant **social and behavioural changes**, and will therefore require supporting and guiding the public.

Private use of electric vehicles → Use of electric vehicles collectively → Installation of charging points → Guidance for citizens → Sustainable mobility

This focus on electric mobility is considered as a part of the work to be carried out in the city to achieve more sustainable mobility than currently exists: promotion of active mobility, reduction of commuting in private motorised vehicles in the city, intermodality, etc.

2.5. ELECTRICAL RENEWABLES

Currently, only 9.5% of the final energy consumption in Pamplona comes from renewable energy sources. This percentage is lower than the national and Navarre averages, respectively. Furthermore, only 18% of this renewable energy is produced locally, which represents 2% of the city's final energy consumption. This indicator illustrates that measures need to be taken to increase the consumption of renewable energy sources in all sectors at municipal level and to increase local production while also promoting renewable energy communities.

The strategy aims to mobilise **investments in photovoltaics** via the public administration, energy communities, individuals, enterprises or communities of owners. Through the development of a **solar map**, it has been possible to analyse the city's potential to produce photovoltaic solar energy (electric) and thermal solar energy. This study indicates that the city has the capacity to **produce 77% of the electricity demand** that existed in 2019.

The potential of photovoltaic energy is very broad and different categories can be distinguished within self-consumption that vary depending on the type of use, the property, ownership of the installations, number of participants, with or without discharge to the grid, etc. So, the City Council aims to promote **collective self-consumption**. This occurs when a group of households, premises, warehouses or facilities connected to the electricity grid **benefit jointly and by agreement** from one or several renewable energy generating installations close to their households, warehouses, premises or facilities.

In the case of a **block of flats**, collective self-consumption occurs when a group or all the neighbours **share the energy generated** by a solar photovoltaic installation located on the community roof or rooftop in order to meet their energy needs. This sharing can also include common services (lighting supply, lift, garage, pressure pumps, etc.). This can also occur with collective installations developed in public and/or private spaces without coinciding on the same plot.

Some of the characteristics of the collective self-consumption model are as follows:

- **Collective:** several electricity consumers are supplied by a photovoltaic installation in an agreed manner through a sharing agreement. Such an agreement establishes the percentage of energy generated that corresponds to each participant.

- **With surplus:** the energy generated that is not used instantaneously is fed into the grid.

- **Simplified compensation:** the surplus compensation mechanism is applied directly to the monthly bill of each user (only possible for installations of less than 100 kWh).

- **Sale of energy:** surplus energy is sold through a sales contract, requiring the owner of the installation to be configured as an electric energy producer.

So, from a total investment of nearly €100 million, the aim is to implement **533** photovoltaic **installations** of collective self-consumption, distributed in different peak-power installations.

3. LEGAL AND ECONOMIC VIABILITY

For the correct implementation of the strategies, a series of economic and legal studies were carried out to analyse the **existing models and requirements** and thus define the role of the City Council as a catalyst, together with the role that various local agents may have in order to participate in the transformation of the city towards Positive Energy Districts.

Given that the implementation of the planned investments follows the same procedure pattern and similar chronological structure, as in most cases they share the legal requirements and conditions of the same regulatory framework, seven **common procedures** have been identified which do not necessarily have to be carried out in the order indicated below:

1. **Technical project and viability plan:** Spanish legislation requires that the installations under study be executed in accordance with a project or technical report drawn up by a competent technician. The economic viability is analysed in a document that defines the technical courses of action, investment, costs, financing and benefits.

2. **Administrative authorisation to carry out works and develop activities:** this is an administrative procedure to grant authorisations to carry out works or installations (articles 190 to 197 of Provincial Decree 1/2017 of 26 July).

3. **Environmental assessment:** administrative process carried out prior to the approval of the project, whereby possible adverse effects on the environment are analysed. The environmental assessment affects photovoltaic and thermal installations and rehabilitation of a certain scope.

4. **Use of space:** In the case of newly constructed photovoltaic installations and biomass boilers, it is necessary to obtain the consent of the competent authority to make use of the space or surface where they are to be installed. There are variations depending on whether it is a public or private space.

5. **Acquisition of ownership of the assets:** as the investment promoters are legal entities, the inferring and expression of their intention must follow the established legal or statutory mechanism. The inferring of intention of the investing entities will depend on whether they are energy communities, communities of residents or public administrations. This will also affect the acquisition of property and related contracts.

6. **Investment financing:** will depend on the origin of the investment, which may be internal if it is financed with owners' funds, external if financed with public aid and/or in the financial market, and finally mixed, combining owners' funds and external equity. Regulations on loan contracts, public grants and subsidies must be taken into account.

7. **Operation, management and maintenance of investments:** once the investment has been made and the facilities have started operating, the entities responsible for its operation, management and maintenance must formalise the legal relationships that guarantee the associated activities and provide them with economic returns.

In addition, it should be noted that for each of the sectors in which this strategy to advance towards Positive Energy Districts focuses, the corresponding regulatory and legal framework is taken into account.

It can be stated that the legal situation is favourable for the development of these projects, although barriers have been identified, as described in the corresponding point, that need to be overcome.

Legislation proposed in Europe also seems to be along the lines of promoting this type of project and even surmounting some of the barriers identified.

With regard to the **economic viability** of the different implementation strategies, there are diverse casuistries which are detailed below.

3.1. REHABILITATION

The **rehabilitation of buildings** can be considered as the first part of the process of energy transformation of households that will facilitate optimising the remaining energy solutions such as aerothermal, biomass or photovoltaic.

So, taking the data from the rehabilitation office as a reference, the City Council intends to promote the rehabilitation of **15,000 dwellings** over the next 15 years, resulting in an investment of **€366,500,000** (around 24,500 euros per household). The investments will be of a **private nature**. It should be noted that this first estimate does not take into account possible public subsidies.

In the event of rehabilitating buildings with private investments, we are talking mainly about individuals; a business model is not envisaged. However, substantial advantages are envisaged in terms of indoor comfort as well as a **reduction in energy demand** resulting in **reduced energy costs**.

Furthermore, following rehabilitation, the dwellings could be revalued by up to 15%, a possible incentive for citizens. It should be taken into account that this activity will represent an important development of the local economy and an attractive potential for the generation of employment.

For all this, the City Council will act as a catalyst in the mobilization of agents and funds, providing advice and information to citizens.

3.2. THERMAL RENEWABLES

Within **thermal installations** there are two technologies, on the one hand, aerothermal and on the other, biomass, both with different modalities and characteristics.

Individual installations which would serve a single household and would be privately owned. In this case the installations would be aerothermal, and would be linked to the electrification of some of the rehabilitated households, with the aim of reaching **7,500 dwellings**.

For individual installations, an investment of **€12,000 per household** is foreseen, which could be financed through **10-year bank loans**. As these are private and personal actions, the sale of energy or other energy services is not foreseen, therefore, as part of the income the following could be contemplated:

- Improvements in energy efficiency, resulting in a reduction of energy consumption.
- Increased capacity of flexibility.
- The elimination of the Natural Gas contract, resulting in savings by no longer paying the fixed term, maintenance of the gas installation, security, etc.

Collective installations (centralised), which would serve various households grouped in one or more blocks of flats, without the need for a major energy distribution network, generally in the form of co-owners. In this case the installations could be **aerothermal** or **biomass** and the financial model would be based on the generation of thermal energy that would be sold to end users.

The business model in this case envisages that the ownership of the investment by the community of owners would be through the energy community, whose legal form would be that of an Association.

In this case, the cost of the investment has been gauged at 400 kW-installations at a cost of 530 €/kW, resulting in a **total investment of €7,208,000** to reach **34 installations** (or a larger installation in steps of 400 kW that would work in the same way), thus reaching a total of **3,773 households**. In terms of income, which would come from the commercialisation of surplus energy, an amount of **€1,468,800** is estimated. In addition to the initial investment, it is necessary to consider the costs of fuel consumption (€502,987 per year) and the fixed costs related to maintenance, insurance, and monitoring and management costs (€391,400 per year).

It should be noted that the replacement of fossil fuels in centralised biomass installations would bring very limited economic savings to users, but together with the integral rehabilitation of dwellings it would allow the integration of individualised energy meters and adjustments to the installations to reduce energy demand as much as possible.

District installations which would serve various blocks of flats, even large parts of an entire district. In this case the installations would be biomass and as in the previous case, the financial model would be based on the generation of thermal energy that would be sold to end users. Ownership of the investment would be through the energy community whose legal form would be that of an Association.

The definition of these new heat stations would involve the search for new sites for their location, the design of new heat networks, connections with existing installations, and new heat exchange substations.

In this case, the cost of the investment has been calculated at 1,000 KW-installations at a cost of 1,000 €/kW, resulting in a **total investment of €17,000,000** to reach **17 installations** (or a smaller number of installations, but always in steps of 1,000 kW with similar characteristics), reaching a total of **3,727 dwellings**. In terms of income, which would come from the commercialisation of surplus energy, an amount of **€1,836,000** is expected. In addition to the initial investment, it is necessary to consider the costs of fuel consumption (€628,734 per year) and the fixed costs related to maintenance, insurance and, monitoring and management costs (€347,200 per year).

In terms of financing, both for the collective and District installations, **bank financing of 50%** of the investment is considered over a term of 10 years. Additional external financing via **crowdlending of 4%** is also considered, with a repayment term of 10 years. In the event of not obtaining the additional external financing, an attempt would be made to cover it with banking facilities.

3.3. SUSTAINABLE MOBILITY

Changes in mobility are essential to achieve Energy Positive Districts, changes that focus mainly on **reducing the energy demand for mobility**. The plan is to reduce the use of private vehicles and encourage walking, cycling and the use of public transport, a task coordinated by the Municipal Mobility division.

Working specifically on private mobility, in addition to reducing the use of individual vehicles, electric vehicles will be encouraged so as to reduce dependence on fossil fuels, related emissions and noise, and also the use of car sharing.

In the case of **private investments**, cost and vehicle autonomy are the main barriers. However, through comparative analyses, such as the Total Cost of Ownership (TCO), between electric vehicles and diesel or petrol vehicles, it is shown that, although the initial investment is higher in electric vehicles, their operating costs (charging and maintenance) are lower, implying a lower total cost throughout their useful life.

The City Council, therefore, aims to encourage the purchase of **680 vehicles**, associated to a corresponding charging point, representing an investment of **€32,500 per household** for the purchase of the vehicle and **€1,500 for the installation** of the private charging point. Through a short-, medium- and long-term evaluation, it is determined that electric vehicles are more profitable between 5 and 10 years of use, implying a cost overrun during the early years. For higher economic profitability in the purchase of electric vehicles, **public grants are necessary**.

In the case of **collective investments**, a model will be promoted in which the ownership and use of both the vehicles and the charging points belong to the energy community which would not only undertake the investment, but would also be in charge of its management, having an income related to use. The City Council intends to promote the purchase of **680 vehicles**, associated to a corresponding charging point, representing a **total investment of €34,000** per vehicle and charging point installation, financed through a 7-year bank loan and from the income generated from the use made by the members of the community.

The income would come from the payment of the energy services offered by the community, being, on the one hand, **income from hours of use** of the vehicle, with a limit of kms which, if exceeded, would have to be paid separately. And, on the other hand, **income for whole days** or fixed hours of reservation. These services would initially be aimed at companies or public entities that might be interested in this type of reservation. It should be noted that the viability of this model requires covering a minimum number of hours of use.

	Conventional vehicle	Electric vehicle	
		Private investment	Collective investment
Initial investment	Average	High	High
Operating costs	High	Average	Average
Total cost	High	Average	Average
Income related to use	No	No	Yes

3.4. ELECTRICAL RENEWABLES

Increasing the production of renewable energies at local level is essential to advance towards Positive Energy Districts, gain **energy autonomy** and, consequently, reduce dependence on fossil fuels. To this end, the City Council is committed to implementing **collective self-consumption**, involving in this way different agents in the city.

In the case of collective self-consumption with surpluses, the regulations do not require that the installation be owned by the group of associated users, allowing the district community or energy community to act as a legal entity and be the owner of the installation, and at the same time carry out the existing economic activities, such as the sale of surpluses.

The objective of the City Council here is the implementation of **photovoltaic installations** for collective self-consumption, driving the mobilisation of around **100 million euros over 15 years**, taking into account both public and private investment, distributed in different peak power installations. It should be noted that VAT cannot be deducted for investments made by Homeowners' Associations and/or private individuals.

The different types of production and ownership envisaged are:

- **<50 kWp facilities** Collective self-consumption installations with surpluses conform to simplified compensation and municipal ownership.

- **220 kWp facilities** Collective self-consumption installations without surplus sale compensation, connected to the internal grid and municipal property. Transfer of use of the installation.

- **<100 kWp facilities** Collective self-consumption installations with surpluses conform to simplified compensation and owned by Communities of Owners.

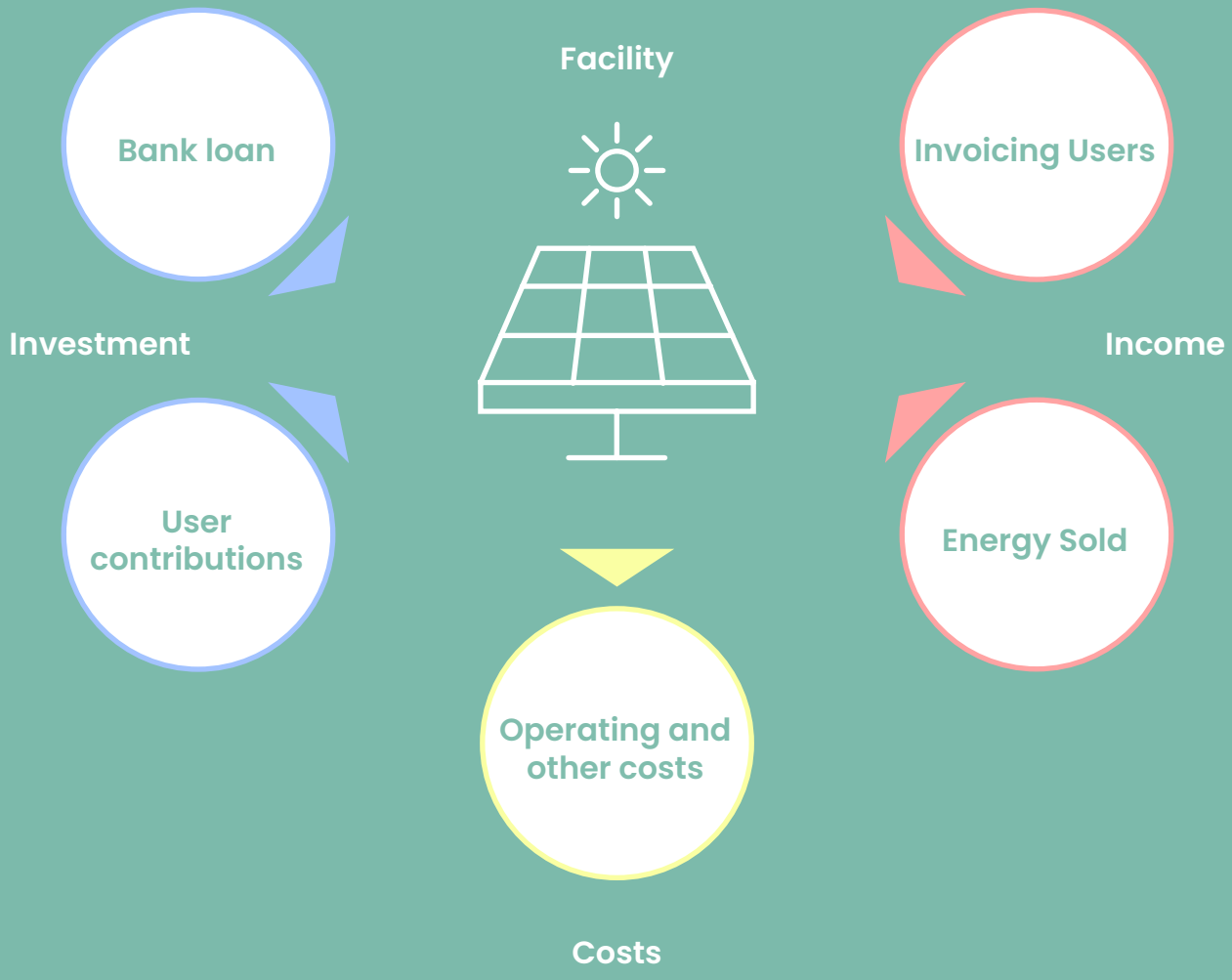
- **1000 kWp facilities** Collective self-consumption installations without surplus sale compensation, connected to the distribution network and owned by the Energy Community.

The business model on which this strategy is based contemplates an initial investment financed through a 10-year **bank loan** (6%) and **contributions from users**. Subsequently, it considers invoicing by the Energy Community (or community of neighbours) to its associates.

This amount would be a percentage of the savings obtained from consuming the energy generated, in other words, it would be a **payment for the energy used**. The income from invoicing the members of the energy community would

serve to absorb both the operating costs of the installation and the repayment of the bank loan.

Furthermore, other **income** is expected to come from the **energy sold** to the electricity market (or other agents), which would be sold directly by the promoter and always depending on the technical characteristics of the project.



In most cases, bank financing is envisaged, with an interest rate of 6.3% and own individual capital. However, it should be noted that there are currently various state, regional and Pamplona City Council grants available for the necessary interventions to advance towards Positive Energy Districts in the city. It worth noting that the economic analysis has been carried out without taking into account the grants available, which are detailed in the studies carried out thanks to the EUCF.

4. RESULTS

Apart from the transformation of Pamplona's neighbourhoods into Positive Energy Districts, one of the main objectives is to promote **conscious and efficient energy consumption**, resulting in both the **reduction of associated emissions** and **dependence on fossil fuels** (contributing to the reduction of phenomena linked to climate change and air pollution), and thus improving the quality of life of citizens.

Although there is a growing global interest and need for a **change of energy model**, the market has not yet reached sufficient level of maturity for there to be enough market players in the city to 1) cover the whole value chain and 2) generate sufficient demand. The **public sector** is identified as essential to **drive investments** and generate a still scant demand for this type of energy service in the city.

4.1. COMPONENTS OF THE INVESTMENT CONCEPT

The funds to be mobilised, 728.285.403 EUR, for the implementation of each of the strategies proposed are detailed below. At the same time, data such as Pay-back and IRR (Internal Rate of Return) are included for a better financial assessment of each of the investments.

Strategy	Investment to be mobilised	Pay-back (years)	IRR*
Rehabilitation	€443,456,000	10	5,75%
Aerothermal	€108,900,000	>25	-4,35%
Biomass	€24,208,000	13	5,48%
Mobility	€51,095,200	6	8,23%
Photovoltaic	€99,760,000	12	6,13%
City Council	€866.203	-	-

* For the calculation of the IRR values, discount rates adapted to each type of project have been evaluated.

In the case of the City Council, investment is not analysed in the same way following the evolution of cash flow, as this would be municipal expenditure.

4.2. BARRIERS

There are various barriers to the implementation of the different strategies, and these can be grouped into **5 main categories**; economic, legal, technical, social and political. In addition to the description of the barriers, proposals not included in this summary have been outlined.

ECONOMIC BARRIERS

Access to financing

- Securing the **necessary financing** is becoming increasingly more difficult due to the rising costs of finance, so various sources, both public and private, are being considered.
- Difficulties in private-individual financing, particularly in lower income districts, for which it is **essential to provide the right advice and public aid to make this investment attractive to citizens**.

SOCIAL BARRIERS

Negative perception of the electricity sector

Need for advice

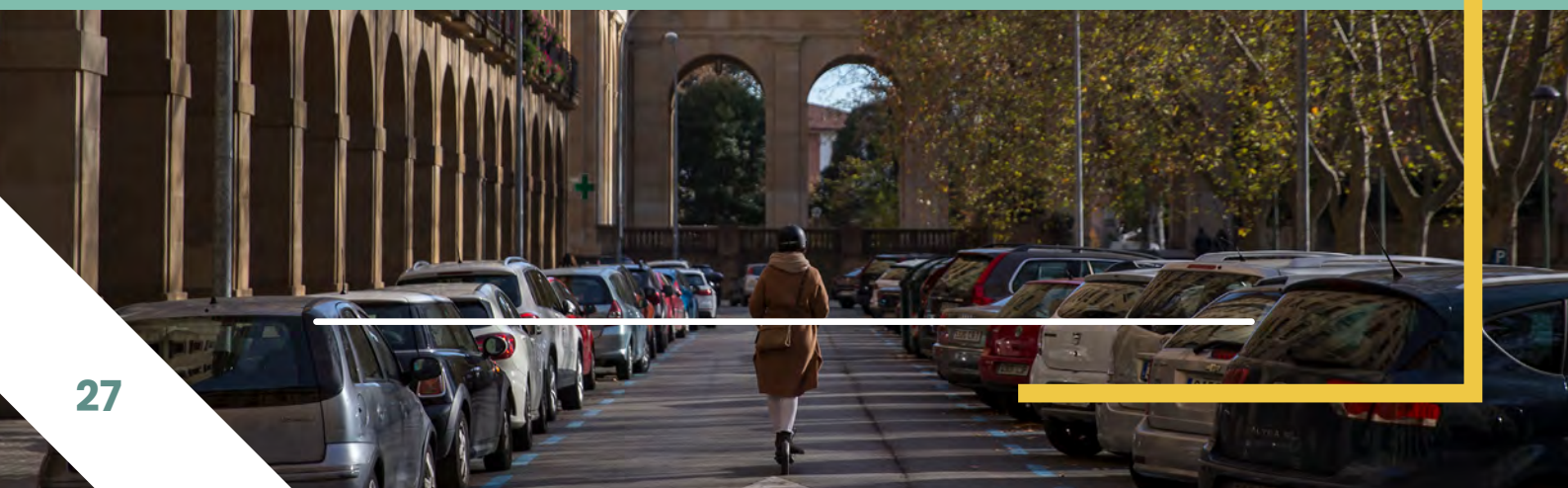
- **Negative perception** that citizens and enterprises have about the electricity sector which is identified as complicated.
- Need for a high level of **advice and communication** from the City Council to facilitate an understanding of the initiatives and the necessary involvement of the different actors, improving in this way the climate culture of the population.

LEGAL BARRIERS

- **Lack of transposition**
- **Difficulties in the procedures**
- **Administrative deadlines**

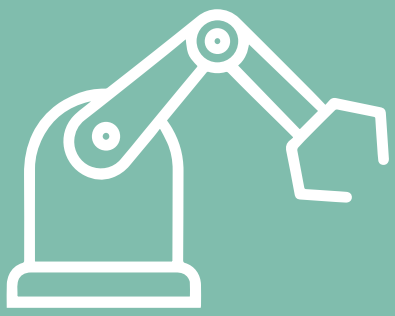
- **Lack of transposition** of everything related to Energy Communities in European directives, which limits the steps to be followed due to the related uncertainty and lack of procedures definition.
- Existing difficulties in the necessary **procedures** for the implementation of energy projects, which hinder the massive roll out of renewable generation and the role of energy communities.
- Impossibility of **energy sales** activity between the members of the energy community itself or participants of a collective installation.
- **Participation** in several collective installations that must be in the same modality.
- Excessive and clearly discouraging **administrative deadlines** for the start-up and operation (correct invoicing) of collective installations.
- Maintenance of static **distribution coefficients** for collective self-consumption.
- Lack of development of **new markets** within the electricity sector that would allow Energy Communities and their members to take advantage of their benefits.

To this end, it is essential to keep up to date with national and European directives for the correct implementation of energy communities. On the other hand, existing Regional legislation that requires the replacement of all oil boilers before 2027, pushing the change to natural gas, may discourage the changeover to biomass or aerothermal energy.



TECHNICAL BARRIERS

- **Lack of technological solutions**
- **Grid capacity**
- **Delays**
- **Availability of wide spaces**



- A lack of **technological solutions** to facilitate the technical, administrative and economic management of energy communities.
- A lack of the **necessary technology** to obtain the maximum potential of the renewable electricity generation installations through flexibility and demand management.
- Low and medium voltage **grid capacity** limitations as well as a lack of transparency in this area on behalf of the companies responsible.
- Need for **wide spaces** for individual aerothermal energy installation which greatly restricts many households.
- **Delays** in installing charging points in private car parks in the event of complicated construction work or higher investments due to rehabilitation needs.

POLITICAL BARRIERS

- **Real commitment and provision of resources**
- **Outdated public structures**
- **Lack of multidisciplinary teams**

- Level of **real commitment and contribution** of economic and human resources necessary to meet the objectives set, which is why the City Council is working on drawing up clear plans that respond to the real needs of citizens.
- Need to update **public structures** in the face of new realities which the fight against climate change and its associated consequences requires.
- Existence of **multidisciplinary teams** with both technical and social perception to provide a better response to citizens. The Energy Advice Offices, described above, attempt to provide a partial solution to this need, and aim to become an instrument to promote a cultural change of the different social agents in the city.

4.3. PROGRESS ACHIEVED

The following are some of the advances that have already been made in the course of action proposed in the strategy presented here, which aims to promote energy communities in order to advance towards positive energy districts as a strategy for decarbonisation in the city of Pamplona.

Course of action	Rochapea	Milagrosa	Ensanche	City of Pamplona
No. of dwellings rehabilitated	-	-	-	-
No. of biomass boilers / District heating	0	0	0	5 + 1 DH Txantrea
No. of electric vehicles purchased	52	22	146	753
Public charging infrastructure (Places electrified)	4	0	12	48
Renewable generation already installed	381 kW	191 kW	263 kW	5.641 kW
No. of Energy Communities existing	1 in pipeline	Process starts in 2023	0	1 constituted 3 in pipeline

4.4. POTENTIAL IMPACT

The benefits and positive impacts related to the promotion, implementation and use of renewable energies are clear, both at environmental level and in terms of the health and comfort of citizens, with a direct impact on energy savings, reduced emissions and generation of renewables.

Strategy	Savings / Production (GWh/yr)	Emissions avoided ($tCO2_{eq}$/yr)
Rehabilitation	76,01	15.354
Aerothermal	26,41	4.559
Biomass	30,60	6.218
Mobility	47,64	11.804
Photovoltaic	87,33	22.705

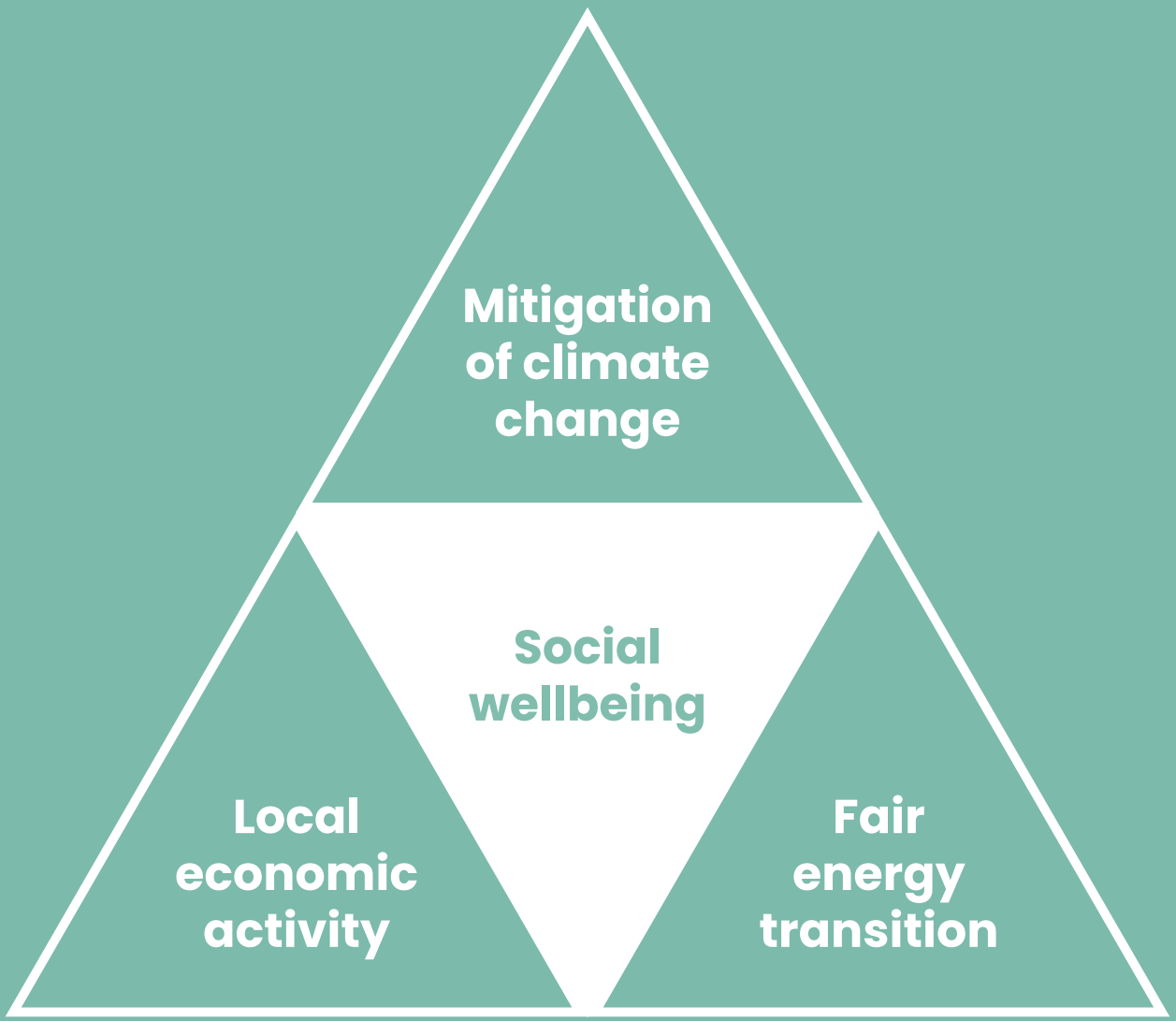
The strategies to be implemented to advance towards Energy Positive Districts also promote the **creation of local employment**. For example, in the case of the implementation of biomass thermal installations, forest biomass close to the point of consumption will benefit, which in turn tackles depopulation problems.

The decarbonisation strategy foresees the **aggregation of small-scale projects** from the City Council, through the creation of Energy Advice Offices, and also facilitating public tenders to make collective procurement of projects in the districts, with a local perspective, and the development of quality employment. Finally, together with the Energy Communities, the strategy would facilitate the development of economies of scale, thus making small projects more profitable.

5. CONCLUSIONS

As the results of the studies carried out within the framework of the EUCF project point out and as described throughout this document, the model of **energy communities to advance towards positive energy districts** is identified as a valid model capable of achieving the objectives set by the City Council in areas such as climate change, security of supply and development of local economic activity.

In turn, all the strategies and/or types of investment analysed are **economically and technically viable**, with different levels of profitability, both for the districts analysed and for their **extrapolation** to other districts in the city of Pamplona and in turn to other national and international municipalities.



Moreover, it has been possible to identify that, in order to guarantee the correct implementation of the different strategies, the **drive from Local Administration** is essential, playing a key role as a catalyst for the districts, taking advantage of its neutral role in the market to encourage and promote both the mobilisation of funds and the mobilisation of actors towards a fair energy transition.

During the study, a number of **significant barriers** have also been identified, some of which are considered immediate as they greatly limit the roll out of energy communities. Therefore, work will continue in parallel to the implementation of the strategies.

It should be noted that beyond the **impacts** that are directly related to the implementation of energy communities, such as energy savings, renewable energy production and the reduction of CO2 emissions, **positive impacts on the environment, the local economy and society have been identified**.

Consequently, the model of energy communities to advance towards positive energy districts is shown to be a **valid and efficient model** that promotes actions to mitigate climate change and promote the local economy and social welfare through a fair and sustainable energy transition. The role of the local Administration as the driver of this model is recognised as essential.

Finally, as explained above, this document is presented as a proposal that must be agreed with the different municipal areas and backed by sufficient political and financial support in order to be implemented.

ENERGY COMMUNITIES TO ADVANCE TOWARDS POSITIVE ENERGY DISTRICTS AS A STRATEGY TOWARDS DECARBONISATION

EUROPEAN CITY FACILITY
EXECUTIVE SUMMARY

FEBRUARY 2023

Ayuntamiento de Pamplona | Iruñeko Udala

GO GREEN PAMPLONA

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