

zero@co₂plana

ENERGY AND ACCESSIBILITY REFURBISHMENT OF THE PUBLIC RENTAL HOUSING POOL



alokabide



EUSKO JAURLARITZA
GOBIERNO VASCO

INGURUMEN, LURRALDE PLANGINTZA
ETA ETXEBIZTZA SAILA
DEPARTAMENTO DE MEDIO AMBIENTE,
PLANIFICACIÓN TERRITORIAL Y VIVIENDA

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ALOKABIDE | Public company dependent on the Basque Government for the development of the social function of housing through the rental policy

EDIT:

**ALOKABIDE, Public Housing Rental Company of the Basque Government Department
of Territorial Planning, Housing and Transport of the Basque Government**

Portal de Gamarra 1A, 2nd floor (Edificio el Boulevard) 01013 Vitoria-Gasteiz

araba@alokabide.eus I bizkaia@alokabide.eus I gipuzkoa@alokabide.eus

www.alokabide.eus

www.euskadi.eus/gobierno-vasco/departamento-medio-ambiente-planificacion-territorial-vivienda/

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6. ENERGY AND ACCESSIBILITY REFURBISHMENT SOLUTIONS

6.1. Refurbishment strategy

The Plan ZERO Plana is the logical outcome of the observance of the Basque Autonomous Community's **Law 4/2019, of 21 February, on Energy Sustainability**.

The purpose of this legislation is, according to the general mandate for energy policy, to lay down the statutory guidelines for energy sustainability within the ambits of the Basque public administrations and the private sector. It does so by setting out the basic obligations and duties that both these sectors are required to uphold, designed mainly for **boosting measures in energy efficiency and saving**, as well as promoting and implementing renewable energies.

Its overriding purpose is therefore to regulate energy saving and efficiency together with the use of renewable energies in the Basque Autonomous Community.

This law is applicable to the General Administration, its Autonomous Agencies, Public Entities governed by private law, Public Companies, Public Sector Foundations in the Autonomous Community, and consortia with their own legal status.

It applies, in general, to the buildings, premises and vehicle pool owned by any one of the aforementioned entities, although the decree does provide for certain exceptions.

In the case that concerns us here, namely, rental housing, the Department of the Environment, Territorial Planning and Housing is therefore governed by this legislation for the buildings it owns, albeit with a major exception. The public rental housing pool is only governed by the law in the case of the so-called **Alojamientos Dotacionales (rented housing units owned by the regional government)**, given their nature of public property, and not the entire park of housing blocks, as the private consumptions of users are not governed by the law's remit.

According to the law, all the other **subsidised housing blocks held for rent**, developed by the public sector in the autonomous community, will be subject to a **Special Plan**, drafted by the department with powers in matters of housing and approved by the Basque Government, following a report by the Energy Sustainability Board, which will decide on both the need to conduct an audit and the timeframes for so doing.

This premise is amply fulfilled within the framework of this Plan ZERO Plana, addressing the energy sustainability of the public rental housing pool through a holistic approach: **the aim is to provide a comprehensive rental and energy service**, not simply highly efficient housing. A service in which people feel supported in their use of energy.

Furthermore, this is set to be a real, measurable commitment. Only by improving the housing stock, engaging occupants through information and awareness, can we ensure that energy is used more responsibly, sustainably and safely.

The Plan ZERO Plana has analysed the environmental and energy performance of the public housing stock, as well as of its occupants, including their health and wellbeing, putting forward improvement measures that will help them to attain a state of almost zero energy consumption.

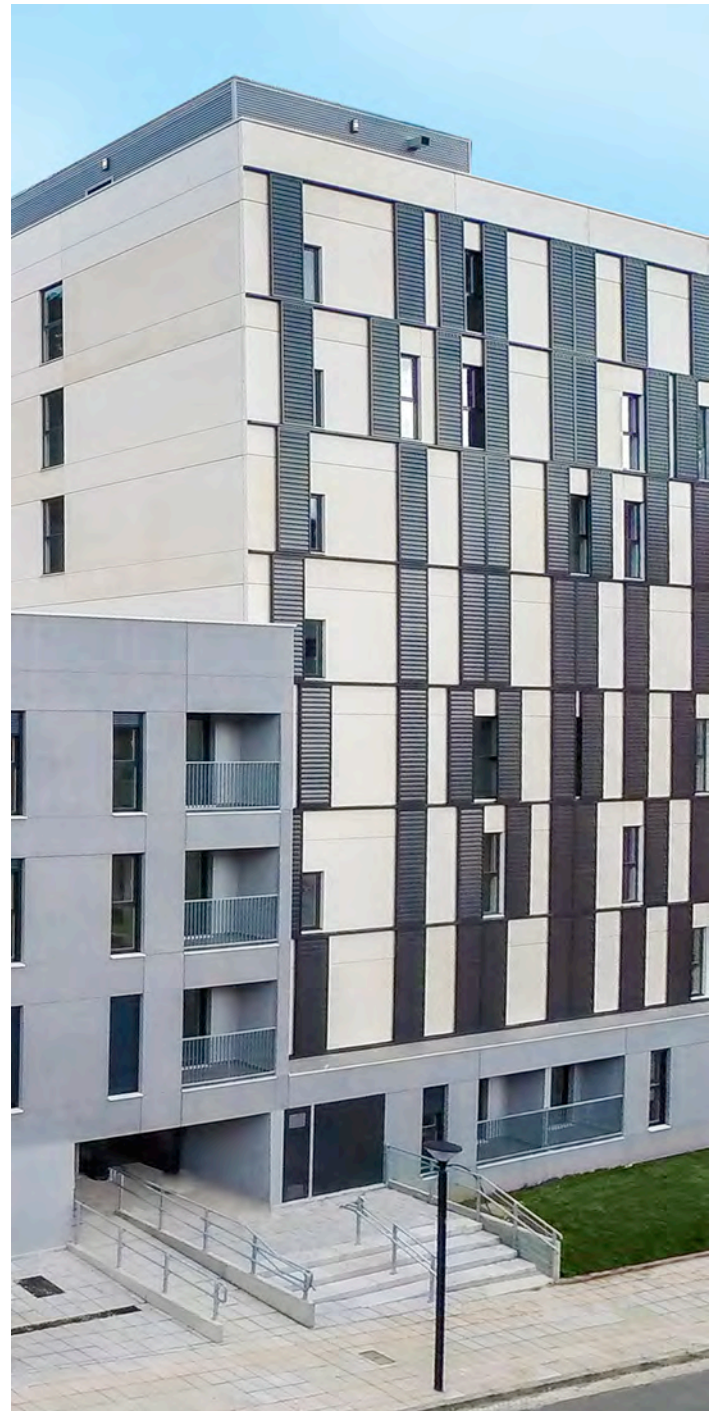
This analysis of buildings and their occupants has provided valuable data of potential use in new fields of innovation. **Fresh opportunities have been found for the design of public rental housing and its services**, contemplating solutions with amenities that are more consistent with the occupants' needs. The aim at this moment, early 2020, is to start implementing the Plan ZERO Plana with a programme involving the "smart" energy refurbishment of the public rental pool in its entirety.

The plan of action has required selecting those steps with the greatest return in economic, environmental and social terms, setting out an order of priority for technical improvement solutions and the pathways for their achievement. This will all be encapsulated in the Refurbishment Director Plan 2020- 2050, which will set milestones for 2030, 2040 and 2050.

In sum, we have aligned environmental goals with the provision of housing to meet the needs of people that are also energy consumers. In other words, **prioritising a service, not simply renting housing**.

This entire process involves a particular model for the social management of energy that suits rented accommodation, prompting the digitisation and efficiency of our services together with people's wellbeing.

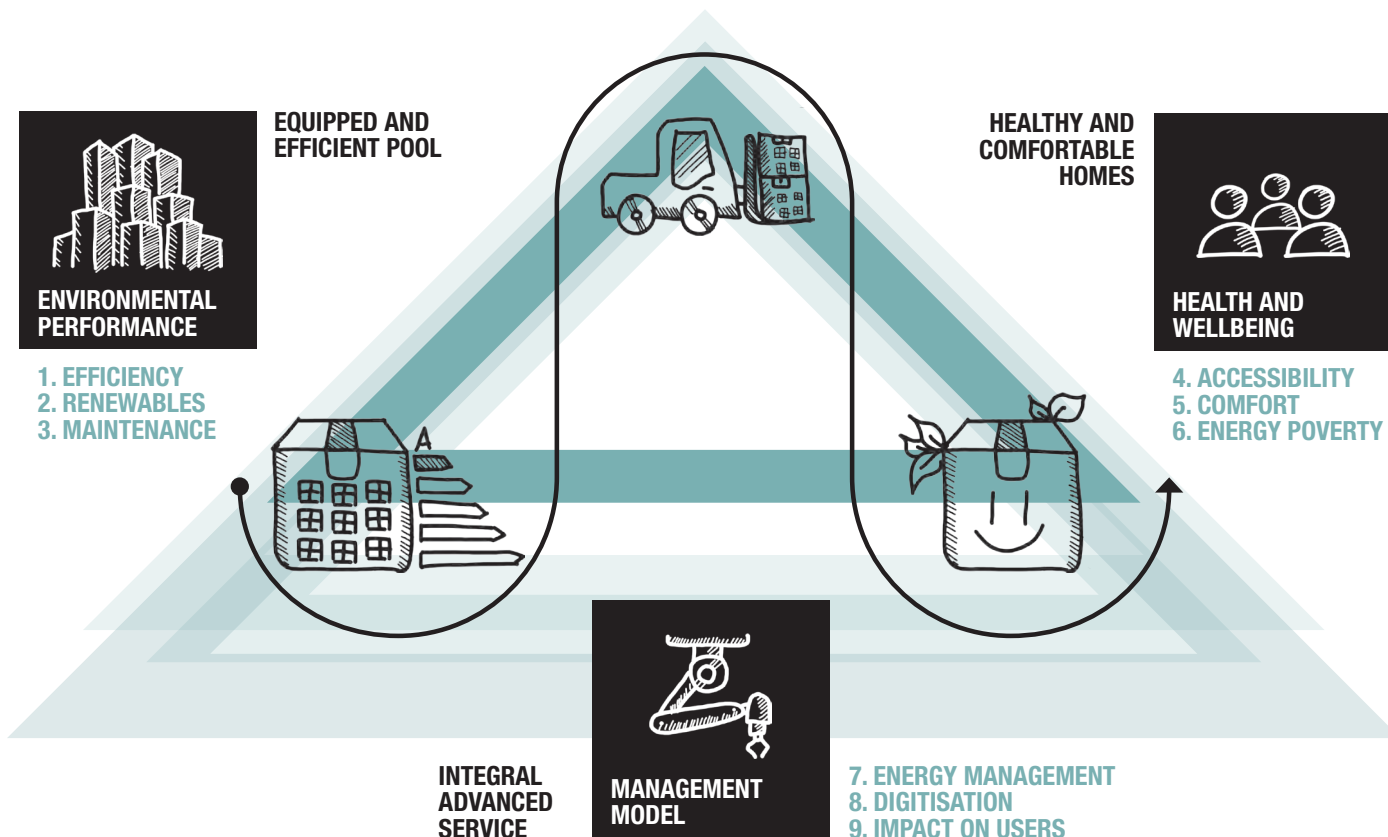
We have defined **an ideal model for the comprehensive management of energy in social housing** to drive the automation of processes and data with a view to minimising energy consumptions for both tenants and the government, with a balanced use of public resources at the lowest cost in all cases.



6.2. Main challenges

The Plan ZERO Plana consists of three challenges and nine parameters:

MAIN CHALLENGES AND NINE PARAMETERS





These three challenges involve decarbonising the housing pool, improving our buildings' energy performance, and a thorough review of the stock of buildings, with the gathering of data to identify the crucial aspects involved in energy and accessibility refurbishment; auditing the state of repair and energy conditions of both buildings and individual housing units.

They are based on an advanced service focused on the **digitisation of the public rental service**, where the gathering, processing and analysis of data are essential for informed decision-making. This therefore requires an in-depth review of the public rental management model in order to draw up new and innovative models (of management) framed within the digitisation and use of smart systems for providing a complete and sustainable service **centred on users**.

It is essential to combat "energy poverty", while at the same time marshalling the empowerment of tenants in the use of energy, raising the level of comfort in homes, tackling the situation of energy and accessibility vulnerability wherever it is detected **to guarantee basic healthy living conditions** for everyone involved.

Digitisation, wellbeing and energy efficiency basically describe the three focal points that social housing needs to address to make the most of the opportunity provided by the Basque Government's firm commitment to rental housing.

Each one of these areas of study and their various research lines converge through an overall analysis of the public housing stock, which has prompted the consideration of the measures to be taken regarding both the buildings themselves and the public service itself, with a view to dealing with the challenges faced in public rental, and thereby effectively implementing the Plan for the Energy and Accessibility Refurbishment of the Public Rental Housing Pool in Euskadi-The Basque Country.

CHALLENGE 1:

Efficient Public Housing

**1. Energy Efficiency**

Optimum costing in terms of economic viability and technical expediency, thereby catering for the determination of the more efficient and more affordable energy and accessibility refurbishment solutions.

**CHALLENGE 2:**

The Health and Wellbeing of Tenants

**4. Accessibility**

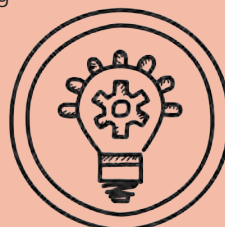
Level of accessibility of homes and building, within a future scenario defined by an ageing society, with especially vulnerable groups and stricter requirements for ensuring their mobility and independence.

**CHALLENGE 3:**

Advanced Public Management

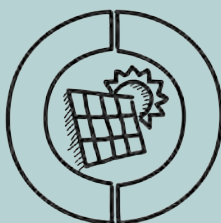
**7. Energy support**

Implementation of an Advanced Management Model in public housing in Euskadi-The Basque Country through a series of processes, tools and services that should consolidate a way of handling the energy performance and the rental process in a more sustainable, effective, and efficient manner.



2. Renewable energy and self-consumption

Use of renewable energies in our buildings, as it is the cleanest and most eco-friendly option, and boost self-consumption, with the aim being to channel the economic benefits obtained towards tenants.



3. Maintenance and repair

Degree of preventive maintenance, with the aim to maximise the useful life of our buildings and ensure their amenities are fully available in perfect conditions.



5. Comfort and health

Conditions of habitability and comfort, at the lowest possible cost and causing a minimal environmental impact. Tenants are empowered to take responsibility for their consumption and adapt their energy habits.



6. Vulnerability and energy poverty

Subsidies for those households that have already installed an energy management system and which may encounter difficulties for turning on the heating in the coldest winter months.



8. Digitisation

Furnish the Basque Government and its social rental buildings and accommodation with the structures, tools and mechanisms for establishing and developing integral energy management plans.



9. Impact on occupants

Appraisal of the effects that the measures adopted have on end users, with the aim of applying those improvements as necessary to guarantee the best possible energy service at the best possible price in rental housing.



6.3. First steps for defining the Plan

According to the ANALYSIS OF THE PUBLIC RENTAL HOUSING POOL presented in VOLUME I of the Plan ZERO Plana, as well as the basic conclusions it reaches, the next stage involves **defining the basic steps to be taken on the buildings under study**, with a view to reducing their energy demand through passive design strategies; reducing energy consumption by implementing efficient equipment and systems; increasing the share of energy provided by renewable energies; and the certification, inspection and supervision of the different installations in the buildings, which are, in short, the goals of EU Directive 2010/31/EU and the Plan ZERO Plana.

This means deploying the solutions on the basis of three strategic pillars with their corresponding dashboard featuring 28 indicators that will be used to measure the progress of the Plan ZERO Plana.

Once the individual solutions have been identified through each strategic pillar, a detailed analysis has been conducted of the most likely outcomes of a combination of solutions, from a mainstream perspective of the project, involving the development of the most cost-effective approach.

The following sections considers the different solutions proposed by the Plan ZERO Plana Steering Committee.



CHALLENGE 1

SOLUTIONS FOR AN EFFICIENT PUBLIC HOUSING POOL are those informed by the analysis of the stock's performance, renewables facilities and state of repair, and the various energy audits involving the representative buildings for each one of the housing types analysed.



CHALLENGE 2

SOLUTIONS FOR THE HEALTH AND WELLBEING OF

TENANTS are those informed by the analysis of accessibility, the energy user's profile, and the study of situations of energy poverty as regards the representative buildings for each one of the housing types analysed.



CHALLENGE 3

SOLUTIONS FOR ADVANCED PUBLIC MANAGEMENT

are those informed by the analysis of the public management of rental housing currently being provided and of the possibilities inherent to the use of advanced technologies in management.

6.4. CHALLENGE 1: Solutions for an Efficient Public Housing Pool

As described in VOLUME I, the analyses conducted on the public rental housing pool according to the pillar of the ENVIRONMENT have focused on the buildings' state of repair, energy efficiency and the contribution made by renewable energy installations. The Plan ZERO Plana Steering Committee has used this analysis to deploy **a series of measures to suit households and individual cases**, designed to undertake an energy refurbishment process according to nearly Zero-Energy Buildings (nZEB), and in keeping with the Plan's strategy.



Energy Efficiency

The audits conducted on each representative building reveal a battery of **10 individual measures and up to 16 combinations to be implemented** on the pool of buildings covered by the Plan, and which are summarised in the following table:

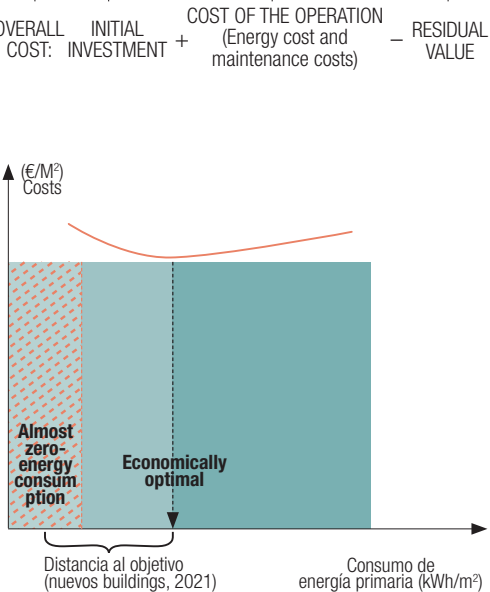
The individual measures and their combinations are applied depending on the particular needs of each type of household, with the aim being to achieve the project's objectives. This means there are myriad options, so the choice in each case has been based on a **cost-effective analysis, pursuant to the provisions of EU Directive 2010/31/EU**.

<div>26</div> <div>Improvement measures</div> <div>10 INDIVIDUAL ONES</div> <div>16 COMBINATIONS</div>		COMBINED MEASURES															
		PASSIVE			ACTIVE				FULL REFURBISHMENT			DECARBONISATION (EXTENSIVE REFURBISHMENT)					
		C01	C02	C03	C04	C05	C06	C07	C08	C09	C010	C011	C012	C013	C014	C015	C016
		Basic thermal envelope (TE)	Complete thermal envelope	Complete thermal envelope + Ventilation	Installations + Renewable Solar Thermal	Installations + Renewable HP	Ventilation + Installations + Solar thermal	Ventilation + Installations + HP + PV	Basis TE + Installations	Complete TE + Installations	Complete TE + Ventilation + Installations	Complete TE + Installations + Solar thermal renewable	Complete TE + Installations + Heat pump renewable	Complete TE + Installations + Heat pump renewable + PV	Complete TE + Ventilation + Solar thermal renewable	Complete TE + Ventilation + Heat pump renewable	Complete TE + Ventilation + Heat pump renewable + PV
INDIVIDUAL IMPROVEMENTS	1	Injection into air chamber															
	2	ETICS															
	3	Roof insulation															
	4	Insulation of lower floors															
	5	Spaces															
	6	Ventilation															
	7	Renewal of installations															
	8	REs – Thermal solar panels															
	9	REs – Aerothermal															
	10	REs – Photovoltaic panels															

The aim of this type of analysis is to ensure that the energy efficiency solutions for refurbished buildings reduce the **life-cycle cost of their use** (which in the case of housing is 30 years), and solutions should be implemented in which the cost of investment, operation and maintenance is as affordable as possible for 30 years.

Thus, in the case of public rental housing, and based on the results of the analysis and the innovation strategies in the public rental service prompted by ALOKABIDE, it seems clear that the refurbishment of housing should prioritise those measures in passive architecture that **maximise comfort, minimise the need for active elements, and reduce operating costs and management procedures**.

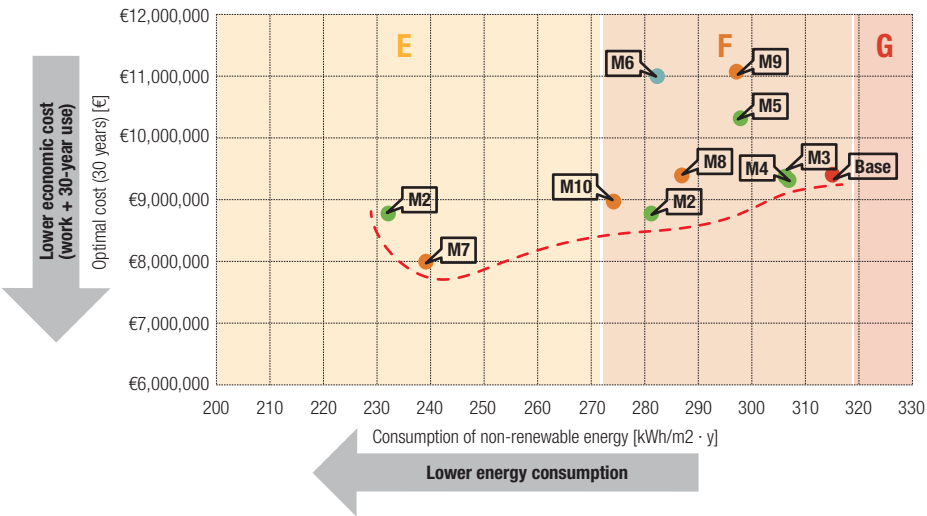
$$C_g(\tau) = C_i + \sum_j \left[\sum_{i=1}^{\tau} (C_{a,i}(j) \times R_d(i)) - V_{f,\tau}(j) \right]$$



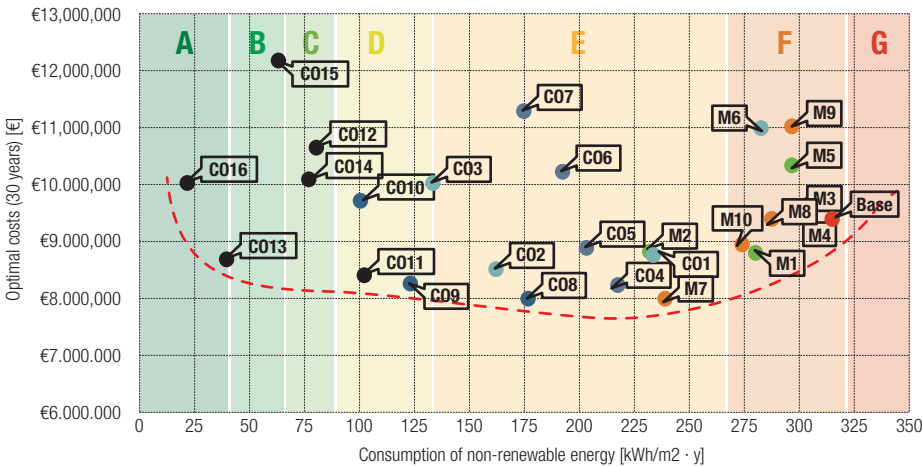
As an example of the process involving each one of the types of housing used to define the measures to be adopted from an ENVIRONMENTAL perspective, there now follows a diagram of the **development of the cost-effective analysis for the following cases:**

- Type C (cold climate and low energy efficiency), whose representative building is IBAIONDO 228.
- Type B (coastal climate and low energy efficiency), whose representative building is MUSKIZ 40.

In the case of IBAIONDO 228, the individual measures proposed have a limited scope in terms of improvements in efficiency and compliance with the Plan's challenges.

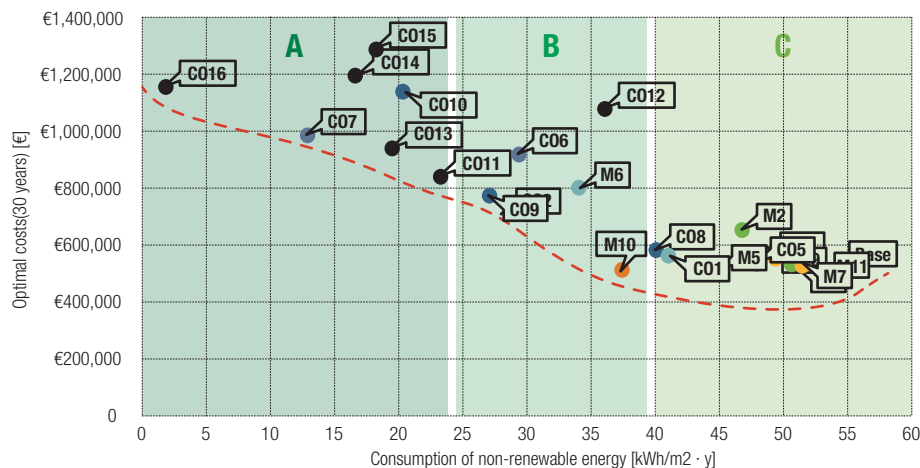


In combined terms, there is a substantial improvement, with diverse possibilities for dealing with the public service's challenges of decarbonising the housing pool and ensuring minimum comfort (see section CHALLENGE 3: SOLUTIONS FOR ADVANCED PUBLIC MANAGEMENT in this VOLUME II):



In this case, the measures adopted for this type of housing will involve the **refurbishment of the envelope**, the **replacement of individual boilers with aérothermal systems**, and the **deployment of photovoltaic systems for the electricity supply in communal areas** (combination CO13).

In the case of MUSKIZ 40, however, the proposed measures will have a different impact to the previous case, with a direct relationship between the investment costs and the improvements obtained.



In this case, the measures to be adopted in this type of housing will involve **the refurbishment of the envelope, an overhaul of the thermal installations**, and the **enlargement of solar thermal installations** (combination CO11).

This methodology is applied to each one of the different types of housing, identifying the measures to be adopted on the buildings in each group, within the scope of PILLAR 1: THE ENVIRONMENT.

With a view to applying the measures to each type of housing and drawing up the necessary budget for the Plan ZERO Plana, **the unitary costs per housing unit have been calculated for each scenario**, including the overall costs of rates, projects and site management, Industrial benefit and general expenditure, building licences, etc., without including VAT.

The estimated costs in this field amount to

€175,774,767.45

and are presented in section 6.7. BUDGETING FOR THE PLAN ZERO PLANA.

Planned target:

**8,065 homes
(136 housing
blocks)**

About the cost-effective method

As regards the cost-effective method for defining energy refurbishment measures, and within the framework of the Plan ZERO Plana, **a more thorough study has been made of one of the representative buildings in order to address this approach**, as per the requirements of EU Directive 2010/31/EU. The following pages describe the steps so far taken at the time of drafting this document:

Creating a climate file

The development of energy simulations requires a climate file. Generally speaking, there are **climate files for provincial capitals**, which reflect “normal climate years”. These files are used in energy simulations to inform energy saving strategies through virtual models. However, the calibration of an existing building **requires a specific climate file for the period of recorded consumptions**.

Data from the Euskalmet database will be used to create a climate file for the period in which readings have been taken in the building.

Modelling the representative building

The construction data received from ALOKABIDE have been used to create a virtual model of the representative building IBAIONDO 228 using Design Builder software. Design Builder is a graphic interface of the EnergyPlus energy calculation engine, developed by the US Department of Energy, which **performs dynamic system simulation for analysing buildings' energy use and comfort**.

The virtual energy model includes geometric data, building information on the envelope's components, and details of a building's installations and facilities. The **aim is to depict in as much detail as possible the building's true conditions**. What's more, this model will provide the platform for the development of the future calibration and study of refurbishment solutions.

Calibration of the representative building

The information on each home's' energy consumptions and indoor conditions, recorded by the monitoring system installed in the representative buildings, is used to **calibrate the virtual model with real data**.

This has involved the application of the heating conditions and timetables identified during the data-gathering process, and a check has been made to ensure that the thermal fluctuations within the homes between the virtual model and the real building are similar.

This has meant altering the characteristics of the more uncertain input data (such as the envelope's thermal transmission, the building's inertial capacity) with a change in the calibration process of the parameters required to bring the temperature curves closer together.

Hence the reason that the hourly figures for heating consumptions are an essential variable for ensuring the quality and accuracy of the project's conclusions.

Once the model has been calibrated, it is assumed that any measures applied to it will have a similar impact as if applied to the existing building.

Study of cost-effective solutions

Following the model's calibration, a study is to be made of energy consumption and comfort using the climate file for a normal year in Vitoria-Gasteiz, and **potential refurbishment strategies will be considered**.

This will involve the **parametric simulation method**, which is used to study the application of different refurbishment strategies compiled in a matrix, providing the first variable of results (in the form of energy consumption and hours of comfort) for creating a point cloud.

Considering the social circumstances of ALOKABIDE's tenants, **any refurbishment steps should focus on passive strategies**, with a view to increasing comfort and reducing energy consumptions, at a minimum associated operating cost. The following strategies are therefore to be studied:

- A. U roofing values (from 3 to 4 values).
- B. U structural values (from 3 to 4 values).
- C. U façade values (from 3 to 4 values).
- D. U windows values (from 3 to 4 values).
- E. Values of windows' solar factor (from 3 to 4 values).
- F. Level of seepages (2 values).
- G. Installation of a heat recovery system (2 values).
- H. Percentage of window space in the wall (from 3 to 4 values).
- I. Orientations (from 1 to 2 values).

The minimum values for each variable will be those that guarantee minimal thermal conditions, and these are to be agreed with ALOKABIDE.

This matrix will give rise to **5,832 different refurbishment steps for the building** (with the need to discard those combinations that are unviable or unrealistic in practice). Each one of them will be assigned an approximate investment cost, and each simulation will provide a result for consumption and hours of comfort. The cost of the measures can be set by ALOKABIDE or Visesa based on their own experience and past projects.

The variables H and I will not involve the building being analysed, but they will, nonetheless, be applicable to other buildings of the same type as the representative one, albeit with different variables for the percentage of window space and orientation, whereby the study's conclusions will be widely replicable in different buildings in ALOKABIDE's housing pool.



The information on the investment costs and operating expenditure over 30 years arising from consumptions and the results of the energy consumptions and comfort for each one of the variables in the matrix will be used to create cloud points.

An analysis has been conducted of planimetric data, the project's construction details, with a view to redoing the calculations on thermal transmittance and producing new ones on thermal bridges

These values will be loaded into the Design Builder energy simulation software.

This has required examining the main thermal bridges with the biggest impact in the building. This has involved the following specifications for materials, obtained from recognised international sources (e.g., UNE and ISO standards, Spain's catalogue of building materials (CTE)):

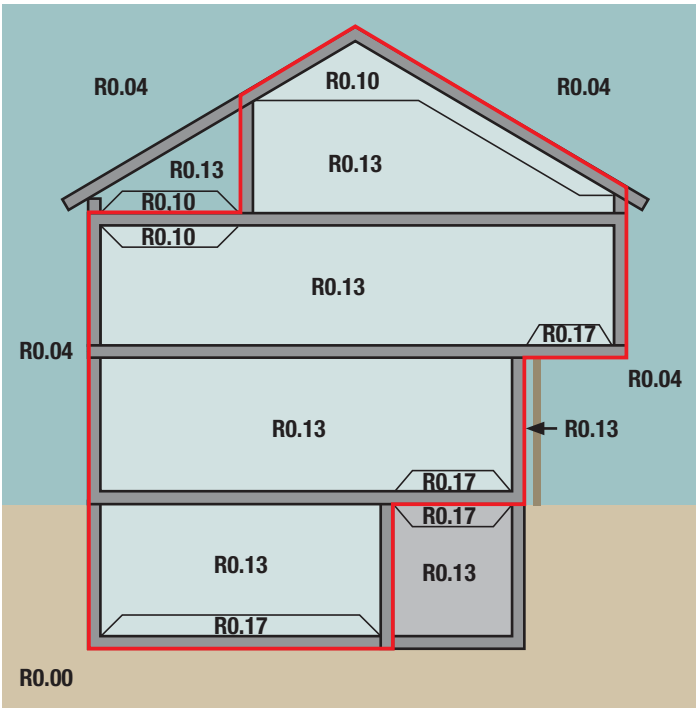
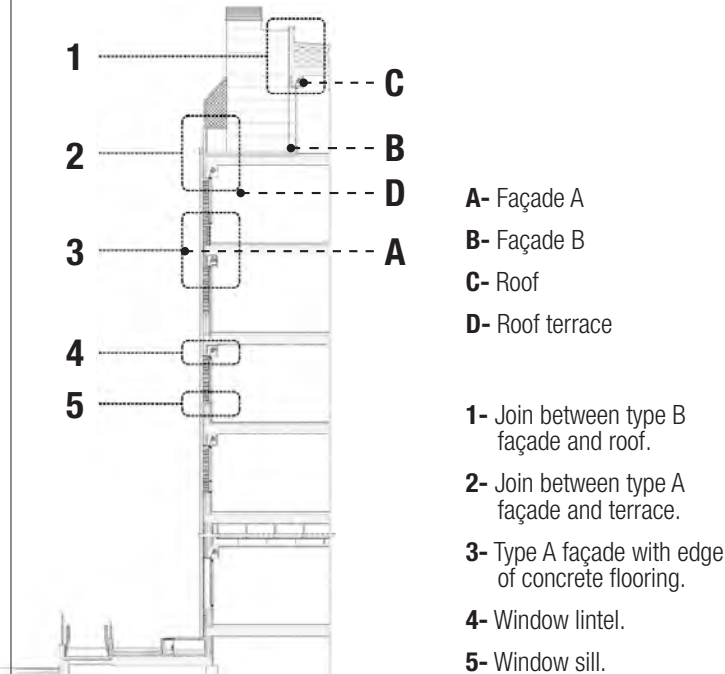
Materials used	Conductivity λ (W/mK)	Specific heat (J/kgK)	Vapour resistance (μ value)	Source
Perforated brick	0.35	780	10	CTE (catálogo de elementos constructivos)
Hollow brick	0.32	770	10	CTE
XPS insulation	0.039	1400	150	CTE
Outside mortar rendering	0.80	1000	10	CTE
Sealed air cavity	ISO 10077-2	1008	1	ISO 10077-2
Ventilated air cavity	ISO 10077-2 ventilada	1008	1	ISO 10077-2 Ventilada
Reinforced concrete	2.50	1000	130	EN 12524
Concrete filling	0.80	840	60	CIBSE Guide A (2006)
One-way concrete flooring	1.429	1000	80	CTE
Steel	17	460	1000000	EN 12524
Polyurethane insulation	0.05	1500	60	EN 12524
Cement mortar	1.41	1000	15	ÖNORM 8110-7:2013
Plaster rendering	0.57	1000	10	EN 12524
Timber	0.18	1600	100	HTFlux database
Tiling	1.30	840	1000000	EN 12524
Felt	0.05	1300	120	EN 12524
Watertightness	0.23	1000	50000	EN 12524
*Sealant	0.50	1000	10000	ISO 10077-2
*Silica gel	0.25	1000	10000	ISO 10077-2
*Aluminium	200	880	1000000	EN 12524
*EPDM	0.25	1000	6000	EN 12524
*Polyamide	0.30	1600	50000	EN 12524
*Glass	2	1050	2200	HTFlux database

* Values used for verifying U of windows (U_w), not for the calculation of linear thermal bridges (PSI). As there are no data on the section and characteristics of the outside carpentry, use has been made of the project's transmittances (U = 3,4 W/m²K). Once the value provided is adjudged to be realistic and feasible (using the values shown in the table), the windows' geometry has been simplified by adjusting its transmittance to that precise project value.

As regards the boundary conditions, the following scenarios for both indoor characteristics (comfort) and outside ones (obtained from IDEA's "Technical guide – Outdoor climate conditions" for Vitoria – Gasteiz):

BOUNDARY CONDITIONS		
	OUTDOORS	INDOORS
TEMPERATURE	-4°C	21°C
RELATIVE HUMIDITY	96%	40%
INSULATION	25 W/m²K (R=0.04)	7.692 W/m²K (R=0.13)

The following are the main thermal bridges analysed:



The **transmittance calculated** in the original project is **based on the thermal resistance of the various layers in the cladding**. It is therefore a one-dimensional calculation (U1d). This is a single calculation that does not take into account internal variations, gaps, or the wide range of non-uniform building systems.

The cost-effective method involves the one-dimensional (U1d) recalculation of transmittances, complemented by calculations based on the envelope's inner heat flow (U2d).

This dual calculation allows verifying the transmittance results of the cladding analysed in order to discover the influence of small joints and imperfections. The U2d calculation in highly homogenous parameters is less significant, as the results of the two kinds of calculation are similar because they are continuous and uniform. The new values calculated are used in Design Builder energy simulations in Stage 2 of this project.

See the table on material specifications, as these may vary from those used for the materials in the original calculations, whose specifications are not known.

TRANSMITTANCE	U Project (W/m²K)	U (1d) (W/m²K)	U (1d) (W/m²K)
Façade A	0.36	0.553	0.569
Façade B	0.34	0.538	0.558
Roof (terrace)	0.59	0.627	0.629
Window (Uw)	3.40	3.400	-
Concrete under roofing	0.27*	0.852	-
Roof panel		1.351	-

*The original project uses a joint value for the entire "plenum" arrangement under the roofing. Nevertheless, the software's characteristics require loading the transmittance separately: for the metal roofing panel on the one hand and for the unusable ventilated space on the other. In this case, they are uniform systems, and the recalculated U(1d) provides realistic values.

LINEAR THERMAL BRIDGE	PSI (W/mK)
1- Join between type B façade and concrete roof	0.479
2- Join between type A façade and terrace	0.166
3- Type A façade with edge of concrete flooring	0.509
4- Window lintel	0.342
5- Window sill	0.390

NOTE: the values obtained, both for U_{2d} and for PSI, may vary during Stage 2 due to possible adjustments and fine-tuning for tweaking the simulations.



Analysis of airtightness

The Thermal Department at the Basque Government's Building Quality Control Laboratory (LCCE) has conducted a quality control of the building that has involved analysing the degree of air seepage into some of the housing units by using the blower test:

ENTRANCE	FLOOR NO.	BEDS.	TYPE	VOL. (m³)	n50 (h1)
45 - 3B	3	2	1 orientation	151	2.39
40 - 3A	3	2	2 orientations	147	2.34
45 - 3C	3	3	Fully exterior	190	3.35

Level of seepages (Source: Energy audit, LCCE).

These figures mean an average of 2.69 renewal/h at 50 Pa, which according to the CIBSE Guide A, could mean 0.12 – 0.15 renewal/h at ambient pressure.

A series of **outside thermal images** have also been taken, which reveal the thermal bridges on the edges of the concrete structure and on the frames of windows.



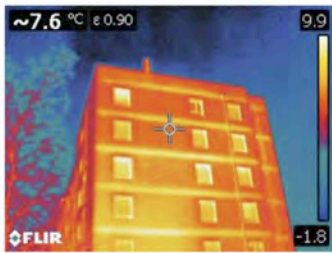
a) North-west façade



b) Close-up window north-west façade



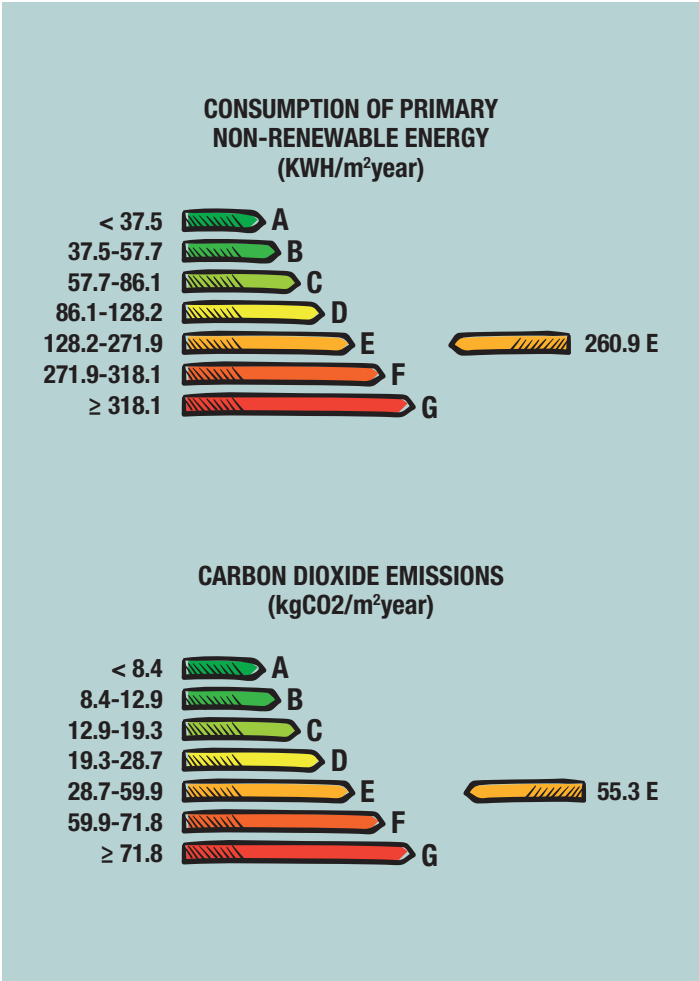
c) Interior north-west façade



d) North-west façade

Energy certification

There is an energy classification dating from 2016 that rates the housing units as class E, although **there are discrepancies between the thermal transmittance values** used in the certification (they have used the CE3X estimation option) and the **project data**. The envelopes will probably change their energy rating when the correct data are inputted.



Climate file

The energy analysis requires the use of a climate simulation file. These files provide detailed information on temperature, humidity, solar radiation, wind speed, etc. for the 8,760 hours in what is considered to be a “normal” climate year.

Vitoria-Gasteiz has a SWEC (Spanish Weather for Energy Calculations) file called “ESP_Vitoria.080800_SWEC”.

SWEC files were originally created for Spain’s 52 provincial capitals to be used with CALENER. These weather files were synthetically produced using Climed (Portuguese software developed by Ricardo Aguiar) based on average monthly data provided by Spain’s national weather office - Instituto Nacional Meteorológico de España.

These weather files **were converted from the DOE-2 binary format to the EnergyPlus format**, and include constant weather speeds of 6.7 m/s. From a technical perspective, the information these files provide is limited (constant wind speed and no information on precipitation). Hence the reason the decision has been made to create a “normal” climate file using Meteonorm software with data from 1991 to 2010, which also reflects the effects of climate change by recording extreme temperatures.

The graph below shows **the hourly average for the climate file by months**, also identifying extreme values.

Average hourly temperatures.	HOURLY AVERAGES	TEMPERATURE (C°)												
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
	01:00	5,3	5,5	7,3	8,8	11,7	15,3	16,8	17,4	14,8	12,4	8,3	5,5	10,8
	02:00	4,8	5,0	6,6	8,0	10,8	14,3	15,8	16,5	13,9	11,7	7,8	5,1	10,0
	03:00	4,4	4,4	5,9	7,2	10,2	13,6	15,1	15,6	12,9	11,0	7,3	4,7	9,4
	04:00	4,1	4,1	5,5	6,7	9,7	13,0	14,5	15,0	12,3	10,6	7,0	4,4	8,9
	05:00	3,9	3,8	5,1	6,2	9,2	12,6	14,0	14,5	11,9	10,2	6,7	4,2	8,5
	06:00	3,6	3,5	4,8	5,9	9,0	12,5	13,8	14,1	11,5	9,9	6,5	3,9	8,3
	07:00	3,5	3,3	4,6	5,8	9,5	13,2	14,3	14,1	11,3	9,7	6,3	3,8	8,3
	08:00	3,3	3,1	4,7	6,7	10,8	14,6	15,7	15,4	11,9	9,7	6,1	3,6	8,8
	09:00	3,3	3,3	5,9	8,1	12,5	16,4	17,6	17,4	13,6	11,0	6,4	3,6	9,9
	10:00	4,1	4,7	7,7	9,7	14,3	18,3	19,5	19,5	15,6	12,8	7,5	4,6	11,5
	11:00	5,6	6,5	9,5	11,3	16,0	20,1	21,4	21,5	17,7	14,6	8,9	6,0	13,3
	12:00	7,2	8,2	11,2	12,8	17,4	21,6	22,9	23,0	19,3	16,3	10,1	7,5	14,8
	13:00	8,5	9,5	12,6	14,0	18,6	22,8	24,0	24,2	20,8	17,6	11,1	8,7	16,0
14:00	9,3	10,5	13,8	15,0	19,4	23,7	25,0	25,1	22,1	18,7	12,3	9,7	17,0	
15:00	9,8	11,1	14,5	15,6	20,0	24,2	25,7	25,8	23,0	19,2	13,0	10,2	17,7	
16:00	10,0	11,3	14,7	15,9	20,2	24,4	26,0	26,2	23,4	19,4	13,2	10,2	17,9	
17:00	9,7	11,1	14,5	15,9	20,0	24,4	26,1	26,2	23,3	19,0	12,7	9,6	17,7	
18:00	8,8	10,4	13,9	15,6	19,6	24,0	25,7	25,7	22,7	18,1	11,8	8,7	17,1	
19:00	8,1	9,2	12,8	14,7	18,8	23,2	24,9	24,8	21,5	16,8	11,1	8,1	16,2	
20:00	7,5	8,5	11,6	13,6	17,8	22,1	23,7	23,5	20,1	15,9	10,6	7,7	15,2	
21:00	7,1	7,9	10,6	12,5	16,6	20,8	22,4	22,2	18,9	15,1	10,2	7,2	14,3	
22:00	6,6	7,2	9,8	11,4	15,3	19,4	20,9	20,9	17,8	14,4	9,6	6,8	13,3	
23:00	6,2	6,6	9,0	10,5	14,1	17,9	19,4	19,7	16,6	13,6	9,2	6,4	12,4	
00:00	5,7	6,0	8,1	9,4	12,9	16,5	18,0	18,4	15,5	12,8	8,7	5,9	11,5	
OVERALL														
Max.	18,3	20,0	22,6	23,7	28,9	33,5	32,7	36,6	31,6	25,8	19,0	18,0	36,6	
Min.	-4,3	-3,6	-1,7	0,1	2,3	7,0	7,8	8,4	4,8	3,1	-0,5	-4,7	-4,7	
Averag.	6,3	6,9	9,4	10,9	14,8	18,7	20,1	20,3	17,2	14,2	9,3	6,5	12,9	

This information has been used to plot a Givoni bioclimate graph that superimposes on a psychrometric chart the 8,760 hours recorded in the climate file and the recommended bioclimate strategies.

The climate in Vitoria-Gasteiz is largely cold, in which the **use of indoor loads** (through insulation) and **solar gains** are the main strategies for maximising comfort during cold spells.

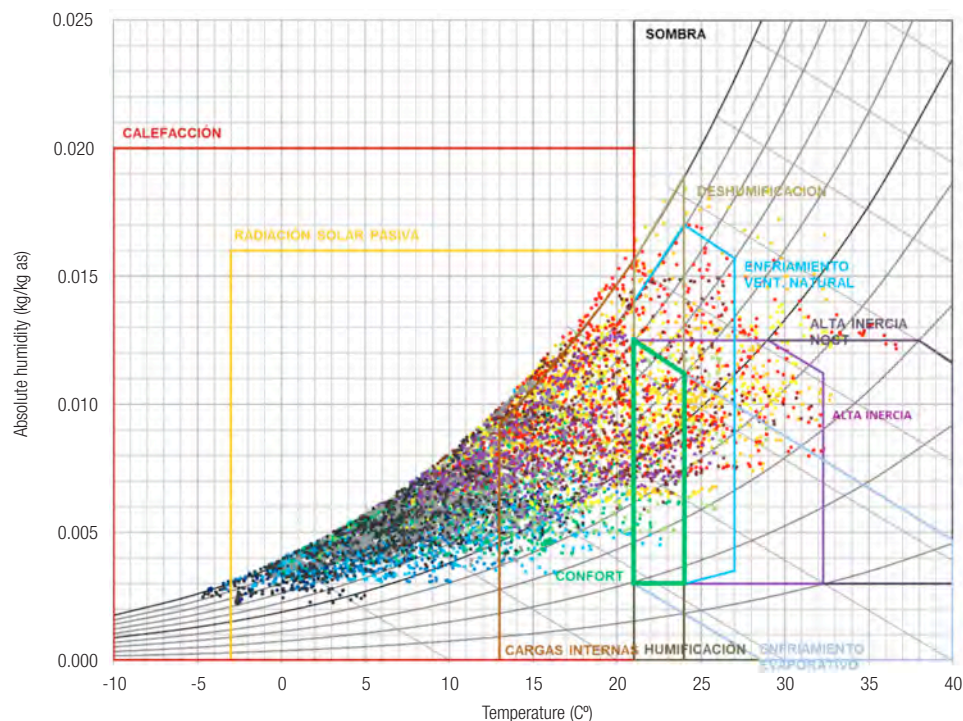
There are, nevertheless, other times during the year when there is a need for shade, using effective natural ventilation and thermal inertia for reducing the discomfort caused by the heat.

The climate file is essential for rolling out energy-saving strategies, and will be used for this project's parametric analysis. However, it cannot be used for calibrating the virtual model, as it does not feature the same outdoor conditions as those the real building has been exposed to during the monitoring period.

This requires **producing a bespoke climate file**, based on the climate information compiled during the data-gathering process.

Euskalmet uses Open Data Euskadi to publish part of the climate information required for creating a climate file. This means that the model's calibration will combine these data with those available in the Meteonorm climate file, generating a bespoke climate file.

Givoni Diagram



Vitoria-Gasteiz

- JAN
- FEB
- MAR
- APR
- MAY
- JUN
- JUL
- AUG
- SEP
- OCT
- NOV
- DEC
- SHADE
- HIGH INERTIA
- HIGH NOCT. INERTIA
- EVAPORATIVE COOLING
- NATURAL VENT. COOLING
- INTERNAL LOADS
- PASSIVE SOLAR RADIATION
- HEATING
- HUMIDIFICATION
- DEHUMIDIFICATION
- COMFORT

Analysis of consumptions recorded

Monitored housing

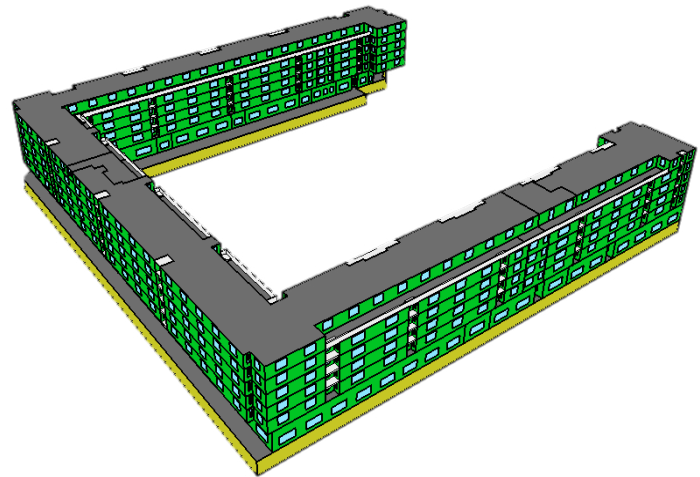
- CL RIO BAYAS 38, BJ A / 02 B A (the boiler has been replaced during the monitoring process).
- CL RIO BAYAS 38, 2 A / 02 2 A.
- CL RIO BAYAS 38, 5 B / 02 5 B.
- CL DONOSTIA 80, BJ C / 07 B C.
- CL DONOSTIA 80, 2 D / 07 2 D.
- CL DONOSTIA 80, 5 D / 06 5 D.
- CL LANDAVERDE 45, 1 A / 11 1 A.

This section will be developed in Stage 2 of the project.

Energy model

A virtual model has been created to replicate the existing building. It includes the specifications of the envelope, and opaque and hollow cladding as previously described. It also includes the linear thermal bridges calculated in preceding chapters.

Once the true monitoring data have been collected for the building, together with the climate information for the same period, the next step (Stage 2) will be to **calibrate the model in the simulation software** to ensure that the virtual building performs as closely as possible to the existing building.



Virtual model of the building Ibaiondo 228 in Design Builder software.

The virtual model is calibrated according to the data on energy consumption and the indoor conditions in the housing units recorded in 2019-2020.

This model is then applied the heating conditions and timetables recorded during the data-gathering period, and a check is made to ensure that the thermal fluctuations within each home between the virtual model and the existing building are similar.

This section will be developed in Stage 2 of the project.

Analysis of comfort and energy consumption in the virtual model

The calibrated model will be used to analyse the comfort ranges recorded in the housing units under study. Based on these data, the minimum target comfort ranges for the units will be determined, and with them the minimum refurbishment strategies to be applied.

This section will be developed in Stage 2 of the project.

Cost-effective refurbishment solutions

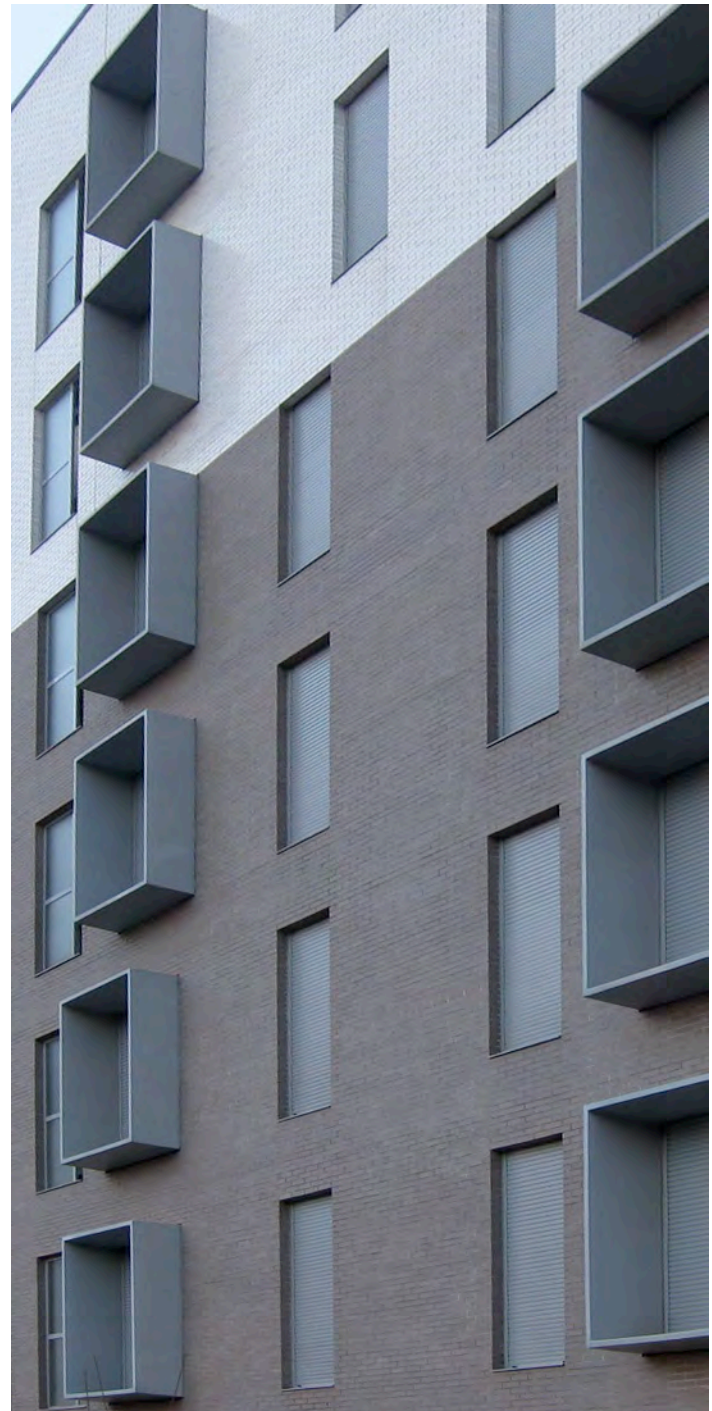
The calibrated model will be used to study different energy refurbishment strategies in order to decide upon those that lead to cost-effective NZEB parameters.

The different variables are to be analysed (as agreed with technical staff at ALOKABIDE):

- A. U roofing values (from 3 to 4 values).
- B. U structural values (from 3 to 4 values).
- C. U façade values (from 3 to 4 values).
- D. U windows values (from 3 to 4 values).
- E. Values of windows' solar factor (from 3 to 4 values).
- F. Level of seepages (2 values).
- G. Installation of a heat recovery system (2 values).
- H. Percentage of window space in the wall (from 3 to 4 values).
- I. Orientations (from 1 to 2 values).

For each one of the variables, ALOKABIDE will provide an estimated cost based on Basque Government data, and the cross-referencing of energy results and expenditure will inform the 30-year cost-effective strategies.

This section will be developed in Stage 2 of the project.



Renewables and self-consumption

As regards the analysis of renewable energy installations (VOLUME I), the planned measures have been included in the discussion on the definition of measures in the preceding point, considering an overall view of energy refurbishment with NZEB objectives and strategic pillar 1.

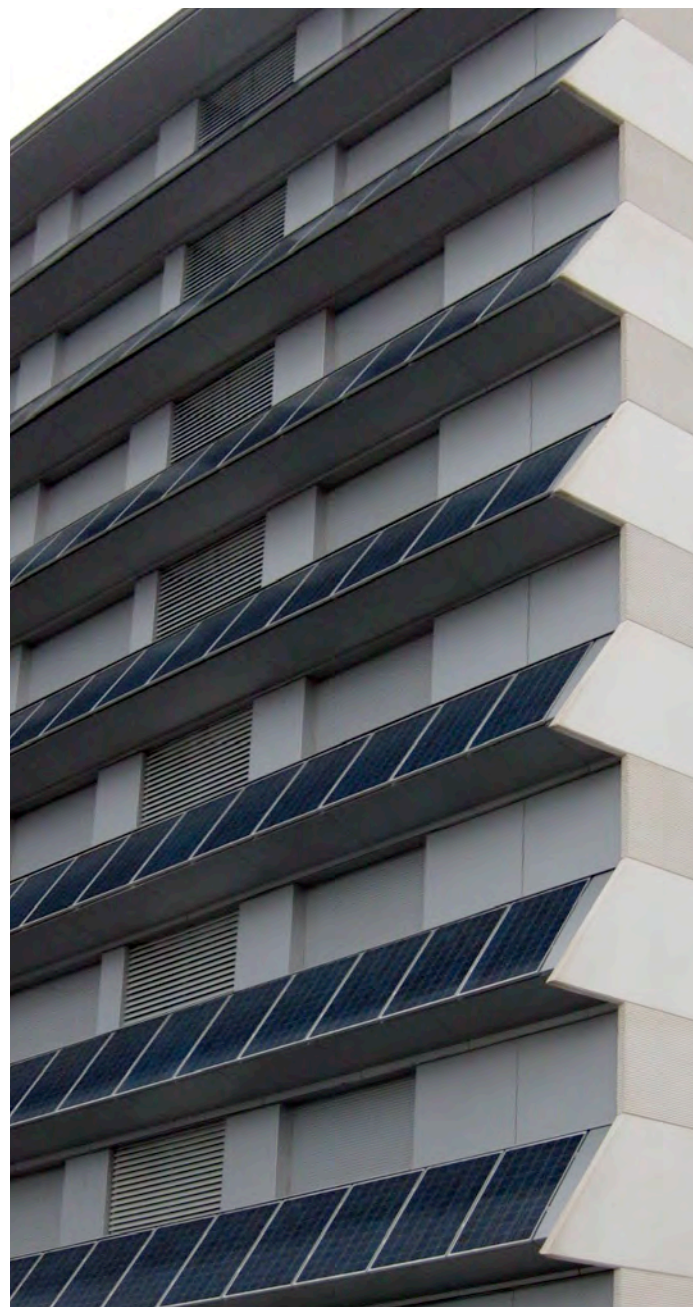
The plan includes measures for enhancing and adapting existing solar thermal systems, as well as implementing communal and individual aerothermal systems, together with the introduction of photovoltaic systems in those buildings with the necessary surface areas.

The ambitious approach the Plan ZERO Plana has adopted to bring the Basque Country's public rental housing pool closer to the target of ZERO CO₂ has given rise to the premise "generate what you consume", and therefore explore innovative ways of lowering costs for tenants and **reducing CO₂ emissions to zero.**

Of particular importance, therefore, is the **inclusion of photovoltaic technologies** in the definition of the Plan ZERO Plana, as a pivotal axis for the project's innovation applied to public service.

We therefore understand that there are two primary approaches for integrating photovoltaic generation into the public rental pool in Euskadi-The Basque Country:

- The classic one, which involves **generating at facilities near to consumption points and associated with them**, as provided for in Royal Decree 244/2019 on the regulation of the administrative, technical and economic conditions for the self-consumption of electricity.
- The alternative one, which involves the **installation of a large self-generation infrastructure that supplies all the housing blocks in the pool**, providing more renewable electricity, reducing the environmental impact, lowering costs and providing greater technical safety.



Photovoltaic panels on an ALOKABIDE building (Neighbourhood of Salburua)

The first of these self-consumption models presents a scenario that provides greater savings for consumers based on the system's advantages, savings on transportation costs, and lower taxes incurred by generation tariffs, which are subject to considerable regulatory risk.

The systemic advantages are based on a very recent Decree, subject to the regulatory toing-and froing of a legislative model that is constantly changing and provides no assurance of continuity. This is very important when we consider that the amortisation period for a photovoltaic installation is very long. This means that considerable stability is required over time to make one financially viable, so these systems do not sit comfortably with models that may undergo changes in legislation. Spain's record in this field is all too well-known.

Furthermore, this model involves installations in unsuitable and problematic locations when we plan for their use over periods of 20/25 years, roofs that normally have features, skylights, and which in the medium-to-long terms require attention or refurbishment needs that have not currently been foreseen, and which may affect the performance of photovoltaic plants.

Photovoltaic installations adapt badly to changes. They therefore tend to be small facilities, expensive to maintain (simply because of their size), and do not receive the necessary level of attention, which in the long term leads to production issues, neglect, and even abandon.

The second of the self-consumption models arises from an innovative premise and from a perspective of public service that is understood to provide a more efficient response to the challenge of using photovoltaic energy in these settings.

If we consider the generation of renewables in factory terms, the first issue to be resolved is the efficiency of their generating.

The bigger a photovoltaic installation, the more efficient it is, and the better its location, in terms of sunlight, temperature,

stability, the absence of external factors, and the distance to the removal point. In other words, **an efficient photovoltaic installation is one that is located in the right place,** and does not involve the use of the space available in a setting with numerous issues.

From a technical perspective, the right location means a greater output (because the setting is more appropriate, with a better orientation, and more sunlight in many cases, etc.), a lower cost (because of its greater size), more stability (no issues), and a better performance.

From an economic perspective, it is important to know whether the plant's economy can be compensated by the model of self-consumption analysed earlier, as the distances regarding the delivery points will be more than 500 metres, and there will not be any others incurred by tolls, taxes, or offsetting.

Our initial estimation is that a Housing Association's involvement in a large installation provides a competitive and stable energy price, ensures its certainty, and overturns any savings involved in an inefficient or low-power installation.

If the aim is the mass deployment of generating facilities for the entire housing stock, **this economic step-up is clearly viable,** with the added benefit that this will increase renewable energy's share in the mix, as there will not be any limitations to generation linked to the space available on the buildings.

The second issue to be resolved **involves organising a development plan that enables all the tenants and owners in a block to undertake such a large project.**

It should be noted accordingly that there have already been positive experiences in Euskadi-The Basque Country involving the development and operation of similar schemes, such as, for example, the Ekian photovoltaic plant in AraSur, which could be used for an in-depth study of the case of the public rental housing pool.

Contemplating the development of a large photovoltaic plan involving each housing association as the owner of part of the facility, with efficient joint management, would **guarantee a competitive price**, avoid many of the regulatory risks described in the self-consumption model, ensure better management, a higher and more sustained output of renewable energy, improve the environmental results sought and, if well managed, prompt exactly the same feeling of engagement and proximity as a small installation mounted on the building's own roof.

Moreover, in terms of risk, **it largely reduces its impacts**, as it has no effect on existing buildings, no potential wear and tear on infrastructures, no spatial limitations, no issues in terms of connection, access...

Exploring this option requires an analysis that goes beyond the scope of this report, but it would **guarantee a mass implementation**, potentially applicable to the whole of the housing pool, and even more importantly, it could be extended to those occupants living in the housing pool that opt for a project involving the sale of energy involving the generation of their own photovoltaic plant.

The difficulties associated with this model stem from the complexity of the legal structure, the need for an operator/retailer/agent that will take charge of the energy transaction from infrastructure to consumer, the model's manager, for arranging its building and long-term maintenance, guaranteeing its performance and resolving any issues; aspects which are also considered in the section "energy management".

The budgeting for the implementation of photovoltaic systems according to the preceding considerations proceeds as follows:

For the case of **installations mounted on the buildings themselves for self-consumption**, we find that not all the buildings considered in the Plan ZERO Plana would be able to introduce photovoltaic systems designed for self-consumption, as revealed by the analysis of the public rental housing pool regarding the possibility of mounting renewable energy systems on roofs.

Calle Sierra de Urbasa, 10, 01010 Vitoria-Gasteiz, Araba, España

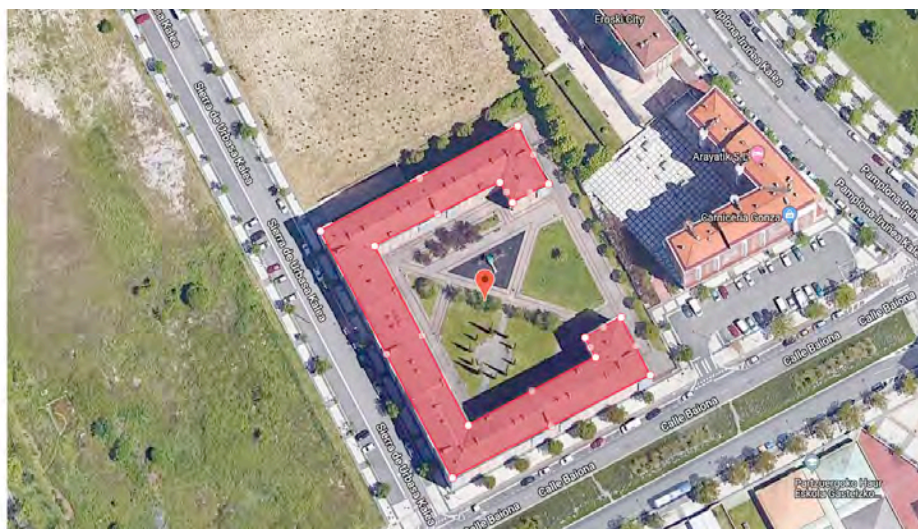
1. Dibuja zona 2. Hábitos de consumo

Dibuja tu tejado en el mapa
Marca punto a punto toda la superficie de tu tejado

O si lo prefieres, dinos la superficie en m²

Superficie **2372 m²**

VOLVER A DIBUJAR CONTINUAR





AraSur photovoltaic generation plant (Álava)

Out of the 136 buildings, the vast majority of them, 123, could be equipped with these systems to a greater or lesser extent. Nevertheless, these capacities would be limited in many cases. We therefore consider three scenarios: buildings where it is not feasible to mount photovoltaic systems, as there is not enough space on the roof; buildings with limited capacity, and those buildings with sufficient capacity.

Based on the sales ratios provided by companies in the sector, for outputs of 4 kWp, the costs of installing the system would be around €9,000 per housing unit (in the most favourable case).

The estimation of the costs of installing photovoltaic systems on the buildings themselves has therefore been considered in the technical solutions described in the point “Technical solutions for the energy refurbishment per household”, within the overall vision of PILLAR 1.

As regards the second model of self-consumption, involving **generation plants or energy farms located nearby in the province for supplying the different communities of users**, the economic analysis of their implementation is beyond the scope of this refurbishment plan, and in any case will be studied in future strategic reflection reports

Maintenance

The action plans, which will correspond to an analysis of the state of repair and issues affecting the public rental housing pool (VOLUME I), have been incorporated into the energy refurbishment measures, considering the overall view of the NZEB goals, thereby responding to the problems detected mainly on façades and roofs.

6.5. CHALLENGE 2: solutions for the health and wellbeing of tenants

Accessibility

According to the ANALYSIS of the existing housing stock undertaken within the scope of universal accessibility (VOLUME I), the Plan ZERO Plana proposes **a series of measures** in terms of both the buildings' architectural obstacles and the public service provided for their occupants.

As regards the existing housing stock, the aim is to respond to the different scenarios described in the analysis, on three specific levels:

- **Accessibility of entrances:** the plan is for extensive measures to be taken in the entrances to buildings to ensure uniform accessibility conditions throughout the public housing stock, regardless of location and age.

*These measures will focus above all on **access fixtures and furnishings** -involving the opening of doors and guaranteeing a minimum transit width- as well as **the entrance flooring** -for the purpose of avoiding falls due to the slippery finish present in most cases. More specifically, measures are also to be taken to resolve **any steps in the area around the entrances**, removing stairs, improving ramps or installing handrails.*

- **Vertical accessibility (lift):** the plan is to install lifts in those buildings without one; although it is true to say that this is not a major concern, as the vast majority of the public rental housing pool already have one; in some cases, such an installation is not possible, and the measures need to be of a pre-emptive nature at the tender stage. Nonetheless, the budgetary impact of the cases requiring the installation of a lift is significant and needs to be taken into account.

Buildings without a lift are the exception in the stock, with each case being explained by the technical difficulty involved or the disproportionate expense. The plan in most cases is to dismiss the installation of lifts, recommending instead management solutions that involve moving the affected person to another building. Elsewhere, the plan is to replace very small cabins where technical progress makes it possible to use the same shaft to install a bigger one. Furthermore, attention will be focused on the fairly large number of lifts that are too narrow, proposing measures for adapting the doors on the cabin and on each floor. Finally, a series of measures are proposed for adapting the inside of the cabins (button panels, mirrors, handrails, etc.).

- **Sensorial accessibility (identification, orientation and communication):** this is one of the areas where the analysis has detected the most needs, as there **is no uniformity or definitive criteria** for the signage on public rental housing.

*The plan is to undertake mass campaigns in order to **provide the buildings in the pool with a basic array of uniform sensorial accessibility conditions**, thereby facilitating identification, orientation and communication in those environments deemed to be of greatest importance. On the one hand, the plan is **to use sensors and automate the lighting fixtures** in communal areas; this measure, together with the replacement of existing fittings with energy-saving ones, also contributes to the general objective of the Plan ZERO Plana. On the other hand, the **aim is also to replace the intercom panels outside the entrance**, adapting them to the conditions required by current legislation in matters of accessibility, as well as the button panels in lift cabins, which may pose a challenge for manufacturers in the sector. Moreover, and in relation to signage, rather than the blanket signage of all the elements, the aim is to focus on those amenities and accesses that occupants or visitors interact with. Finally, the plan is to replace the doorbells on each housing unit.*

Within the scope of the public service's management, ALOKABIDE does not have any data or information on the functional diversity of its tenants that enable setting specific improvement strategies tailored to reality in terms of both customer service (face-to-face appointments in offices, phone hotline, personal presence in homes to attend to utilities and technical services, etc.), and the assignment of housing and other related services.

In response to this need, the aim is to arrange a WIDESPREAD CAMPAIGN FOR CLASSIFYING TENANTS in matters of functional diversity **to shed light on the profiles of the occupants of the public rental housing pool**, as well as to analyse the suitability of the homes in each case. These analyses will need to be accompanied by **a diagnosis of the accessibility of the urban area around the building**, as this information may have an influence on decision-making.

This is a widespread campaign that will take in all the housing managed by ALOKABIDE, with a view to improving the service and providing the appropriate data-management tools required for analysis, establishing strategies, and introducing measures.

The budget under this item amounts to

€ 7,457,075.00

and appears in section
**6.7. BUDGET FOR THE PLAN
ZERO PLANA.**

Impact:

**8,065 homes
(136 buildings)**

Comfort and Health

The perception of comfort is subjective, varying according to age, gender and even provenance. The norms in matters of comfort are based on statistical data, and the ranges are defined by the percentages of people satisfied or dissatisfied.

Within the framework of the Plan ZERO Plana, and following the studies made of the energy use profile in the public stock, a potentially innovative measure could involve the establishment of a **minimal level of comfort to be guaranteed by the public rental service, thereby democratizing the service** and avoiding the “special” treatment afforded to groups already identified as vulnerable in their use of energy.

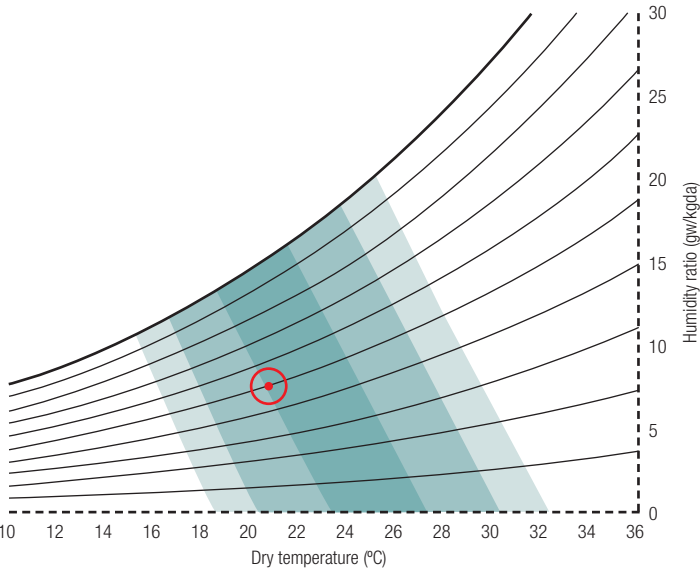
We have established a minimum threshold of comfort by reviewing current legislation on the matter and verifying it with the actual experience of the various projects undertaken.

There is currently no specific legislation on the minimum indoor parameters for homes. Spain’s Regulation on Thermal Installations in Buildings (RITE) and Royal Decree 1826/2009, solely specify that **“the air temperature inside heated premises should not exceed 21°C**, when using traditional energy sources for the heating system.” This is applicable to administrative and commercial premises, and public buildings in general.

The most common yardstick for comfort in Europe is the EN-15251 standard, which uses the comfort values stated in PMV and PPD created by P.O. Fanger, analysing comfort values ranging from -3 (cold) to +3 (hot). A Predicted Mean Vote (PMV) of 0.00 means thermal neutrality in terms of comfort, and the recommended comfort zone is set between $-0.5 < PMV < +0.5$.

In addition to this parameter, **Fanger established the Predicted Percentage Dissatisfied (PPD)**, based on empirical studies conducted under analysis conditions. with comfort ranging from values of 15% and 5% of dissatisfied people.

EN-15251 Comfort Diagram



The following table shows the minimum hygrothermal conditions for fulfilling the standard (category III), considering the same radiant and air temperature, an air speed of 0.1 m/s, an activity coefficient of 1.2 MET (sedentary activity) and wearing indoor winter clothing of 1 CLO (long trousers + vest + long-sleeved shirt+ jumper with sleeves). This shows that comfort ranges cannot be achieved with a temperature of less than 18 °C.

Comfort category - III (lower limit). Minimum to comply with EN-15251 (1,2 MET / 1 CLO)				
Humidity (%)	40	50	60	70
Temperature (°C) *	18.6	18.3	18.1	17.9
PMV	-0.68	-0.70	-0.70	-0.69
PPD (%)	15	15	15	15

During the night-time, when it is assumed that occupants are in bed, activity falls to 0.7 MET, but insulation may increase to 3.4 CLOs (bedwear + bedding). The standard does not, however, consider CLOs higher than 2. The temperature could fall to 16°C provided the bedding provides good insulation.

Comfort category - III (lower limit). Not considered in EN-15251 (0.7 MET / 3.4 CLO)				
Humidity (%)	40	50	60	70
Temperature (°C) *	16.6	16.2	15.9	15.5
PMV	-0.69	-0.70	-0.69	-0.70
PPD (%)	15	15	15	15

For reference purposes, the table below shows the temperature required for reaching the lower range in Comfort Zone-I (category of maximum comfort), which stands at around 21°C.

Comfort category -I EN-15251 (1.2 MET / 1 CLO)				
Humidity (%)	40	50	60	70
Temperature (°C) *	20.9	20.7	20.4	20.2
PMV	-0.20	-0.19	-0.20	-0.19
PPD (%)	6	6	6	6

To conclude, in the case of the public rental housing pool, the minimum theoretical comfort to be guaranteed is as follows:

- **From midnight to 6 am, a temperature of 17°C.**
- **From 6 am to midnight a temperature of 20°C.**

This means an average temperature of 19.25°C. This parameter will be used for comparing different types of housing, with or without a system of Energy Self-Management (AUGE).

As regards the **humidity parameter**, this project does not set any minimums to be guaranteed. This is a parameter that will be analysed in step with other projects scheduled for 2020 onwards, and the results forthcoming from the various refurbishments considered in the Plan.

The measures proposed within this ambit are circumscribed to the integral management approach to public rental, which is outlined under point 7 in this document, as well as to the energy support campaign for empowering occupants in the responsible use of energy. On a corrective level, the planned measures are described in the next point.

Vulnerability and energy poverty

In line with the Director Plan for Housing 2018-2020, ALOKABIDE is working on the **identification of situations of energy poverty and accessibility issues** in its pool of subsidised rental housing. The Director Plan is to further this approach because both the situation of energy poverty and issues with accessibility have increased in recent years.

When it was discovered that households renting properties managed by ALOKABIDE were in a situation of energy poverty, a novel proposal was drawn up in 2017 for **Addressing Situations of Energy Poverty** that included its own particular definition of the concept of Risk of Energy Poverty and the search for supportive measures in terms of guaranteeing comfort instead of simply providing benefits or subsidies.

Although it is true to say that the proposal is a pilot scheme, the results, within the framework of the Plan ZERO Plana, have helped to design the best possible strategy for attending to these situations of energy vulnerability.

The project involves public rental housing blocks with communal hot water and heating installations. They have been backed up by an energy self-management system referred to as **AUGE (AutoGestión Energética)**, consisting of, amongst other things, temperature and humidity sensors in homes, tablets or mobile apps, payment gateways, actuators on stop/valves, call centre, WiFi connections, etc.

This means that **the heating system can be remotely controlled and self-managed** by the occupants themselves, who may read their consumptions in real time. The system also enables ALOKABIDE to guarantee, in those cases identified as involving energy vulnerability, a minimum level of comfort by remotely operating the valves in a home.

A) IDENTIFYING HOUSEHOLDS AT RISK OF ENERGY POVERTY

The project's sternest challenge is the objective identification of people facing financial difficulties for paying the energy bills during the winter.

An assessment of the numerous indicators that could be reflecting these difficulties reveals that many of them stem from the procedures being followed by the companies managing the AUGÉ system with tenants. ALOKABIDE has the advantage that this highly individualised service means that these companies have very valuable information with a view to detecting who is in a vulnerable situation.

After inputting verification data for modelling and validating this initially open and readily accessible data, the energy utilities of all the developments send the social department at ALOKABIDE a list of people according to the following premises:

- Below-average consumptions of hot water and heating.
- Few top-ups (payments for receiving the utility) or small top-up amounts.
- No attempt to receive this service.
- Constant rejection of direct debits by banks.
- Occupants that directly ask for help.

In a first step, the companies submit a list of households that are then carefully scrutinised to identify those that are going to benefit from a care service for situations of energy poverty, based on the following:

- Number of people in the household.
- Date of arrangement and expiry of the rental agreement.

- Amount of the rent.
- If there are any non-payments and, if so, their amount.
- If they have any temporary rent adjustments or payment agreements.
- If there is or has been any social intervention.
- If they received any benefits the previous year (priority is given to those that are not repeating the programme).
- Any kind of issues during the life of their contract.

B) CARE CRITERIA

A major consideration in the project involves laying down specific criteria and parameters for defining the support services that will be provided for the families identified. These criteria are as follows:

- The period of subsidised supply will begin on 1 December and end on 28 February (the coldest months).
- The guaranteed level of comfort is 20°C during the day and 17°C minimum at any time.
- Furthermore, the supply of hot water will be guaranteed during that period.
- **ALOKABIDE will assume the debts incurred by hot water and heating prior to the launch of the project** (1 December), and no demand for payment will therefore be made to those households, so when the period ends (28 February) they will be able to start paying for the service without the burden of any back-payments.
- The pilot scheme is being launched with a limited annual budget.



The project involves the drafting of a **communication and information plan for tenants identified as being at risk of energy poverty**, which will unfold as follows:

- **Initial contact phone calls** made by the social department according to the following script: We are calling you from ALOKABIDE to give you important information about your heating costs. We have analysed your financial circumstances and your household heating charges and have concluded that you may be finding it difficult to afford heating during the coldest months this winter. We should therefore like to inform you that you are entitled to receive support to alleviate this situation.
- **Information on the situation** in which they find themselves throughout the subsidised period via the tablet installed inside the home, as part of the AUGE system.

This assistance we are going to provide means that during the coming months of December, January and February, ALOKABIDE is going to guarantee you a minimum level of heating in your home without you having to make a payment to top up the system.

We are aware that you have other payments outstanding (especially rent) so you are kindly requested to clear these debts as soon as possible. If you are in any doubt on this matter, please contact us.

- **Letters for those people that cannot be located** and would therefore be excluded from the project.
- **Drafting of a general letter of intent**, with information for those people selected, and with an explanation for those that have not and request an explanation.

Within the numerous projects it organises, ALOKABIDE, is providing energy support for those households that need it because they are going through hard times.

If you have not received a formal letter from ALOKABIDE, we regret to inform you that you have not qualified for this programme.

Now that three years have elapsed since the launch of this programme, we can report the following conclusions:

- The households that benefited from the project numbered 35 in 2017-18, 44 in 2018-19, and 63 in 2018-19.
- The feedback calls made reported that everyone was satisfied with the system and expressed their thanks.
- The system has not caused them any problems, and any issues have been resolved quickly.
- In the case of low-income households, they have been very grateful for the help, and when there were payments outstanding, they have managed to clear them.
- The figures for hot water use have been the same as other years in all the homes except for one.
- The data-gathering process has been fairly straightforward because of the friendly approach adopted by the AUGE management companies. In the future, given the project's foreseeable extension to many more homes, at least those in developments with communal central heating, there will be a need to rethink the process to automate it with the indicators available.
- Steady increase in the budget, as from one year to the next there are going to be more buildings and homes with the AUGE system installed, and more people in energy poverty that may benefit from the project.
- The average monthly amount destined to guarantee comfort and hot water amounts to €78 for each home.

Regarding the approach to the widespread implementation of a support service for situations of energy poverty in ALOKABIDE, the following steps are to be taken within the scope of the Plan ZERO Plana:

- **Installation of the AUGE system**, at least in all the buildings with communal amenities, which will allow addressing the strategy piloted within a broad spectrum of the buildings under management.
- **Finetuning the processes for identifying situations of risk of energy poverty**, ensuring they are as automatic as possible, as the number of evaluations is expected to increase substantially.

As for budgeting in this matter, and given that we still do not have specific indicators for situations of energy poverty in the public rental housing pool in Euskadi-The Basque Country, we are relying on the reports “Pobreza energética en España” [Energy Poverty in Spain], issued by the Association of Environmental Sciences [Asociación de Ciencias Ambientales -ACA], as well as by those drafted by the Observatory for Energy Poverty [Observatorio de Pobreza Energética] in Gipuzkoa, according to which 9% of people are unable to keep their homes at a suitable temperature.

By transferring these percentages to the buildings targeted here for the installation of the AUGE system, the costs of dealing with situations of energy poverty can be estimated. Furthermore, these figures can include the costs of the repayment of arrears in the cases involved.

Note: *this approach leaves some of the buildings with individual installations. They will all involve pilot schemes, which as in the case of communal systems, will allow setting up a protocol for the care of situations of energy poverty.*

The budget under this item amounts to

€ 1,506,607.20

**and appears in section
6.7. BUDGET FOR THE PLAN
ZERO PLANA.**

Impact:

5,012 homes

6.6. CHALLENGE 3: Solutions for Advanced Public Management

Energy management

In response to the results of the analysis launched in VOLUME I of this Plan, which has detected a significant lack of information among users regarding the different options for contracting energy, **a scheme has been introduced in 2019 for supporting users in the arrangement of their contracts**, as well as for identifying areas of improvement in the administration's energy management.

Generally speaking, energy management within homes in the public housing stock has been left up to tenants, who have not received enough support from the Administration in terms of **advice on the various options for** contracting utilities, the availability of subsidies, care alternatives in cases of need, etc.

The Plan ZERO Plana therefore **provides different ways of supporting tenants in the field of energy**, with the aim being to foster the energy empowerment of households.

Understanding energy empowerment to be a social contingency in which consumers, in full awareness of the economic, energy and environmental impact of their behaviour, adapt their energy habits in pursuit of the utmost efficiency. The aim of the energy empowerment of users is, in short, to achieve the highest possible comfort at the lowest cost, causing the least environmental impact.

E-Lagun project for providing energy support for households

The Plan ZERO Plana is backed by the E-Lagun project headed by AVS Euskadi, in which ALOKABIDE is a partner, for exploring ways of supporting households within the field of energy, as well as the introduction of joint energy management strategies.

The E-Lagun project's goals:

- 1. Verify and assess procedures and tools** for laying the foundations for a comprehensive energy management model.
- 2. Assessing the processes for optimising** users' consumptions, costs and performance, especially regarding electricity supplies.
- 3. Design and validate the model and method** for the subsequent development of innovative or advanced ways of managing energy consumption, and especially the use of electricity.
- 4. Reduce consumers' energy costs** in the use of electricity, help them to manage and foster their empowerment in energy matters, and lay the foundations for a knowledge source that will lead to the development of social policies and more efficient management.
- 5. Consider ways of acting in the utilities' market** on behalf of tenants in the public housing stock and new subscribers.

The project's scope involves two interconnected beneficiaries with different characteristics. On the one hand, there is the occupant/tenant of social housing, and on the other, the actual operators of social housing.

A pilot scheme has been launched in 2019 involving 2,000 homes in the public rental housing pool and 150 buildings, with the following challenges:

- Change at least 80% of the tenants to the best rate available.
- Achieve an economic saving that is twice the project's cost.
- Adapt the user habits of at least 50% of the occupants.
- Create at least five reference indicators to allow housing management operators to establish performance ratings.

Particular focus will be placed on those derivatives linked to the Law on Data Protection as regards market agents, such as energy distributors and retailers, as well as on the use of information and technology by tenants.

The E-Lagun project also seeks to **assess and propose an integral energy management model**, as well as the necessary tools and protocols for its due and proper implementation.

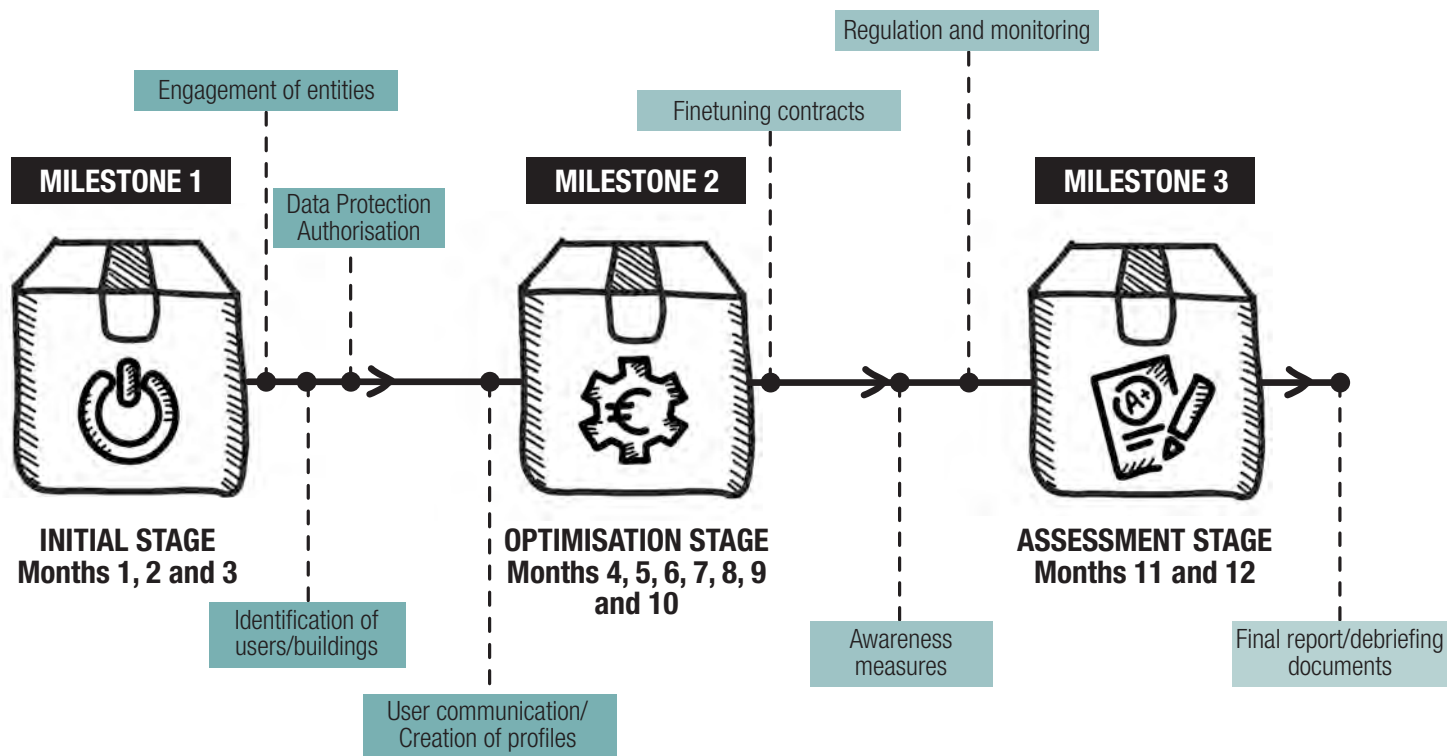
This will involve a number of technical, operational and social steps to be taken in pursuit of the set goals, with a need to innovate in both methods and forms of communication, management, engagement, and awareness.

There will likewise be a need to trial different technologies to assess a different way of overseeing consumption and behaviour and establish the parameters used to appraise possible derivatives or deviations affecting standard models of use.

The project's overriding principle is to introduce the figure of "go-between" "support" or "energy manager", whose duty it is to act on behalf of any kind of user by managing, reporting, monitoring and supervising all those aspects related to consumption, cost and behaviour, always seeking the most advantageous energy, economic and environmental performance.

Furthermore, this figure should fully manage the series of significant information on the performance of all utilities, whether these are individual or communal, and develop content, services and/or data to enable owners to take steps to reduce demand and costs and improve the housing stock's energy sustainability.

Project milestones



Milestone 1

- Definition of behaviour profile or level of energy empowerment.
- Arrangement for the entire housing stock and communal utilities by the figure of “support and representation”.

Milestone 2

- Adjustment and optimization of electricity contracts.
- Verification of consumers’ acquisition of energy knowledge and culture.

Milestone 3

- Assessment of the level of economic saving achieved through optimization, support and regulation.

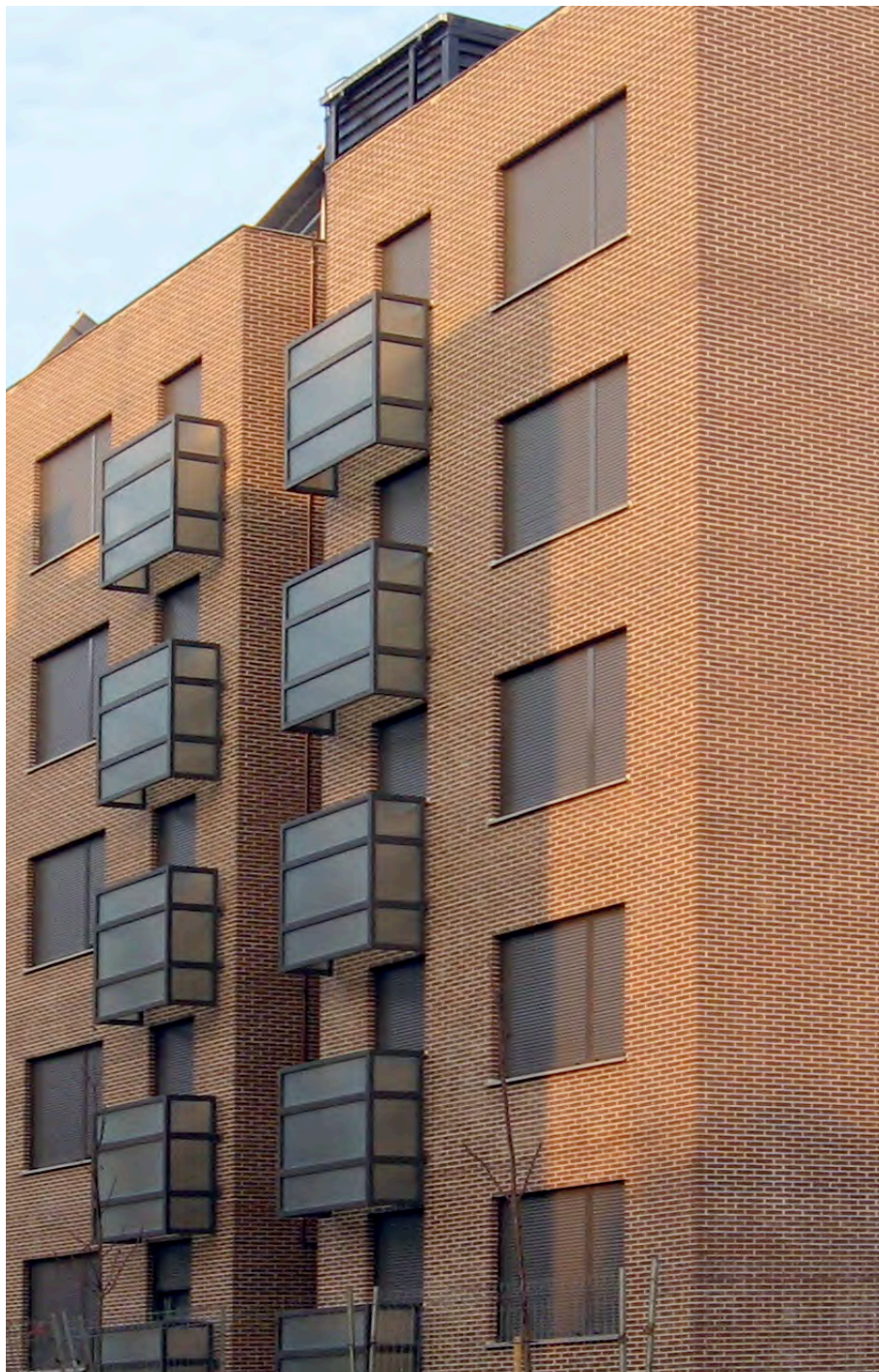
The budget under this item
amounts to

€ 30,000.00

and appears in section
**6.7. BUDGET FOR THE PLAN
ZERO PLANA.**

Impact:

1,000 homes



Tenant's handbook

ALOKABIDE currently provides its occupants with a **handbook on the use and maintenance of their home** that contains a wealth of information on maintenance and the channels of communication for reporting any kind of incident.

The Plan ZERO Plana is to extend this information in order to raise awareness and help households to make energy-related decisions in the following areas, for example:

Energy support:

- What is it?
- What's it for?
- How does it work?

Basic information on energy contracting:

- Electricity.
- Rates.
- Subsidies.
- Natural gas.
- Rates.
- Water.
- Rates.
- Communal hot water and heating systems.
- Energy watchdog platform.
- Subscribing to the AUGÉ system.
- Utilities.
- Arranging and implementing utilities.

What utilities do I need to contract for my home?

- Natural gas.
- Communal hot water and heating systems.
- Electricity.

Use of energy installations:

- General recommendations on use.
- Electricity.
- Heating.
- Hot and cold water and drains.
- Ventilation.

In addition, the tenant's handbook will include **advice on usage** to help occupants **reduce and control their energy bill**. Sundry steps will be taken to disseminate the document and help households to assimilate its content in a practical and straightforward manner.

The publication of this document will require a project for integrating tools for conflating the technical data on buildings and the recommendations on supply and maintenance with aspects on the use of energy.

The budget under this item amounts to

€ 20,000.00

and appears in section
**6.7. BUDGET FOR THE PLAN
ZERO PLANA.**

Impact:

**8,065 homes
(136 buildings)**

Digitisation

The digitisation of the public rental housing pool and the use of software tools that can cater for a public service that manages a growing stock of 14,000 housing units (both publicly and privately owned) and 238 buildings from different operational perspectives of activity is in itself a challenge of huge proportions .

The digitisation process involves the following different levels, according to their scope and speciality:

- Property management platform (CMMS) and customer care.
- Digitisation of the stock and BIM modelling.
- AUGES energy self-management systems.

Property management system and customer care

The main aim of a computerised maintenance management system (CMM) is to provide ALOKABIDE with a property management tool that caters for all its present and future needs regarding the modelling and maintenance of a public housing stock that requires the strict control of its condition, expense, safety and security.

The diversity of tools available for supporting ALOKABIDE's basic needs means that **an extra effort will be required in the design of a robust and reliable arrangement of interfaces**, ensuring the immediate availability of data wherever it is required, and avoiding the duplication that currently exists.

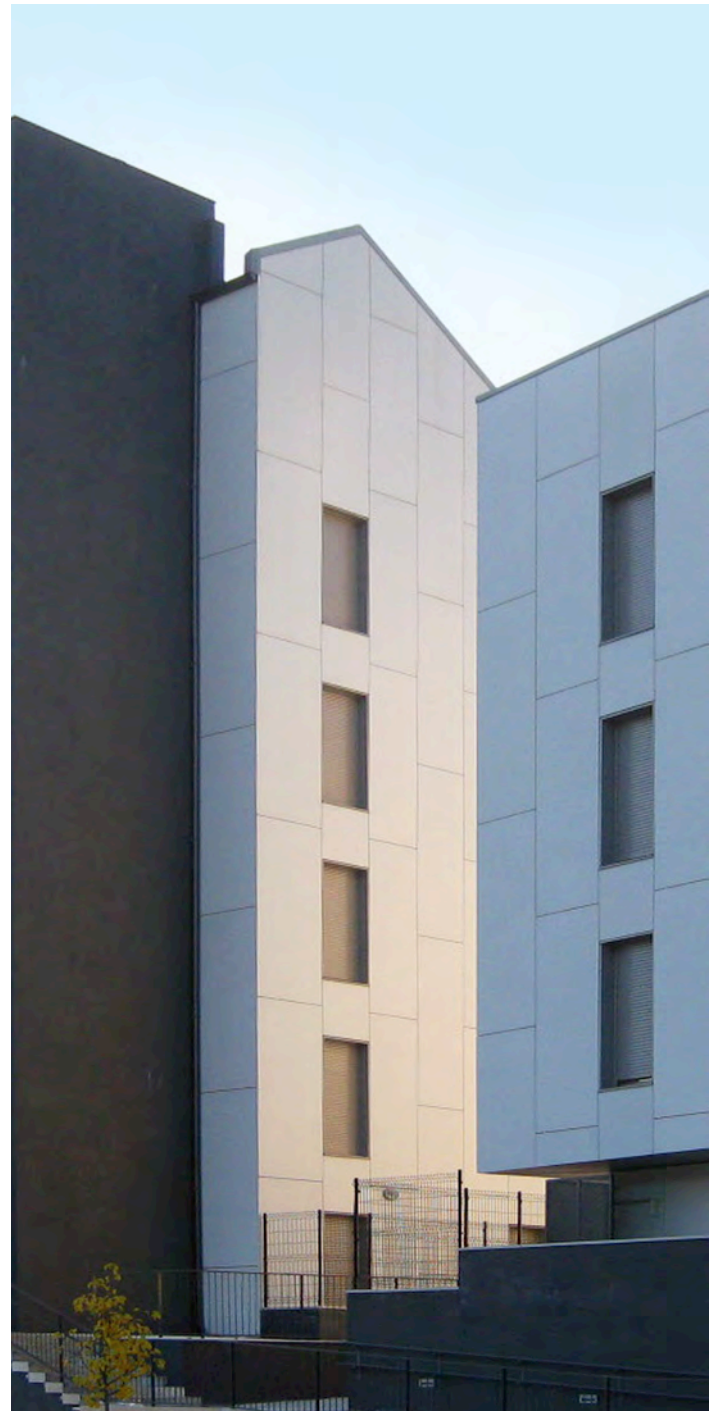
The exponential growth in the management of the public rental housing pool has not been accompanied by the updating of software management tools. Accordingly, the various different areas of the public management of rentals (contracts, treasury, technical, social or customer care) call for the provision of customised tools for the control, monitoring and management of energy in our buildings and housing units.

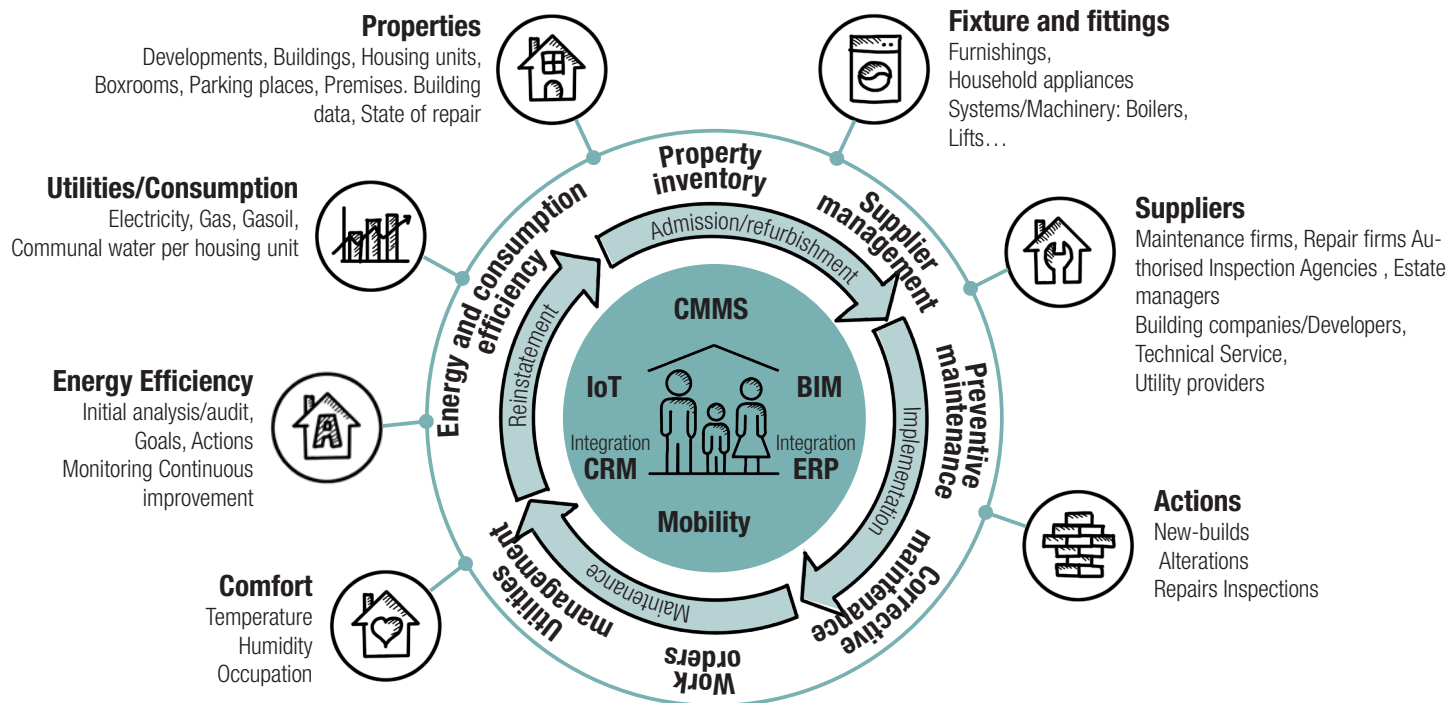
This need increases in step with the size of the stock under management and with the demands made of ALOKABIDE in terms of the monitoring and control of properties. Based on the supervision of the energy consumed by the installations in our buildings, data gathering and remote monitoring, **we can evolve in our quest for the energy efficiency of our installations.**

It is essential to encourage manufacturers, installers, and public housing tenants to make good use of technology as a way of resolving general issues. There is therefore a need for tools that permit the acquisition, analysis and control of the equipment installed in order to reduce unnecessary consumption and obtain economic benefits for our tenants and environmental ones for Basque society as a whole.

Comfort and energy saving will only be possible through the use of the Internet of Things (IoT). This technology, furthermore, may also help to **oversee and supervise the safety and security of our homes and buildings** by monitoring any movement in unoccupied housing, which will undoubtedly reduce the number of squatters and problems between neighbours arising from this growing social problem.

The priority is the need to improve energy management in all its derivatives, as well as make the best possible use of resources. It seems essential to generate “knowledge” (Data/Model) and a more effective and more mainstream model in which tenants and occupants are “supported”.





By relying on a proprietary property management tool (CMMS), the aim is to deploy a platform that caters for the following:

1. Flexibility

Open arrangement of properties in an integrated manner with the ERP, allowing for the inclusion of new properties as required, different structures of importance, and the grouping of features, the dynamic creation of new entities and characteristics, etc. In addition, the integration with BIM models and their functions for working with COBLe standards will allow for a high degree of automation of all these management processes and **make the most of the data available on a specific property.**

2. Dynamic management

This means **predicting and planning preventive maintenance measures** according to the nature of the equipment and/or their conditions of use (time, weather metrics, etc.), as well as the **management of a property's corrective/reactive maintenance**, all integrated with the ERP (report by WOs) and the CRM (customer notifications, reporting on state of incidents, etc.) without the need to resort to different tools to do so.

3. Monitoring and continuous improvement

Tools for **gathering and analysing information from different sources** (consumptions, performances, suppliers, etc.), which is used for assessment and making the right decisions for the business.

4. Mobility

Mobile tools to enable suppliers and technical services to interact remotely with the platform, thereby guaranteeing the immediate availability of information wherever it is required (checking work orders, reporting on tasks, etc.)

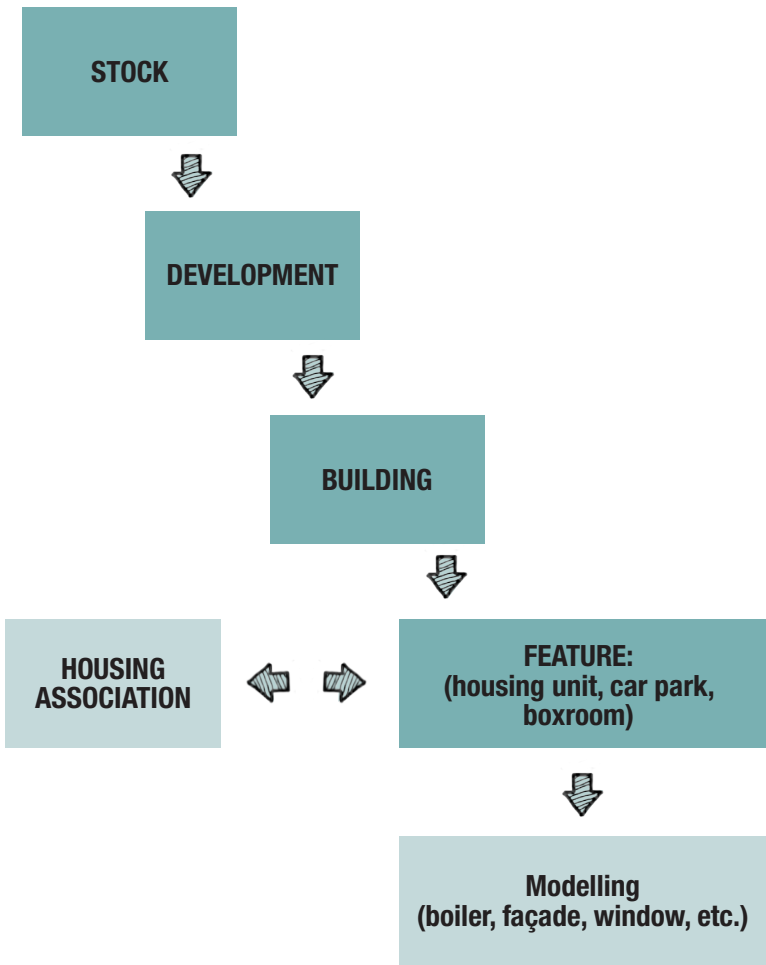
5. New interfacing capacities (IoT)

For defining new processes and ways of working, exploiting the use of new technologies: automated reading of sensors, integration of SCADA systems, interfaces with BIM models, etc.

6. Use and analysis of BIG DATA by the Technical Department at ALOKABIDE

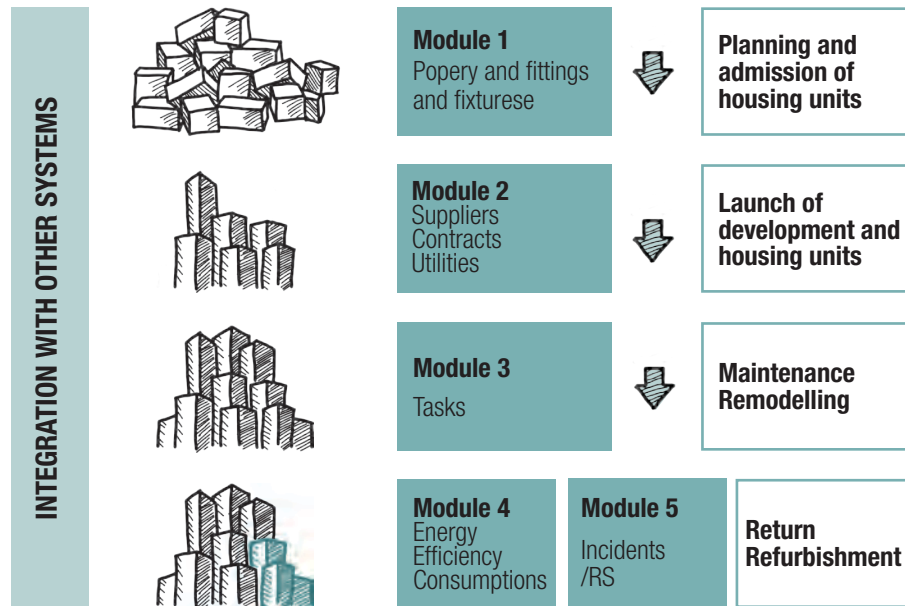
By Big Data we mean **series of data or combinations of sets of data** whose size (volume), complexity (variability) and speed of growth make them difficult to capture, manage, process or analyse using standard technologies and tools, such as relational databases and conventional statistics or display packages. Big Data are extremely useful for many companies because they provide answers for numerous questions companies did not even know they had to ask. In other words, they provide a reference point.

The new property management system should include the following:



- Existing buildings and premises.
- Developments/buildings that are still at the drawing-board stage (they are being studied and there are related documents and paperwork).
- Description of properties: detail of a property's components with all its specifications.

The selected tool should therefore cater for the following modules that **encompass the entire value chain involving the public rental housing pool**:



Function

- Definition and arrangement of properties.
- Preventive and corrective maintenance (repairs and expert advice to be recorded on the property).
- Management of work orders.
- Management of suppliers.
- Management of the buildings' energy efficiency.
- Management of consumptions and supplies.
- Website/extranet for providers and mobile tools (to be defined according to the type of provider and access to information: insurers, Estate managers, technical services, technical reports, repair and maintenance companies , etc.).
- Interfaces required with BIM, ERP, CRM, the Basque Government's Document Manager (DOKUSI), and others.
- Use of data and decision-making.

The budget under this item amounts to

€ 776,597.64 (5 years)

and appears in section
**6.7. BUDGET FOR THE PLAN
ZERO PLANA.**

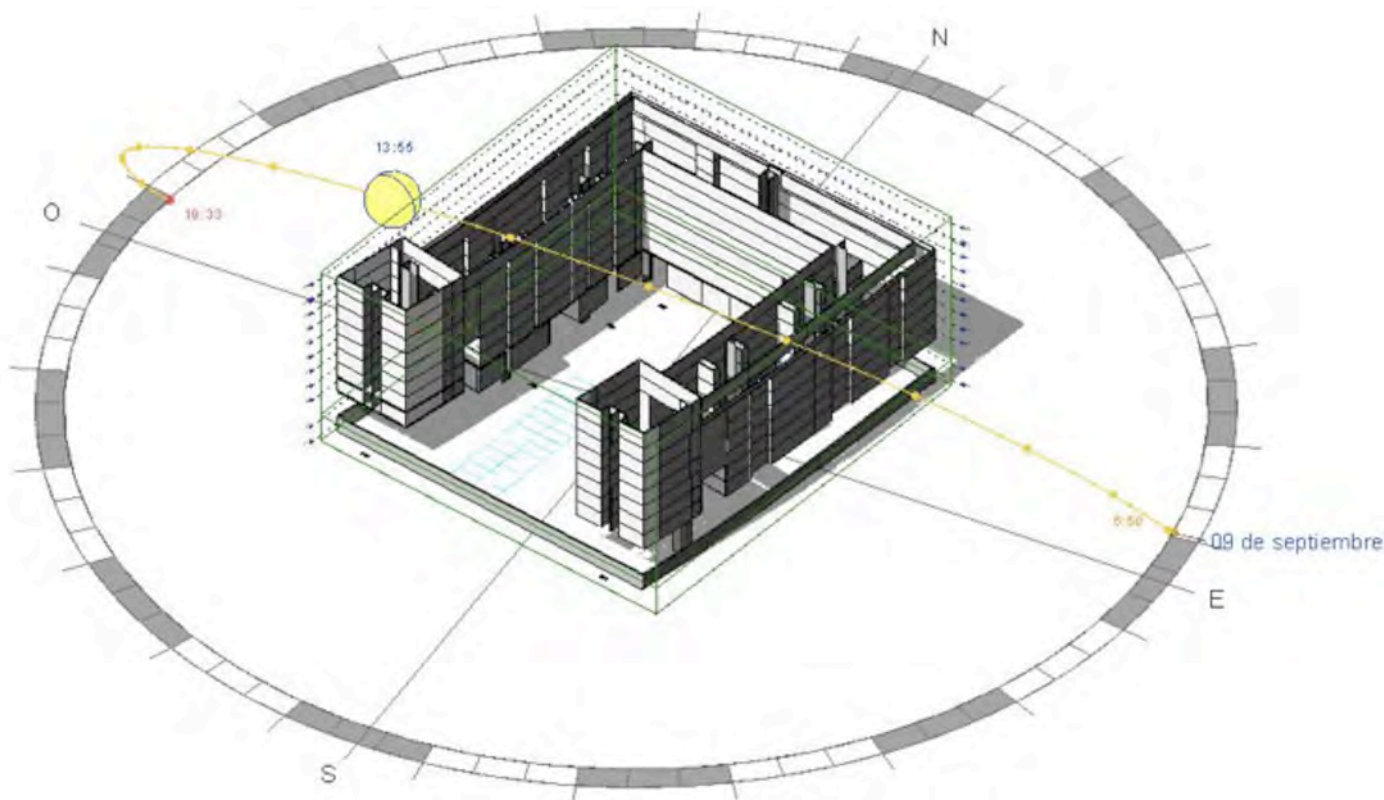
Impact:

**8,065 homes
(136 buildings)**

Digitalising the stock and BIM modelling

In step with the CMMS tool, and with a view to guaranteeing efficient property management, the plan is to **steadily digitise the housing stock through BIM models** using a collaborative working method, creating a digital model of each one of the buildings. This digital model will constitute a **vast database** for managing the fittings and fixtures that make up each building's infrastructure during its entire lifetime.

The use of BIM models in itself is not a tangible goal, but instead a means for achieving a specific objective during the stages of designing, constructing and operating a building. Advanced property management throughout the value chain, embracing **sustainability as an additional factor of competitiveness**, to optimise the current stock's value, reduce operating costs and generate sector-related knowledge, reinforcing the value chain through the coordination of information and collaboration with different agents.



Advantages:

1. **Better communication and coordination** in the rental management process.
2. **Automatic documentation and a single model of data:** availability and reliability.
3. **Two-way** engagement.
4. **Data security.** Minimising errors.
5. **Virtual reconstruction:**
 - Early detection of interferences and conflicts over the management of contingencies.
 - Improve understanding via 3D display.
6. More accurate, faster and more economical **planning and management**
7. Encompassing **all the stages in a building's lifecycle.**
8. Allowing for **modifications**, based on updated figures.

Functions:

The definitive incorporation of BIM methodology calls for steps to be taken throughout the various levels of development (or degree of maturity) in the use of technology for design, calculation, management, etc.

Level 1: introduction of practices for the management of data production, distribution and quality (standard collaboration process).

Level 2: management of BIM tools in 3D environments in the project's different disciplines and associated data.

Level 3: integration of data in web services allowing for collation and interaction. The provision of transparent details on the volume and profile of information and the level of design required is a critical aspect for the development of any BIM project. The level of development (LOD) refers to the field of design and has clear levels that are known to agents. In the case of the level of information (LOI), there are no set parameters, and each project will be the one that defines the necessary variables in each target, stage, etc.

The budget under this item amounts to

€ 559,550.00 (10 years)

and appears in section
**6.7. BUDGET FOR THE PLAN
ZERO PLANA.**

Impact:

**8,065 homes
(136 buildings)**

AUGE Energy Self-Management Systems

The implementation of the AUGE system in buildings under management with communal hot water and heating systems has been crucial in the **process of optimising public rental management** and, above all, in its **empowerment of tenants** in terms of their use of energy.

It is, in short, a technology that facilitates the allocation of the charges for individual hot water and heating costs in communal installations as a whole, providing an immediate visual and accessible display of consumption.

It uses mobile devices such as tablets or phones that reflect the balance in favour of each household, and as each one uses the hot water/heating the corresponding sum is deducted.



Background

The normal economic management of hot water and heating in our buildings involves a company collecting the data on consumption readings from the individual metres for each home, relaying them to the estate manager, who then issues the hot water and heating bills that are sent to each household.

This arrangement presents a number of problems:

- Individual distribution of consumptions.
- Paperwork, complaints and claims in daily management.
- Control and monitoring of bills.
- Non-payments that lead to treasury shortfalls in the housing association.
- Increase in default payments.

This is due mainly to the following:

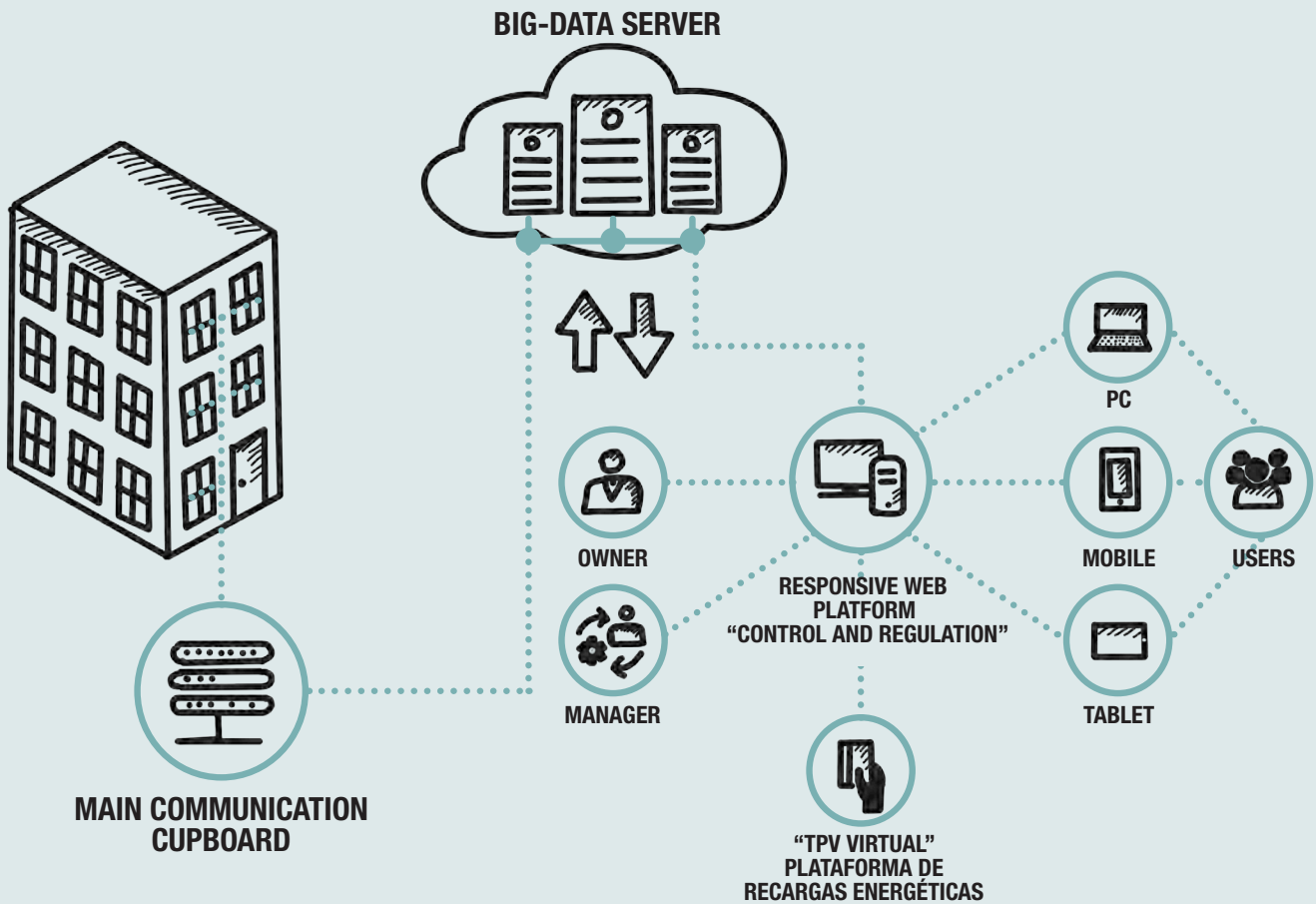
- Part of the consumption corresponds to the communal use of the installation.
- Tenants are unaware of the distribution arrangement and energy improvements.
- Scant appreciation of public resources.

The proposal therefore involves installing, programming and launching a system of energy recharging for hot water and heating.

Description

This involves operating equipment, a control and communication network, as well as individual terminals and mobile accessibility, including a central communications unit and energy self-management control systems for hot water and heating and the integration of the consumption readings from meters for thermal energy, electricity or m³.

DIAGRAM OF THE DATA NETWORK



The installation caters for the **full control of individual consumption and energy costs**, as well as for monitoring the installation's economic performance and its general operation, and it serves as a hands-on tool for users and their energy efficiency.

The control system or platform permits the automatic use of regulated utilities, provided individual balances are positive, and effectively manages the building's financial operation.

Main system characteristics

The pre-paid energy management system is designed to **fully exploit existing energy resources**, fostering energy saving and efficiency, allowing for the control of individual consumptions of the energy used on hot water and heating, and monitoring the cost of mains water supplies and electricity. The installation has the following components:

- Control system.
- Display network (screen).
- Operating network (electrovalves and solenoids).
- Supply network.
- Metring network.
- Implementation and handbook.

The main component is the web user-system interface, which is to cater for viewing at least the following data from an individual terminal, a PC or a smartphone:

- Cash balance available and supply status.
- Past record of top-ups, non-payments or deposits.
- System for ordering and managing top-ups via a bank account.
- Virtual payment platform with credit/debit card.
- Total and accumulated energy consumption (kWh).

- Accumulated consumption of hot water (m3).
- Other individual household consumption using communal installations, if present (electricity, mains water).
- Unitary rates for hot water and heating.

Advantages

Tenants can **monitor in real time the financial cost** of their use of hot water and heating. This allows them to adjust their consumer habits, adapting them to their own particular circumstances.

There are hardly any non-payments at either individual or communal level, making the system more sustainable for all stakeholders.

There is a reduction in the costs for owners, and in ALOKABIDE's case, there is an improvement in efficiency and the use of public resources.

The plan is to **gradually implement this system in existing buildings with high hot water and heating costs**, whose occupants will benefit the most from the introduction of these devices and will enable ALOKABIDE to proceed with the advanced social management of energy.

We therefore **consider a change in estate management**, separating the normal management from another one called energy management (housing blocks) with dedicated companies and using a pre-payment system.

In view of the above, the Plan ZERO Plana proposes the mass installation of AUGÉ in buildings with communal systems for optimising consumptions and empowering occupants.

CURRENT SYSTEM			DUAL SYSTEM	
MANAGEMENT BY HOUSING ASSOCIATION		OWNER	MANAGE, BY HOUSING ASSOCIATION	ENERGY MANAGEMENT
ESTATE MANAGER		MANAGER	ESTATE MANAGER	ENERGY ADMIN.
MAINTENANCE AND SERVICE COMPANIES	REPERCUSSION ON HEATING CONSUMPTIONS	MAINTENANCE	MAIN. AND SERVICE COMP.	REPERCUSSION HOT WATER/HEATING CONSUMPTIONS
READINGS, INCIDENTS, BILLS	RECEIPTS, UNIT. PRICES, UTILITIES			

The budget under this item amounts to

€ 5,900,800.00
(20 years)

and appears in section
6.7. BUDGET FOR THE PLAN
ZERO PLANA.

Impact:
3,688 homes
(57 buildings)

Impact on occupants

A vital part of the Plan ZERO Plana within the scope of the advanced management of the public rental pool involves assessing the effects of the measures adopted by end users, with the aim being to identify occupants' acceptance of the different strategies considered, as they are ultimately the service's primary focus.

This assessment is undertaken on various levels :

- **Impact of guidelines on the use of the home:** assess the impact of the instructional measures on the use of energy, heating systems and ventilation systems in the end consumption by households and in the comfort of homes.
- **Impact of the energy support measures:** assess the impact that the measures involving energy support and the arrangement of utilities (E-Lagun Project) have on the end costs for households and the comfort of homes.
- **Impact on the comfort of homes:** assess the impact that the different refurbishment measures considered within the Plan ZERO Plana have on the end consumptions of households and the comfort of homes.
- **Impact on satisfaction:** assess the impact that the sum of measures in the Plan ZERO Plana have on occupants' satisfaction.
- **Impact on health:** assess the impact that the sum of measures in the Plan ZERO Plana have on occupants' health.

Impact of guidelines on the use of the home:

within the framework of the Plan ZERO Plana, a **pilot scheme** was launched towards the end of 2019 involving one of the buildings under public rental management, with the aim being to assess the impact of the instructional measures on the use of the home in terms of the end consumptions by households and comfort in the homes. As noted above, **the growing use**

of new technologies (ventilation, heating control, etc.) in buildings has a **negative impact on end users**, unless the appropriate instructional measures are put in place.

The project's highlights are as follows:

- **Induction of new occupants**, with the usual basic information on the contract, criteria for dealing with problems, contacts with the estate manager and key maintenance providers... **without providing extra information on the building's efficiency specifications.**
- **Monitoring key buildings** for overseeing comfort and consumptions .
- **Period of grace without instructional measures** during the winter.
- **Guidelines** on the use of heating, on the one hand, and on the use of ventilation systems, on the other. The guidelines will be presented at **group workshops** held with occupants.
- **Feedback on results and key impact analysis** involving consumptions, comfort, occupants' satisfaction, and disclosure of the results to those participating.
- **Conclusions within the sphere of public rental management** and recommendations for the review of the ALOKABIDE tenant's handbook.

The costs of this scheme (instructional measures, monitoring and assessment of results) have amounted to €7,822.50. Nonetheless, measures of this kind are part of the end user's **energy empowerment** and play a vital role in the process of energy optimisation in rental management, which means they are considered **part of the refurbishment process in each one of the buildings in question.**

The costs of instructional measures and the assessment of impacts amount to

€ 721,400.00 (30 years)

and appear in section
**6.7. BUDGET FOR THE PLAN
ZERO PLANA.**

Impact:

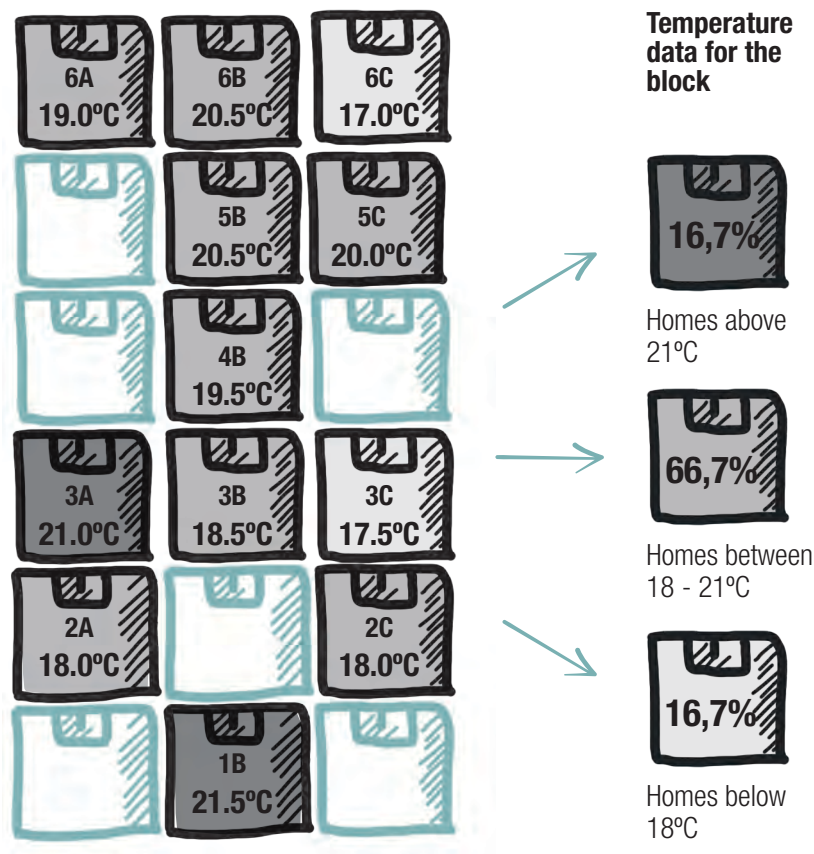
**8,065 homes
(136 buildings)**

Impact of the energy support measures: this means for assessing the impact of energy support for households is included within the scope of the E-Lagun Project described in the section on energy management.

Impact on the comfort of homes: the assessment of the impact on comfort of the measures put in place in the Plan ZERO Plana will be included in the different work projects scheduled, whereby each building to be refurbished will have a monitoring plan introduced at least one year before the actual work starts. Nonetheless VOLUME I in this Plan has **already described the monitoring of different buildings for assessing each home's user profile** and verifying the levels of indoor comfort.

Impact on satisfaction: the Plan ZERO Plana provides for the **administering of satisfaction surveys** in all the refurbished buildings one year after the work has been completed. Specifically, a series of surveys are going to be held at the end of the Plan ZERO Plana in those buildings that have finished the scheduled refurbishment process (one year later), to gain first-hand feedback on the impact it has had on the occupants.

Comfort diagram by floor in the buildings
AVDA. NACIONES UNIDAS, 47



The budget for these survey campaigns involving all the housing units in the refurbished buildings amounts to

€ 26,500.00 (30 years)

and appears in section 6.7. BUDGET FOR THE PLAN ZERO PLANA.

Impact:
8,065 homes
(136 buildings)

Impact on health: within the framework of the Plan ZERO Plana, a research line is to be launched in 2020 that focuses on **an assessment of the impact of the sum of projected measures on occupants' health.**

The Plan therefore echoes reports such as the one by Joana Ortiz and Jaume Salom "Estimación del efecto de la rehabilitación energética en la salud de las personas. Enfoque económico" [Estimation of the effect of energy refurbishment on people's health. Economic focus] issued by the Catalan energy research institute Institut de Recerca en Energía de Catalunya, which concludes:

- The relationship between health and housing is well documented, and there are numerous studies showing that **deficient living conditions cause health problems.**
- The relationship between health and energy efficiency needs to be further explored, and more studies are required to determine its effect clearly and for each one of the issues that may arise in homes, such as problems of noise, water quality, etc.

The following table provides a snapshot of the **main causes and consequences** between living conditions in the home and people's health.

HOME CAUSE	HEALTH CONSEQUENCE
Cold in winter	Higher mortality rate in winter Hypertension and other cardiovascular complaints Respiratory diseases such as asthma, chronic bronchitis and chronic pulmonary obstruction
Very hot in summer	Higher mortality rate in summer Circulatory and respiratory complaints
Damp and mould	Respiratory complaints such as irritation, allergies, infections and asthma
Indoor air quality	Respiratory and cardiovascular disorders Lung cancer
Noise	Cardiovascular illness Cognitive impairment, sleep deprivation, Tinnitus Higher mortality rate

The Plan ZERO Plana therefore seeks detailed information on the relationship between health and the public renting housing pool, and assesses the effects of energy refurbishment on its occupants; with this involving a project that is to be launched in 2020.



The costs of assessing the impact of the Plan ZERO Plana on occupants' health amount to


€ 14,900.00 (1 year)

Impact:
8,065 homes
(136 buildings)

6.7. Budget for the Plan ZERO Plana

The above measures proposed for each challenge are grouped according to the following budgetary item, providing us with an overall perspective of the Plan ZERO Plana:

<div>CHALLENGE 1: Environment Public Stock</div> <div></div>	1.1 Efficiency	Guarantee sustainable, more efficient and affordable homes through energy and accessibility refurbishment measures.	€ 175.774.767,45
	1.2 Renewable energies and self-consumption	Drive the use of renewable energies in our buildings and foster self-consumption in order to pass the economic benefits obtained onto tenants.	INCLUDED IN 1.1
	1.3 Maintenance and repair	Maximise our buildings' useful life and ensure the full availability of their installations in perfect conditions.	INCLUDED IN 1.1
	€ 175.774.767,45		
<div>CHALLENGE 2: Health and Wellbeing Occupants/Homes</div> <div></div>	2.1 Accessibility	Degree of accessibility to homes and buildings with a future outlook defined by an ageing society, with especially vulnerable groups, and stricter rules and regulations in order to guarantee people's mobility and autonomy.	€ 7.457.075,00
	2.2 Comfort	More affordable living conditions and comfort, with a smaller environmental impact. Tenants are empowered to take responsibility for their energy consumption and adapt their energy habits.	PROPOSAL IN "OUTLOOK FOR PUBLIC RENTAL MANAGEMENT"
	2.3 Energy poverty	Subsidies for those households that already have an energy management system installed in their homes and who may not be able to afford to turn on the heating during the coldest winter months.	€ 1.506.607,20
€ 8.963.682,20			

<div>CHALLENGE 3: Advanced Public Management ALOKABIDE</div> <div></div>			
	3.1 Energy support	Model of Advanced Energy Management in Social Housing in Euskadi-The Basque Country, involving a series of processes, tools, protocols and services designed to consolidate a more sustainable, effective and efficient energy performance.	€ 50.000,00
	3.2 Digitisation	Provide the Basque Government and its social rental buildings and housing units with the structures, tools and mechanisms required for introducing and developing comprehensive energy management plans.	€ 7.236.947,64
	3.3 Impact on occupants	Assessment of the effects of the measures adopted with end users for applying those improvements required for guaranteeing the best service, as well as the best energy price in rental housing.	€ 721.400,00
			€ 8.008.347,64
€ 192.746.797,20			



7. OUTLOOK FOR ADVANCED PUBLIC MANAGEMENT

The approaches informed by the Plan ZERO Plana go beyond refurbishment steps and the implementation of information technologies for improving rental management, from the perspective of the housing pool's efficiency.

As noted throughout this text, there is a need to **reflect upon structural aspects that go further than a strictly technical approach** and consider innovative measures for the management of the public rental housing pool in Euskadi-The Basque Country.

This section covers the **impact on the structure of the public rental service**, which involves a strategic change in the management model toward a comprehensive service system in which tenants pay a single amount for their rent that accounts for 30% of their income, and the buildings' maintenance and repair are overseen directly by the public manager ALOKABIDE.

The following is a description of the key points in the current management that will be affected by this new approach:

- **Maintaining the housing pool:** hands-on management by ALOKABIDE instead of farming out the maintenance of basic facilities and services as is currently the case with housing associations in each building (fee paid by each household to the housing association).
- **Guaranteed minimum comfort:** once the buildings are being remotely maintained and supervised, the option may be considered of guaranteeing a minimum level of comfort as an additional benefit of the rental service as regards the thermal efficiency of the homes and their comfort.

- **Energy management service:** setting up a SERVICE at ALOKABIDE that is in a position to respond to the energy challenges posed by the public rental pool for holistic energy management. The aim is therefore to extend the reach of the ALOKABIDE public company to also provide a service in energy.
- **Model of integral rental management:** guarantee that the rents ALOKABIDE's tenants pay are more egalitarian and under no circumstances exceed 30% of the household income, including rates and the building's fixed costs, and analyse the consequences of merging the items of rent and housing fees into a single overall payment. This means a tenant will not be burdened with two bills, with ALOKABIDE covering the housing fees at its own expense.

Pool maintenance: internalising the public service

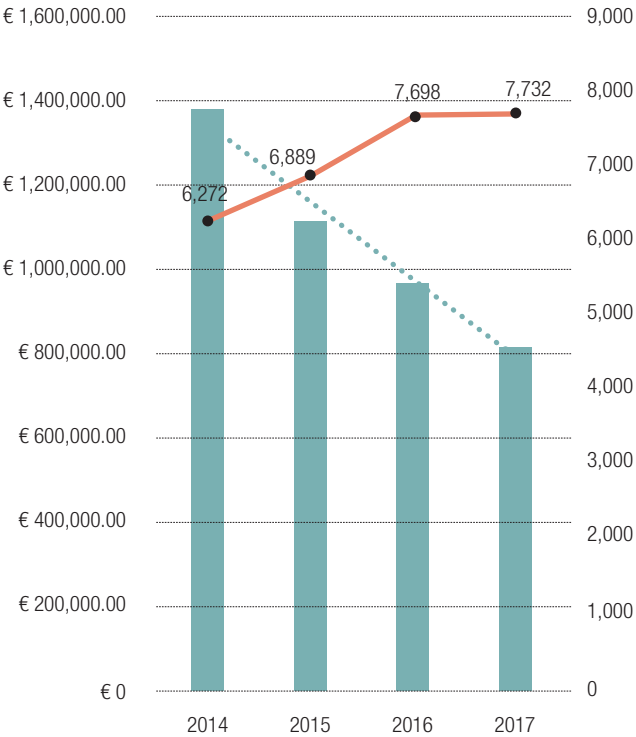
On a preventive maintenance level, the approach adopted by the Plan ZERO Plana, whereby it adapts the scope of its service so that the management model is as democratic as possible, is reflected in its **rules and regulations on the maintenance and repair of the public rental pool**.

The managed pool's widely varying nature, the diversity of types of buildings and the challenge of providing an advanced service highlight the **administration's need to oversee the pool's maintenance and repair**, with a view to democratising the service and finetuning the process for arranging the maintenance of the different amenities in each building.

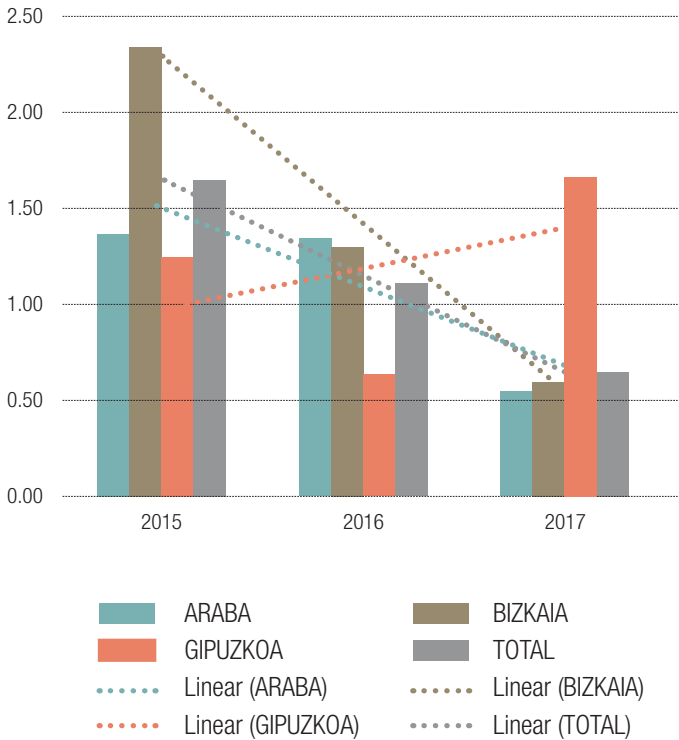
This section therefore includes an **estimation of the costs for ALOKABIDE and the impact on its operations** if it were to cover all the preventive maintenance costs involved in the public rental pool. Nevertheless, it is not part of the budget for the Plan ZERO Plana.

Preventive maintenance is designed to uphold the condition of equipment and installations through **inspection and repair process that ensure they are fit-for-purpose and reliable**. Preventive maintenance is carried out on equipment that is service, as opposed to **corrective maintenance**, which involves the repair or restoration of those that have stopped working or are damaged.

Maintenance's overriding purpose is to **avoid or mitigate the consequences of equipment failure**, with a view to **pre-empting any incidents** before they occur. Preventive maintenance should forestall such faults and indirectly provide occupants with a sense of presence and control over the buildings. Accordingly, since ALOKABIDE has taken responsibility for the preventive supervision of its buildings, for every €1 spent on prevention, €1.11 is devoted to corrective measures (i.e., the building – communal areas):



CORRECTIVE/PREVENTIVE RELATIONSHIP



Within the context of public rental management in Euskadi-The Basque Country, **the current model requires households to pay a fee to the housing association** (maintenance contracts on installations and basic communal services), together with the payment of replacements, mandatory regular inspections, and major repairs by the owner (ALOKABIDE). Within this scenario, the following table shows the breakdown of costs between owners and tenants:

OWNERS' SHARE OF ANNUAL BUDGET

PROVINCE	TOTAL	ALOKABIDE HOUSING	BASQUE GOV. HOUSING	COUNCIL HOUSING
ARABA	€ 833,620.07	€ 623,248.92	€ 210,371.15	€ 0.00
BIZKAIA	€ 768,514.91	€ 127,910.38	€ 610,118.65	€ 30,485.88
GIPUZKOA	€ 523,161.79	€ 196,574.56	€ 295,825.60	€ 30,761.63
TOTAL €	€ 2,125,296.78	€ 947,733.86	€ 1,116,315.41	€ 61,247.51

TENANTS' SHARE OF ANNUAL BUDGET

PROVINCE	TOTAL	ALOKABIDE HOUSING	BASQUE GOV. HOUSING	COUNCIL HOUSING
ARABA	€ 1,973,570.35	€ 1,570,366.00	€ 403,204.35	€ 0.00
BIZKAIA	€ 1,617,068.24	€ 301,360.00	€ 1,241,429.44	€ 74,278.80
GIPUZKOA	€ 1,342,522.26	€ 545,561.70	€ 726,670.91	€ 70,289.65
TOTAL €	€ 4,933,160.85	€ 2,417,287.70	€ 2,371,304.70	€ 144,568.45

Note: on a structural level, this change entails the creation of specific units for supervising, monitoring and managing a considerable volume of maintenance contracts that are currently the responsibility of housing associations overseen by estate managers.

The estimated cost of ALOKABIDE's decision to cover the maintenance and repairs costs of its buildings will amount to

€ 7,205,670.60
(with a 30-year horizon)

Minimum comfort guaranteed by the public service

The approach in this matter, as already mentioned above, and if adopted, would be based on the paradigm of an advanced public service, **setting out to guarantee a minimum level of comfort in all the homes regardless of their situation of energy vulnerability** (democratising the service). This is an innovative approach that requires different far-reaching structural adjustments that need to be analysed from a macro-perspective of the management model: such as changing the management model in which tenants make a single rental payment, while the public administration, in this case ALOKABIDE, is the one responsible for maintaining, repairing and operating the buildings according to certain specific habitability parameters.

With a view to the costs that ALOKABIDE will incur by guaranteeing that the housing units it manages provide a minimum level of comfort of 17°C at night and 20°C during the day, sundry projects are to be arranged in 2020 and 2021 to **analyse differences with the current system**, given this measure's importance.

Nevertheless, this measure will be applied to all the buildings with an energy self-management system (AUGE) for the remote control of their installation.

Notwithstanding the above, the macro estimation of this measure's impact will involve basic parameters on the overall consumption of buildings with this kind of design, based on the results of the software control platform already installed in the housing blocks under management.

Note: this approach means that some of the buildings retain their individual installations. Pilot schemes will be arranged for all of them, which as in the case of communal services, will allow introducing a protocol of support for situations of energy poverty.

The estimated cost of the decision to guarantee a minimum level of comfort in homes will amount to

€ 94,055,850.00
(with a 30-year horizon)

Energy management service

Faced with the energy challenges arising from the current climate scenario and the sector's variability, there is a pressing need for ALOKABIDE to introduce a SERVICE that can respond to the energy issues posed by the public rental housing pool as regards holistic energy management. In sum, it means **broadening the scope of the ALOKABIDE public company to also provide a service in the field of energy.**

This public manager therefore needs to be furnished with the tools, processes and procedures for efficiently supervising and operating the public rental pool. A further priority involves **creating a culture of energy efficiency and sustainability among tenants** in public housing to foment their energy empowerment.

Advantages

There now follows a detail and definition of the main requirements, services and fundamentals of an advanced energy management model within social housing.

There are initially two tiers of requirements, one corresponding to ALOKABIDE and the other to tenants. Both share fundamentals and goals, although their needs in services and solutions are different.

Ideal model for the public rental pool

The ideal model from ALOKABIDE's perspective would be one with the following features:

- Provision of agile, straightforward and quick procedures in the process of subscribing to and cancelling utilities.
- Availability of the necessary data for creating performance profiles and statistics.
- A sustainable energy supply.

- The cost of utilities is as economical as possible.
- Provision of advice, recommendations and alerts on unusual readings.
- Flexible payment methods.

Ideal model for tenants

The ideal model from the tenant's perspective would have the following features:

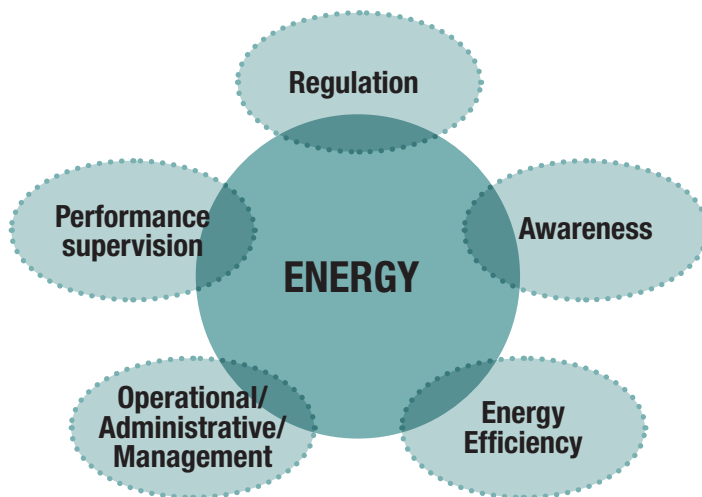
- Provide a direct support service and/or a channel for inquiring about readings, consumptions and costs.
- Provision of agile, straightforward and quick procedures in the process of subscribing to and cancelling utilities.
- A sustainable energy supply.
- The cost of utilities is as economical as possible.
- Real-time control of consumption, cost and economic impact.
- Receiving advice, recommendations and alerts on unusual readings.
- Flexible payment methods that adapt to each situation, circumstance, consumption and payment possibilities.
- The information on consumptions, costs and readings should be accessible, clear and sufficiently understood by all the occupants of the same household.

These premises will be used to develop the fundamentals, criteria and challenges that are to underpin an advanced and holistic management model.

Functions

The service's principal functions are designed to cater for the main requirements affecting both ALOKABIDE and its tenants. A range of needs that involve the integral management of the performance, consumption, cost and reduced demand for energy.

A compendium of measures that will improve today's energy-related processes and lead to the development of services, solutions and control methods involving registration, cancellation, consumption, performance, economic cost, payment method, etc.



Regulation

This involves monitoring the performance of both individual and communal supply points. These processes are to involve the creation of ratios, indicators and statistics for **detecting any deviations from the average values determined for consumption, cost and comfort.**

The acquisition of data and their subsequent use require a prior process for integrating these data, installations and equipment, as well as the gradual implementation of energy monitoring for both individual and collective meters or consumer points, and for all the energies that can be used in social housing. This calls for **technological tools and data processing and storage systems** for creating energy BIG DATA.

Through the use of an integrated energy regulation system, ALOKABIDE will be able to oversee its consumer points independently and, at the same time, the contracted utility company, as well as provide its owners and tenants with tools and data for controlling their cost and consumption.

The **integral regulation system** needs to be backed up by a **comprehensive monitoring system** that covers all the supply points for the different energies, systems, buildings and installations, and which provides for the development of performance models that may be used to draw up support and instruction schemes and take steps for improving installations.

Awareness

The proper instruction and awareness of tenants supported by tools that foment consumer empowerment might help to reduce the demand for energy by more than 10%, simply by knowing how energy behaves.

This service will organise **awareness campaigns and schemes**, as well as **briefing information and support for consumers** on any aspect related to energy consumption and cost. The campaigns or actions need to assess the degree of progress.

There will be a need to arrange measures that consumers understand and engage with. There is understood to be a need accordingly to create the figure of expert or go-to person, who in direct contact with consumers will see to resolving and streamlining tenants' consumptions, costs and performance.

Improving efficiency

It is the service’s responsibility **to ensure the utmost efficacy and effectiveness of the installations and equipment inside buildings and homes.** This requires it to supervise, monitor and oversee all the installations, equipment, systems, companies and procedures involved within the scope of the housing blocks used for social housing.

The tools for the integration, control and monitoring of equipment, as well as the premises of each housing entity and of each installation or building, will be used to **create the appropriate procedures and schedules for supervising the progress made in the performance of installations and their equipment,** regularly drawing up reports, statistics and indicators for controlling the performance level of existing installations.

Administrative/operational management

Depending on the experience we gradually acquire and the data provided by the energy regulation tools, we need to analyse, study, develop and process the arrangement of public tenders that group types of utilities or specific needs so that the different market agents and players can provide **services adapted to the real needs of the social housing pool.**

The best way of reducing energy’s economic impact in the stock of social buildings and housing units is to **group utilities and circumstances together, as well as keep them in the best condition possible and fit-for-purpose in terms of their operation and performance.**

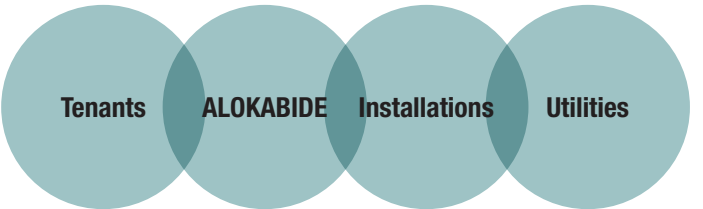
Performance supervision

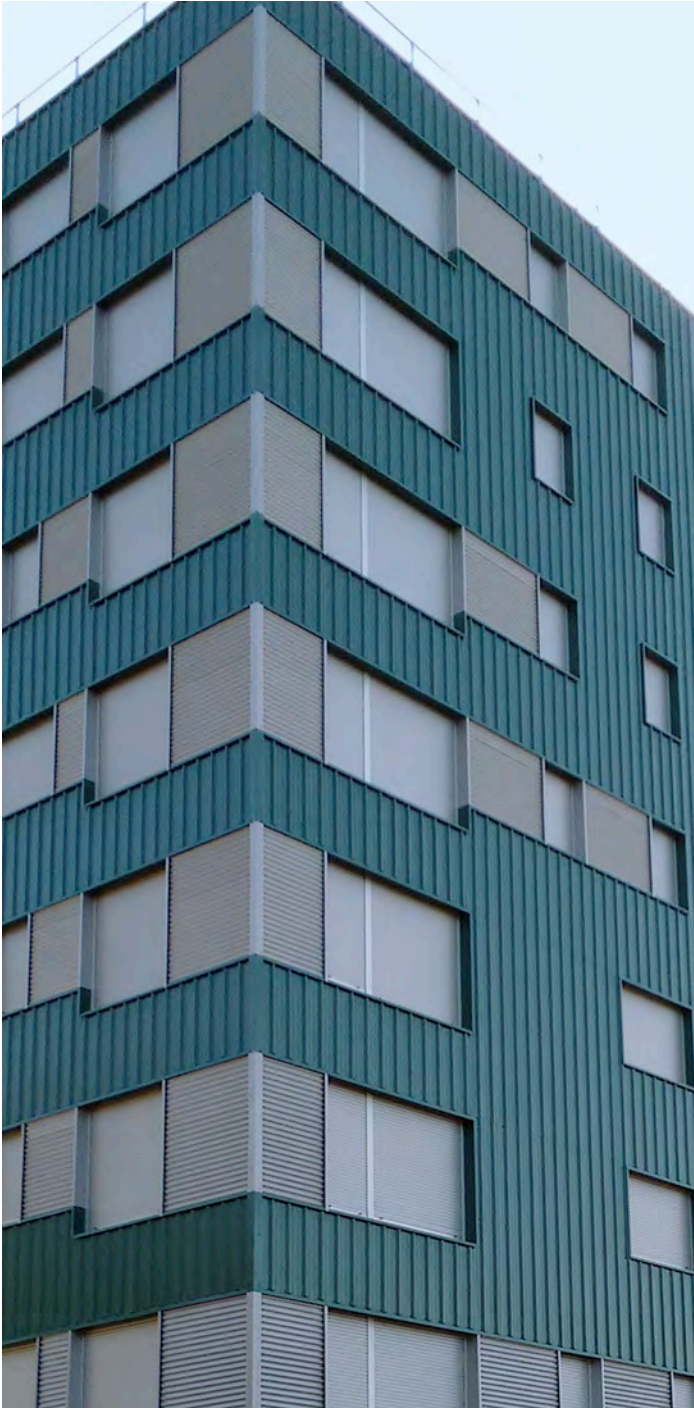
Performance supervision is understood to mean the **customisation, control and finetuning of all electricity contracts** in terms of both the power contracted and the amount consumed in the communal installations that use it, such as lifts, fans and lighting, the performance of heating and hot water equipment, renewable energy installations regardless of their nature, and maintenance services.

This calls for the drafting of a **detailed schedule for overseeing and supervising** each and every one of the system’s installations. It needs to be grounded in equipment control platforms and trigger alerts and indicators that flag areas for improvement.

We need the necessary licences from the corresponding authorities to process the appropriate measures and changes for amending the installations and contracts as soon as possible for guaranteeing economic and energy saving as regards the initial starting-point.

A **past progress chart** is required for all the installations, contracts and equipment for monitoring and assessing the advances made in their performance, as well as for the measures taken over the years.





Challenges

We need to effectively resolve **different technological, social, cultural, operational, economic and environmental challenges**.

It is vital to know how to design and tender services and/or solutions that improve the housing stock's management in energy matters, creating models of relationship between all the stakeholders and placing all the information and data at the service of improving and streamlining performance.

The main challenge lies in the **development of a culture of saving, efficiency and sustainability**, transferring responsibility for energy performance onto end consumers, providing them with all available information for the effective management of their resources, and guiding them towards more sustainable forms of use.

An essential step in dealing with these challenges will involve other related aspects, such as the **treatment of data for solutions for their processing**, the generation of protocols of representation and ownership, the introduction of innovative public procurement processes, and intermediation in economic or technical energy-related conflicts.

The basic aim is clearly to reduce the overall energy demand for all energy contracts, regardless of the type of energy, and guarantee the lowest possible price.

Overcoming these challenges will involve resolving the following aspects, as they are understood to be essential for providing an effective response to ALOKABIDE's goals.

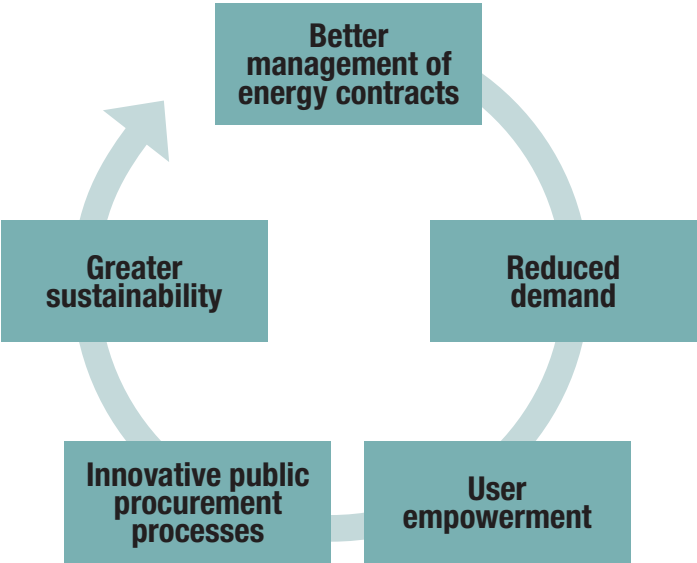
The institutions need to use the data on consumptions, costs and performance to **design buildings and installations that cater for real needs in matters of consumption and comfort**, and earmark resources for the use of clean energies on residential buildings.

Reaching this ideal scenario will obviously not be easy and cannot be achieved in a short period of time. The particular nature of the energy market, its users, and the actual types of social housing entities are obstacles in the way of this change of paradigm.

This has required **defining a concrete roadmap** and certain specific guidelines that will be used to create the ideal framework **for consolidating a new model of energy consumption.**

A participative model in which users are in control, with the right to manage the energy they consume and afford the price they consider to be right for their level of comfort.

In short, **the implementation of an integral energy management service** of these characteristics calls for specialist resources in the energy sector that inform processes, measures in support of users, and guarantee the latter's arrangement of utilities that are suited to the specific profile of the public rental housing pool.



The estimated cost of the remit to guarantee a minimum level of comfort in the homes under management will therefore amount to

€ 12,480,000.00
(with a 30-year horizon)

Integral rental management model

As things stand, the economic effort required of tenants living in a housing unit within the public stock managed by ALOKABIDE varies depending on the development where their home is located, its situation, and the pool it belongs to.

The aim is to study the possibility of **ensuring that the rents** ALOKABIDE's tenants pay **are more equal, and under no circumstances exceed 30% of their income**, including rates and fixed housing fees.

Specifically, when focusing this study, and regarding a possible adjustment in the way of collecting the rent and the other household costs in a housing unit managed by ALOKABIDE, this report has analysed the **consequences of combining the items of rent and housing fees into a single charge for the overall rent**. This means that tenants will not distinguish between the two items, receiving a single bill, with ALOKABIDE paying for the housing fees at its own expense.

In short, there is a need to respond to this situation in a proactive and realistic manner without compromising the economic sustainability of the main public entities that today ensure the availability of protected rents, as this would restrict the future development and expansion of the public rental housing pool.

Background

It should be remembered that each housing unit currently tends to pay a different sum depending on the housing association. There are various reasons for this: developments where all the tenants pay the same quota, and developments where tenants pay depending according to the size of their home.

The average housing fee charged to a tenant household in the public rental pool is around €62 (*), which includes the following:

- Standard maintenance of communal amenities.
- Communal utilities.
- Services in communal areas.
 - Cleaning of entrance, landings, boxrooms...
 - Estate manager.
 - Sundry repairs: locksmith, plumbing, lighting fixtures ...
 - Reading of meters and issue of individual bills for the consumptions of communal hot water.
 - Right of way in car parks.

Based on a study conducted by ALOKABIDE in 2014, a household's average expense in the rental pool exceeds 30% of its weighted income.

(*) 2014 data for ALOKABIDE housing.

In turn, repair costs are covered by ALOKABIDE and the Basque Government as owners of the public stock:

- Care of the building:
 - Replacement and repair of communal facilities.
 - Preventive maintenance measures.
 - Arrangement of communal utilities.
 - General supervision of maintenance and services.

PROVINCE	HOMES	AVERAGE WEIGHTED TAXABLE INCOME	RENT EFFORT	RECEIPT EFFORT	AVERAGE RENT	AVERAGE HOUSING FEE
ARABA	2,257	€ 10,940.06	24.17 %	31.51 %	€ 185.95	€ 62.51
BIZKAIA	517	€ 12,184.12	23.11 %	29.57 %	€ 234.66	€ 64.95
GIPUZKOA	748	€ 13,720.16	22.69 %	27.64 %	€ 259.48	€ 56.49
TOTAL €	3,522	€ 11,637.00	23.69 %	30.36 %	€ 229.78	€ 61.58

Description:

The aim is to **analyse the economic impact involved in modifying the current rent and its calculation method**, with the proposal being to cap the sum of this rent at 30% of each tenant's weighted taxable income on a set and general basis, with ALOKABIDE paying the pool's housing fees at its own expense.

In light of a possible adjustment in the way of collecting the rent and other expenses of the tenants in a housing unit managed by ALOKABIDE, an analysis was conducted of the consequences of combining the items of rental and housing fees into a single charge for the overall rent. As already noted, this means that a household will pay a single bill without distinguishing between the items, with ALOKABIDE paying the housing fees out of its own pocket.

There are two scenarios:

SCENARIO 1: Current situation

(2014 data for ALOKABIDE housing)

INCOME FROM RENTS + HOUSING FEES + RATES	
Income from rents + Fees. + Rates/month	€ 941,184.91
Income from rents + Fees. + Rates/year	€ 11,294,218.92

This real scenario was used for comparing the option of modifying the current rent and its calculation method, with the proposal being to cap the rent at **30% of each tenant's taxable income on a set and general basis**, with ALOKABIDE and the Basque Government meeting the housing fees as part of the pool's own expenditure.

SCENARIO 2: Capping the household effort at 30% in all cases

(2104 data for ALOKABIDE housing)

30% RENT INCOME	
Total income 30%/month	€ 934,274.03
Total income 30%/year	€ 11,211,288.39

This means that the difference in income between the two scenarios only represents a drop in invoicing of €82,930.53 (0.7%). Nevertheless, it would have the following impact on households:

- Households recording a decrease in the end bill to be paid: 1,774 tenants.
- Households recording an increase in the end bills to be paid: 1,470 tenants.

Nonetheless, we realise that we need to maintain the calculation system until their contract expires for those who are going to see a rent increase, and lower it immediately for others, which means the following loss of real income for ALOKABIDE:

INCOME	RENTS	HOUSING FEES	30 %	TOTAL
Income maintaining the same system for those with a rent increase	€ 383,630.12	€ 88,444.10	-	€ 472,074.22
30% of taxable income of those with a lower rent	-	-	€ 354,007.15	€ 354,007.15
Income scenario adjusted to end of contract	-	-	12 months	9,912,976.44 €

The real costs of implementing this measure will therefore be the difference between the current scenario of income + housing fees + rates/year and the scenario of income adjusted at the end of the contract.

Adjusting the management model to a scenario involving the collection of a single sum will therefore entail estimated costs over the first three years of implementation amounting to

€ 1,381,242.48

The above measures proposed for a new model for public rental management and its budgeting are set out in the following table:

OUTLOOK FOR PUBLIC RENTAL MANAGEMENT	Integral Management Model	To guarantee that the rents paid by tenants of ALOKABIDE are fairer and under no circumstances exceed 30% of their income, including rates and fixed housing fees, and analyse the consequences of merging the items of rent and housing fees into a single charge for the overall rent. This means the tenants will not distinguish between the two items, receiving a single bill, with ALOKABIDE paying for the housing fees at its own expense.	€ 1,381,242.48
	Comprehensive Maintenance of the Pool	Direct management by ALOKABIDE rather than the outsourcing of the maintenance of installations and basic services currently undertaken by the housing associations of each building (housing fee paid by occupants).	€ 7,205,670.60
	Minimum Guaranteed Comfort	Once the buildings' facilities are being remotely supervised and maintained, a decision may be made on guaranteeing a minimum level of comfort as an integrating measure of the rental service regarding the thermal efficiency of homes and their comfort.	€ 94,055,850.00
	Public Energy Management	Creation of a department at ALOKABIDE that can respond to the energy challenges of the public rental housing pool for integral energy management. The aim is therefore to extend the scope of the ALOKABIDE public company so that it can also render a service in the field of energy.	€ 12,480,000.00
€ 115,122,763.08			



Partners









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EUSKO JAURLARITZA
GOBIERNO VASCO

INGURUMEN, LURRALDE PLANGINTZA
ETA ETXERAKTZA SAILA
DEPARTAMENTO DE MEDIO AMBIENTE,
PLANIFICACIÓN TERRITORIAL Y VIVIENDA