Environmental, socio-cultural, and economic sustainability in care facilities: evaluating the impact of person-centered building renovation in Aragon, Spain

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Highlights

- Territorial inequalities in access to care facilities for older people
- Prevalence of private management in long-term care services
- Limited adoption of a person-centered care model in care facilities
- Existing long-term care building stock has low energy efficiency
- A significant investment is needed to achieve holistic sustainability

Abstract

The increasing aging population, life expectancy, and dependency rates in Spain have led to a growing demand for long-term care places, presenting a significant challenge for care facilities for older people. Transitioning from institutional care homes to a person-centered care model is essential for improving the well-being and quality of life of residents. This paper focuses on Aragon, a region in Spain facing territorial disparities and aging-related issues. The study proposes a holistic sustainability approach that encompasses socio-cultural, environmental, and economic dimensions to evaluate the impact of renovating institutional long-term care facilities into person-centered care environments. The research methodology involves creating a holistic database of care facilities in Aragon and assessing their sustainability through socio-cultural indicators (size, living units, and single rooms) and environmental factors (construction year, energy consumption, and carbon emissions). Several design measures, such as implementing living units and improving insulation, are proposed to evaluate economic sustainability. The findings reveal that 25% of care facilities need to reduce their capacity, with only 7.7% having adopted living units. Additionally, over 80% of the building stock is energy inefficient. Renovating these care facilities in line with a sustainable, person-centered approach is estimated to cost between 101 and 170 million euros. The paper concludes that a holistic approach combining socio-cultural, environmental, and economic sustainability is crucial for implementing a person-centered care model in Aragon's facilities. Furthermore, effective public-private collaboration is needed to ensure equitable access to care services and uphold quality standards that safeguard the well-being of older adults.

Keywords

care facilities; person-centered care; sustainability; renovation; building stock; aging; older people

1. Introduction

Southern European countries are experiencing rapid demographic aging. By 2050, over a third of the population in Greece (35.5%), Portugal (33.9%), Italy (33.7%), and Spain (32.7%) will be 65 years or older (Eurostat, 2023a). In Spain, which in 2023 had the highest life expectancy in the European Union at 84 years (Eurostat, 2023b), this population shift poses significant challenges for long-term care facilities. As demand for residential care beds increases, the longer life expectancy has also resulted in a higher prevalence of comorbidities and neurodegenerative diseases (Divo et al., 2014). Additionally, the COVID-19 pandemic has intensified feelings of loneliness and depression among older adults, particularly affecting women (Alzheimer Europe, 2019; INE, 2021).

In this context, long-term care homes for older people will need to adapt to a growing population of elderly residents who are increasingly dependent and predominantly female, with a wide range of physical and cognitive abilities. However, many care facilities in Spain are still bound to an institutional care model that fails to meet the needs of this aging population (Rodríguez Rodríguez, 2021). This traditional approach results in standardized, impersonal living environments that negatively impact older adults' physical and emotional well-being (Anderson et al., 2020; Bradshaw et al., 2012; Schwarz, 1997). Furthermore, the large-scale layout of these facilities, with extensive common areas and shared bedrooms, was a critical factor in the rapid spread of COVID-19 in 2020 (Observatorio de la Realidad Social, 2020). In Spain, 45,175 residents died from COVID-19 in care homes for older people, accounting for 31% of the country's total deaths (IMSERSO, 2023a).

In response to the pandemic's impact, public institutions are working to deinstitutionalize long-term care facilities. In Europe, the European Commission is promoting the European Care Strategy through policies like the "Council Recommendation of December 8 2022 on access to affordable high-quality long-term care (2022/C 476/01)" (Unión Europea, 2022). In Spain, the "National strategy for a new model of care in the community: a deinstitutionalization process (2024–2030)" (Ministerio de Derechos Sociales, Consumo y Agenda 2030, 2024) serves as the primary tool for transitioning from an institutional care model to a person-centered care approach.

Studies conducted both internationally (Brownie and Nancarrow, 2013; Burton et al., 2010; Poey et al., 2017; Williams et al., 2015) and in Spain (Barbosa et al., 2022; Díaz Veiga et al., 2016; Rodríguez Rodríguez, 2022) have confirmed that adopting a person-centered care model in residential facilities significantly improves the quality of life for older adults. Parallel research has shown the positive influence of a sustainable, age-friendly environment on dependent older adults (Chen et al., 2022; Marquardt et al., 2014; Van Hoof et al., 2021). Key design measures for achieving this include integrating green spaces (Bengtsson and Carlsson, 2013; Finlay et al., 2015; Rappe and Kivelä, 2005; Raske, 2010; Serra and Feio, 2024) and enhancing indoor thermal comfort (Baquero Larriva and Higueras García, 2023; Van Hoof et al., 2017, 2010; Wu et al., 2023; Yi et al., 2022). Hu's (Hu, 2021) literature review on environmental sustainability in residential settings for older adults highlights five key research topics: (1) energy consumption, efficiency, and management; (2) environmental sustainability in institutional environments; (3) application of sustainable technologies; (4) sustainable home modifications; and (5) other topics, including biophilic design and healthy buildings. In the context of care facilities for older people, MaloneBeach and Zuo (MaloneBeach and Zuo, 2013) examined practices and challenges associated with environmental sustainability in the United States, while Yuan et al. (Yuan et al., 2019) proposed five indicators to evaluate environmental sustainability in residential settings in China.

Moreover, improving energy efficiency through sustainable renovations—e.g., increased thermal insulation and upgraded systems—is a crucial strategy to reduce long-term operational costs (Beltrán Velamazán et al., 2022; Boerenfijn et al., 2018; Gangolells et al., 2020; Van Hoof et al., 2017), especially as the demand for residential care continues to rise; several studies have explored the link between the growing aging population and its effect on reducing household carbon emissions (Ge et al., 2024; Yang et al., 2015; Zhang et al., 2023). In the Netherlands, numerous initiatives and programs have been developed to enhance environmental sustainability in social housing and care facilities for older adults. Notable measures include the installation of solar panels and heat pumps, energy competitions, and monitoring energy consumption through smart home devices (Boerenfijn et al., 2018). Additionally, various authors emphasize the importance of understanding older adults' behavior and perceptions regarding environmental sustainability to improve the quality of residential settings and age-friendly communities (Dikken et al., 2025, 2024, 2023; Van Hoof and Dikken, 2024). Similarly, the research conducted by Ayalon (Ayalon et al., 2023; Ayalon and Roy, 2023) and Pillemer (Pillemer et al., 2011; Pillemer and Wagenet, 2008) explores the connection between older people and climate change, addressing topics like ageism and environmental volunteering.

In Spain, "Law 9/2022, of June 14, on the Quality of Architecture" (Jefatura del Estado, 2022) emphasizes the importance of social, cultural, environmental, and economic sustainability in architectural quality. However, there is a lack of studies that connect socio-cultural

perspectives (care model transformation) with environmental and economic approaches (affordable and sustainable renovation of care facilities).

This paper seeks to address the previous research gap by investigating whether a holistic sustainability approach—considering socio-cultural, environmental, and economic dimensions—effectively evaluates the impact of renovating institutional long-term care facilities into person-centered care environments. The study focuses on the region of Aragon in northern Spain, which exemplifies many of the challenges encountered by care homes for older adults. The research aims to achieve two objectives: (1) to assess the current condition of the long-term care building stock in Aragon and (2) to evaluate the socio-cultural, environmental, and economic sustainability of these care facilities to determine the holistic impact of implementing a person-centered care building renovation strategy in the region.

A holistic database of care facilities for older people in Aragon has been created to analyze the building stock. This database integrates various administrative and architectural datasets. To evaluate sustainability, six criteria were established: three socio-cultural criteria (facility size, living units, and individual rooms) and three environmental criteria (construction year, energy consumption, and CO_2 emissions). These indicators are used to identify socio-cultural and environmental deficiencies in the care homes, propose strategies for implementing person-centered care building renovations, and assess economic sustainability.

This paper contributes to the field of impact assessment (IA) by proposing a multi-dimensional method to evaluate the sustainability of transitioning care facilities into person-centered care environments. The study introduces socio-cultural indicators (Social Impact Assessment, SIA), environmental metrics (Environmental Impact Assessment, EIA), and cost-benefit analysis that offer evidence-based, actionable insights for practitioners, policymakers, and researchers in impact evaluation, sustainable management, and policy development.

The innovation of this study lies in its novel methodology, policy relevance, and holistic scope. The research uniquely combines socio-cultural, environmental, and economic perspectives to evaluate the sustainable renovation of care facilities. While previous studies separately address energy performance and decarbonization (environmental dimension), care model transformation (socio-cultural dimension), and affordable housing options and services for older people (economic dimension), this paper provides a holistic view of how these interconnected factors collectively influence the long-term success of person-centered care models. Furthermore, although the need for smaller, home-like care environments is widely acknowledged, especially after the COVID-19 pandemic, the economic sustainability of implementing a person-centered care model at a regional scale remains underexplored. This study focuses on this gap by analyzing cost implications and proposing viable and sustainable renovation strategies, providing a template for decision-makers. Additionally, creating a holistic database not only facilitates a detailed evaluation of current conditions and renovation opportunities for care facilities but also serves as a replicable framework for similar analyses in other regions and countries. Lastly, the research promotes an interdisciplinary approach, combining insights from architecture, gerontology, regional studies, and public policy. This integration is essential for tackling the multi-dimensional challenges posed by demographic aging and climate change.

1.1. The case of Aragon

The effects of aging and late-life dependency on long-term care facilities are particularly noticeable in Aragon. Demographic projections indicate that the current proportion of older adults in Aragon (22.1%) is expected to rise by approximately five percentage points by 2037. By that time, older people will make up 70.5% of the rural population in the region [52,53]. Approximately 14,000 residents aged 65 and over live in Aragón's care homes [54], of whom 11,000 are oldest-old adults (aged 80 years or older). This group represents 11.6% of the region's total oldest-old population (IAEST, 2023). Most residents are highly dependent individuals whose physical and/or cognitive decline prevents them from aging in place (IMSERSO, 2024; INE, 2021). While most people prefer to age in their own homes (Katunský et al., 2020), doing so requires balancing various external factors, such as the dwelling condition, the quality of the surrounding urban or rural environment, the availability of community services, and the individual's level of and cognitive decline. Without a robust care network, aging at home can lead to social isolation, deteriorating health, and higher rates of loneliness, depression, and neurodegenerative diseases (Donovan and Blazer, 2020; Means, 2007; Prattley et al., 2020; Wiles et al., 2012). In Aragon, there are approximately 170 daycare centers, offering around 3,500 places for older individuals—equivalent to 1.2 places per 100 people aged 65 or older (Aceituno Nieto et al., 2023a).

Long-term care facilities for older people in Aragon are classified into two main types (IMSERSO, 2023b): care homes and assisted living. Care homes provide accommodation and round-the-clock care for those who can no longer live independently due to social, economic, or health issues. On the other hand, assisted living offers non-medical care in specially adapted housing, allowing older adults to maintain their independence while living in a community environment.

According to data from the Institute for the Elderly and Social Services (*Instituto de Mayores y Servicios Sociales*, IMSERSO) (IMSERSO, 2024, 2023b), Aragón has approximately 270 care homes and six assisted living facilities. The prevailing residential care model consists of private centers with an average capacity of 70 beds and a balanced mix of individual and shared bedrooms. Furthermore, 89% of available beds are occupied, mostly by highly dependent women over the age of 80. The caregiving workforce is also predominantly female, with a high proportion of caregivers graduated from vocational schools compared to university-trained professionals.

Most care homes for older adults in Aragon follow an institutional long-term care model, resembling the design of hospitals and hotels. These large-scale facilities feature oversized common areas and long hallways lined with identical rooms (Rodríguez Rodríguez, 2021, p. 14). Research has shown that institutional care homes have negative effects on residents, leading to isolation, loneliness, depression, dementia, and other health issues. Additionally, staff experience increased stress, heavier workloads, and a sense of social distance from residents (Camacho-Conde and Galán-López, 2020; De Medeiros et al., 2020; Rodríguez Rodríguez, 2021; Runcan, 2012; Santiago and Mattos, 2014).

By contrast, the person-centered care model organizes care to focus on the needs and desires of the residents, leading to significant improvements in their quality of life, health, and overall well-being (Barbosa et al., 2022; Brownie and Nancarrow, 2013; Poey et al., 2017; Rodríguez Rodríguez, 2022, 2021). From an architectural standpoint, this approach emphasizes smaller facility sizes and seeks to integrate them into the community, fostering

a more homelike atmosphere (Ausserhofer et al., 2016; Díaz Veiga and Sancho Castiello, 2012; Díaz-Veiga et al., 2014; Martínez Rodríguez, 2022).

1.2. The three pillars of holistic sustainability

To renovate Aragon's institutional care architecture into a person-centered care model, it is essential to understand the characteristics of the existing buildings. Current databases on care facilities in Aragon (IMSERSO (IMSERSO, 2024, 2023b) and Envejecimiento en Red (Aceituno Nieto et al., 2023b)) offer administrative information, including details about ownership, capacity, and daycare services. However, these databases do not provide socio-cultural or person-centered data, such as the types of rooms available (single, double, or communal), the range of services offered, or the presence of living units and specialized care modules, like those for dementia care.

In addition to creating home-like environments, renovations of care facilities should focus on current goals for decarbonization and improving energy efficiency in buildings. According to the "Directive (EU) 2024/1275 of the European Parliament and of the Council of 24 April 2024 on the energy performance of buildings" (Unión Europea, 2024), all new buildings must achieve zero emissions by 2030. To reach climate neutrality by 2050, the entire building stock must be decarbonized. Moreover, improving energy efficiency is also essential for enhancing the comfort, accessibility, and affordability of housing for older adults, a collective particularly vulnerable to energy poverty (Boerenfijn et al., 2018; Van Hoof et al., 2017).

Despite these urgent objectives, there is a significant information gap regarding the energy performance of Aragón's care facilities. Existing databases also lack information on key construction characteristics of these buildings, such as energy efficiency, CO_2 emissions, built area, climate zone, or construction year.

Economic sustainability, along with sociocultural and environmental factors, is crucial for the viability of a person-centered care model. In Aragón, the average retirement pension is €1,517, while the monthly cost of a private single room averages €1,965 (€1,710 for shared rooms) (Jones Lang LaSalle, 2023). In public facilities, the average cost is €1,755 per month, with residents contributing 40.4%, which amounts to €708 per month (IMSERSO, 2023b). With the expected rise in the number of dependent older adults requiring residential care, public institutions will not only face increased social service spending but will also need to fund renovations of existing facilities and the construction of new ones. No studies to date have examined the financial feasibility or costs associated with implementing a person-centered care model on a regional scale. The only available economic information in Aragon comes from construction budget documents for developing living units in the nine residences managed by the Aragonese Institute of Social Services (*Instituto Aragonés de Servicios Sociales*, IASS), which can be accessed through the State Contracting Platform (*Plataforma de Contratación del Sector Público*) (Gobierno de España, 2024).

The lack of architectural data on care facilities for older people in Aragon, encompassing both socio-cultural, environmental, and economic factors, underscores the limited role that architecture is playing in transforming the care model. Despite substantial evidence demonstrating how the built environment influences the quality of life for older individuals (Fleming and Purandare, 2010; Marquardt et al., 2014), the architectural discipline is perceived by institutional, professional, and academic circles as disconnected from pressing contemporary issues (Heynen and Pérez-Moreno, 2022; Tronto, 2019). These

challenges include demographic aging, the crisis in the care system, the sustainability of the pension system, and climate change.

In contrast, a holistic approach to sustainability in architecture considers the social, environmental, and economic impacts of design on user well-being, based on the concept of the three pillars of sustainability (Purvis et al., 2019). Some studies (Memmott and Keys, 2015; Qtaishat et al., 2020; Rosaleny Gamón, 2020; Soflaei et al., 2017) and regulations, such as Spain's "Law 9/2022, of June 14, on the Quality of Architecture" (Jefatura del Estado, 2022), also introduce a cultural pillar to holistic sustainability, either as a standalone component or as an integrated dimension of social and cultural factors. This research adopts the latter approach.

The environmental pillar in architectural sustainability covers aspects like natural environment protection, carbon emissions, energy consumption, material circularity, waste, water use, transport, pollution, health and indoor environmental quality, biodiversity and greenery, climate adaptability, and food production (Asociación Española de Normalización, 2012; Eklova, 2020; Green Building Council España, 2023; U.S. Green Building Council, 2023). The economic dimension focuses on indicators like life-cycle costs, commercial viability, maintenance and monitoring expenses, payback period, net present value, internal rate of return, and return on investment (Asociación Española de Normalización, 2016; Eklova, 2020). Finally, the sociocultural component encompasses parameters such as participation, adaptability, usability, inclusivity, accessibility, safety, health, comfort, quality of life, flexibility, affordability, and neighborhood impact (Asociación Española de Normalización, 2015; Eklova, 2020).

2. Methods

2.1. Holistic database

To assess the sustainability of renovating care homes in Aragon, a holistic database has been developed, focusing on socio-cultural and environmental factors (Table 1). The economic perspective was omitted due to a lack of suitable datasets in Aragon.

Table 1. Sources and indicators for the holistic database of care facilities for older people in Aragon.

Socio-cultural sustainability		**Environmental sustainability**	
Sources	**Indicators**	**Sources**	**Indicators**
Envejecimiento en Red	Name, address, municipality, phone number, ownership, long-term places, postal code, latitude, and longitude	Land Registry	Registry number, area, and year
Registry of Entities, Centers and Social Services	Registry number, name, address, municipality, province, phone number, type, ownership, long-term places, and daycare places	Spanish Technical Building Code	Climate zone H1 and climate zone H4
Framework Agreement	Framework Agreement (Yes/No) and Framework Agreement places	Energy Efficiency Certificate	Year, area, land registry number, energy certificate number, issue date, expiration date, carbon emissions, energy consumption, emissions classification, energy classification, and type of building
No dataset	Living units, individual rooms, double rooms, and shared rooms		

For the socio-cultural dimension, data were primarily drawn from two sources: the 2022 *Envejecimiento en Red* dataset (Aceituno Nieto et al., 2023b) and the care facilities listed in the 2023 document from the "Registry of Entities, Centers, and Social Services" of the

Government of Aragon (Gobierno de Aragón, 2023a). By comparing these sources, care homes that are no longer operational were removed from the database. Additional variables, such as latitude and longitude (from the *Envejecimiento en Red* dataset only), ownership, type of care home, and availability of daycare places (from the Social Entities Registry only), were included to facilitate the geographic location and detailed characterization of the management and capacity of care facilities in Aragon.

To enhance ownership information, the document "Service Contract, through Framework Agreement, for long-term places in care facilities for older people in a dependency situation in Aragon" (Instituto Aragonés de Servicios Sociales, 2023) was added. This Framework Agreement provides regional funding in municipal and private care homes to reduce the cost of residential care places. After integrating these three socio-cultural sources, the database now includes n=272 care facilities in Aragon.

Furthermore, the socio-cultural dimension of the database was enriched with indicators aligned with the person-centered care model, such as the presence of living units and the number of different room types (individual, double, and shared). Since these details are not available in the three main data sources, information was gathered from the websites of care homes and online care home directories. Only 124 of the 272 centers provided data on room capacity, and just 21 explicitly stated that they had person-centered living units. Consequently, this research assumes that the remaining facilities have not implemented homelike environments.

The final step in constructing the holistic database involved the incorporation of sources related to environmental sustainability. Data on land, climate, and energy for the care homes were reviewed. By inputting the variables 'address' and 'municipality' in the Land Registry search tool (Ministerio de Hacienda y Función Pública, 2023), the land registry reference, property area, and construction year for each care facility in Aragon were obtained.

This land registry reference was subsequently used to retrieve information on energy certificates, which are available in the "Registry of Energy Efficiency Building Certificates of Aragon" dataset on the Aragon Open Data platform (Gobierno de Aragón, 2023b). Only 64 out of Aragon's 272 care homes (23.5%) have an energy certificate listed in the registry. 32 out of 78 public care homes (41.0%) hold the certification, compared to just 16.5% of private centers.

Finally, HE1 and HE4 climate zones were assigned to the Aragonese municipalities hosting care homes, according to the "Basic Document HE Energy Efficiency" of the Spanish Technical Building Code. Climate zone information was obtained using CE3X software (Efinovatic and Centro Nacional de Energías Renovables, 2024), which is approved by the Ministry of Ecological Transition of the Government of Spain for certifying buildings through a simplified procedure.

2.2. Evaluation criteria

2.2.1. Socio-cultural sustainability

In the socio-cultural sustainability dimension, the evaluation encompasses all necessary interior modifications—such as demolitions, partitions, mechanical, electrical, and plumbing systems, cladding, flooring, fixtures and fittings, painting, etc.—to adapt care facilities to the requirements of a person-centered care model.

The socio-cultural indicators are defined using the ratios set by the "Agreement on Common Criteria for Accreditation and Quality of Centers and Services in the System for Autonomy and Care for Dependence (*Sistema para la Autonomía y Atención a la Dependencia*, SAAD)" from the Ministry of Social Rights and Agenda 2030 (Ministerio de Derechos Sociales y Agenda 2030, 2022).

- **Size**: According to the SAAD Agreement, care facilities must limit their capacity to a maximum of 75 places in rural or sparsely populated areas (<100/km²), 90 places in medium-density areas (100–200/km²), and 120 in densely populated areas (>200/km²). Care homes exceeding these thresholds are classified as facilities that need to be renovated.
- **Single bedrooms**: In line with SAAD Agreement criteria, at least 65% of public or subsidized places in residential centers should be provided in single bedrooms, with the remainder in double bedrooms. Since the databases from *Envejecimiento en red* and the Government of Aragón do not specify the type of rooms for the places financed by the Framework Agreement, this study assumes that the requirement of 65% of single rooms applies to all care facilities, regardless of ownership. Additionally, care homes with shared bedrooms (three or more beds) are also identified as facilities needing renovation.
- **Living Units**: The SAAD Agreement requires public or subsidized care facilities to be organized into stable living units that do not exceed 15 residents. Due to data limitations, as previously noted in the single-bedroom indicator, this study considers the absence of living units in care homes as an indicator of socio-cultural renovation.

2.2.2. Environmental sustainability

The evaluation of environmental sustainability in care facilities for older people focuses on analyzing the thermal envelope of buildings to minimize energy demand. While improving ventilation, heating, and cooling systems is crucial for enhancing energy performance (*RuralREGEN. Estudio sobre el estado de la rehabilitación energética de viviendas en el ámbito rural en España: diagnóstico, barreras y soluciones*, 2022), specific data on these aspects is unavailable in Aragon, limiting the development of evaluation indicators.

Environmental indicators are defined with guidance from the "Basic Document HE Energy Efficiency" of the Spanish Technical Building Code, the "Long-Term Strategy for Energy Renovation in the Building Sector in Spain (ERESEE), 2020 Update," and the Energy Efficiency Certificate.

The "Basic Document HE Energy Efficiency" (Ministerio de Vivienda y Agenda Urbana, 2022) establishes the minimum requirements for energy efficiency, energy consumption, and energy demand. It also specifies criteria for heating, cooling, and lighting systems, renewable energy use, and electric vehicle charging infrastructure. Energy consumption calculations in this document are based on the building's climate zone, which is determined by geographic location and altitude above sea level.

The ERESEE 2020 document (Secretaría General de Agenda Urbana y Vivienda, 2020) categorizes Spain's building stock into six construction periods: pre-1900, 1901–1940, 1941–1960, 1961–1980, 1981–2007, and post-2008. These periods reflect technical and legislative changes that influenced insulation standards, impacting buildings' energy performance. Buildings constructed before 1940 typically use traditional construction methods (load-

bearing walls with high thermal inertia), while pre-1900 buildings are considered historical. Buildings from 1941 to 1960 were part of the first wave of urban expansion and predominantly feature masonry constructions. The 1961–1980 period represents the second wave of urban growth, marked by innovations in construction techniques. The period from 1980 to 2007 corresponds with the implementation of the NBE-CT/79 technical standard, which established minimum insulation requirements for building envelopes. In 2008, the Spanish Technical Building Code was introduced, significantly enhancing energy efficiency requirements. The Technical Building Code was updated in 2019 to align with the European Directive 2010/31/EU. Generally, buildings constructed before the Spanish Technical Building Code are considered energy inefficient, while those built before 1980 are highly inefficient.

The Energy Efficiency Certificate rates building energy performance on a scale from A (very efficient) to G (very inefficient). It evaluates factors such as the thermal envelope, systems (including heating, cooling, ventilation, air conditioning, and domestic hot water), lighting, occupancy, and energy production to calculate energy demand and carbon emissions. Following the European Directive 2018/844 (Unión Europea, 2018) and Royal Decree 390/2021 (Ministerio de la Presidencia, Relaciones con las Cortes y Memoria Democrática, 2021), most buildings in Spain must have an Energy Efficiency Certificate. New care facilities for older people, as well as all public care homes over 250 m^2, are required to obtain an energy certificate.

- **Construction Year**: Based on the ERESEE construction periods, care facilities for older people in Aragon are classified into three categories: highly energy-inefficient (constructed before 1980), inefficient (built between 1980 and 2008), and efficient (constructed after 2008).
- **Energy Consumption**: Information on energy consumption is derived from the Energy Efficiency Certificate. Care facilities with an A or B rating (indicating energy consumption below 75% of the national average) are considered energy efficient. In contrast, care homes rated C to G are assumed to be inefficient.
- **Carbon Emissions**: Data on greenhouse gas (GHG) emissions is provided by the Energy Efficiency Certificate. Facilities with an A or B rating (with carbon emissions below 75% of the national average) are classified as having low or negligible environmental impact, while those rated C to G are assumed as high-impact care homes.

2.2.3. Economic sustainability

To achieve the transformation from an institutional to a person-centered care model, while advancing the decarbonization of built environments and ensuring economic feasibility, the primary renovation measures for care facilities for older people in Aragon focus on creating homelike living units (socio-cultural sustainability) and reducing energy demand (environmental sustainability).

Regarding socio-cultural sustainable renovation, the economic impact depends significantly on the architectural layout of each care facility. Additionally, various studies suggest that interior space renovations contribute minimally to reducing energy demand compared to interventions on the building envelope (Simona et al., 2017; Žigart et al., 2018). Consequently, the economic impact analysis for socio-cultural sustainability in this paper is centered on estimating both the cost of implementing living units and the cost of a

holistic architectural transformation of the facilities, including upgrades to the thermal envelope.

Accordingly, the cost of implementing living units was estimated for the nine care facilities operated by the Government of Aragon, with available construction budget documents on the State Contracting Platform (Gobierno de España, 2024). Besides establishing homelike living units, four of these regional care homes also address the thermal envelope and several structural elements of the buildings.

To estimate the economic, energy, and carbon emissions savings after renovating the building envelope, this study uses the ERESEE 2020 scenarios, which provide average transmittance values for building envelope components in the national residential stock by construction period. Although ERESEE 2020 differentiates between three residential building typologies—detached houses, collective buildings with three or fewer stories, and collective buildings with four or more stories—the most restrictive values, which correspond to detached houses, were used to calculate thermal transmittance for care facilities. These values were applied to calculate minimum insulation thicknesses and potential savings in energy and greenhouse gas emissions, following the methodology developed in the RuralREGEN report (*RuralREGEN. Estudio sobre el estado de la rehabilitación energética de viviendas en el ámbito rural en España: diagnóstico, barreras y soluciones*, 2022) to renovate the residential building stock in rural areas in Spain.

3. Understanding care facilities for older people in Aragon

3.1. Available facilities and places

Aragon hosts a total of 272 care homes for older individuals: 53 in Huesca, 36 in Teruel, and 183 in Zaragoza. These facilities collectively offer 19,438 long-term places and 2,143 daycare stays, comprising 3,696 long-term and 499 daycare places in Huesca, 2,886 long-term and 316 daycare places in Teruel, and 12,865 long-term and 1,328 daycare places in Zaragoza (Table 2). The disproportionate number of care homes in Zaragoza compared to Huesca and Teruel is due to its higher population density. In 2022, Zaragoza had a population density of 55.9/km², while Huesca and Teruel had 14.4 and 9.1/km², respectively (Instituto Geográfico de Aragón, 2023).

Table 2. Care facilities, long-term places and daycare places for older people in Aragon by province.

	Huesca	Teruel	Zaragoza	Aragón
Care facilities	53	36	183	272
Long-term places	3,696	2,886	12,856	19,438
Day-care places	499	316	1,328	2,143

Care facilities for older adults in Aragon are strategically situated in key municipalities across the region: out of the total 272 facilities, 114 (41.9%) are located in provincial capitals, with 97 in Zaragoza, 11 in Huesca, and 6 in Teruel. Notably, Zaragoza alone accounts for 38.8% of the total beds available in Aragón, totaling 7,534 beds. Apart from the provincial capitals, Calatayud hosts 6 nursing homes, followed by Barbastro and Pinseque with 4 facilities each. Additionally, 24 municipalities boast 2 care facilities, while 96 cities have one. However, 459 Aragonese municipalities lack any care homes for older people.

In rural Aragón, most nursing homes are found in towns with populations ranging from 1,001 to 5,000 individuals. Orés, situated in Zaragoza province, stands as the only municipality with fewer than 100 inhabitants that hosts a care facility.

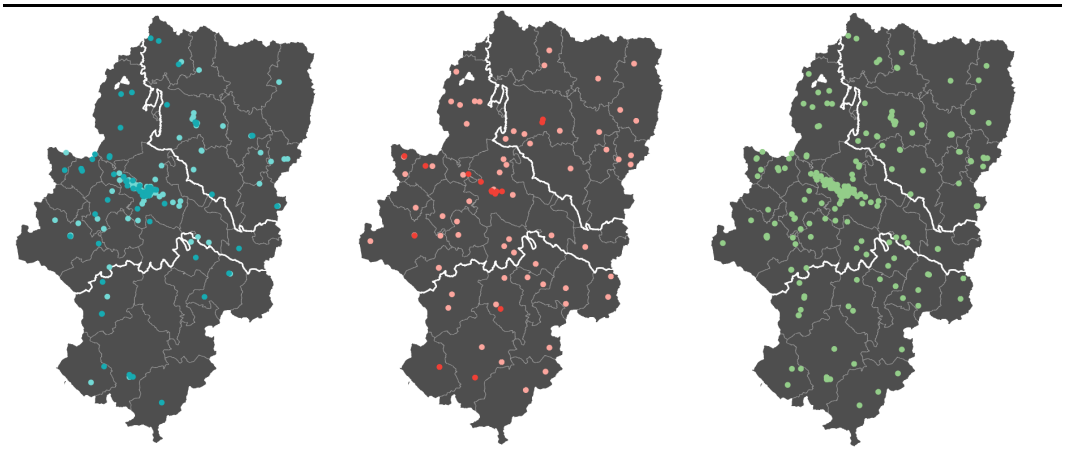
By climate zone, most care homes for older people are located in zones D2 or D3, corresponding to the central districts of the region. The rest of the care facilities are situated in zones E1 (26 care homes), C3 (20), and C2 (1).

3.2. Management

Private entities predominantly manage care homes in Aragon (71.3%), with 44.5% being business associations and 26.8% non-profit organizations. Of the 73 non-profit care facilities, 50 are managed by Catholic congregations and foundations. Publicly operated care homes account for 28.7% of the total, with municipal authorities managing 23.2% and the Government of Aragon supervising 5.5%.

When considering management type (Table 3), private care homes are predominantly clustered in Zaragoza's metropolitan area, while public facilities are more evenly distributed across the region. In Teruel, private care homes tend to be located in peripheral regions with higher population densities, while the depopulated areas of Teruel solely host public care facilities. Teruel stands out as the only province with a higher proportion of public care facilities (52.7%) than private ones. This can be attributed to Teruel's lower population density (Instituto Geográfico de Aragón, 2023) and gross disposable income (Instituto Aragonés de Estadística, 2022), making commercial nursing homes less profitable compared to those in Huesca and Zaragoza.

Table 3. Location of care facilities for older people in Aragon by type of management.



The Aragonese Institute of Social Services (*Instituto Aragonés de Servicios Sociales*, IASS) operates 15 care homes for dependency grades II and III. Through the Framework Agreement, the IASS collaborates with private and public care facilities to provide government-subsidized places, partially funded by the institute. In the 2023-2025 service contract (Instituto Aragonés de Servicios Sociales, 2023), 150 out of 272 Aragonese care facilities were part of this agreement, offering 5,881 government-subsidized places, accounting for 30.3% of total long-term places in Aragon.

3.3. Size

The size of care homes for older people in Aragon typically falls into the medium-scale category, with 50 to 99 long-term places (37.1%) and 25 to 49 long-term places (29.8%). Only

a minority, 12.1%, have fewer than 25 places, while 21.0% are considered large-scale facilities, offering more than 100 places. When considering management, half of the public care homes feature between 50 and 99 places. Conversely, private care facilities display a significantly more diverse scale, ranging from 25 to 49 places (33.5%), 50 to 99 (32.0%), to over 100 (22.2%). The most pronounced divergence occurs in Teruel province, where 35.3% of private care homes exceed 100 places, contrasting with just 5.3% of public large-scale care facilities in the same region.

3.4. Bedrooms

Care homes in Aragon show a balance between single bedrooms (50.6%) and double bedrooms (49%). Shared bedrooms of three or more residents (0.4%) are practically non-existent. The distribution by province is very similar: Teruel has more single bedrooms than double bedrooms and no shared dormitories, while Zaragoza has more double bedrooms. However, the proportion of rooms by type may not be representative of all care facilities in Aragon, since only 45.6% of Aragonese care homes offer data on the number of rooms by type.

3.5. Construction year

Considering the ERESEE 2020 construction periods (Table 4), the majority (55.5%) of care homes in Aragon were constructed between 1981 and 2007, followed by the period from 1961 to 1980 (16.9%) and post-2008 (15.8%). In terms of management, private care facilities were primarily built between 1981 and 2007 (52.6%) and from 1961 to 1980 (20.1%). Conversely, public nursing homes emerged later, with construction concentrated between 1981 and 2007 (60.3%) and after 2008 (17.9%). Provincially, there are no significant disparities regarding ERESEE building periods. The average area of care facilities in Aragon ranges between 3,000 and 5,000 m^2.

Table 4. Number of care facilities and average area by construction period and province.

	Number of care facilities						
	<1900	**1901-1940**	**1941-1960**	**1961-1980**	**1981-2007**	**>2008**	**Total**
Huesca	3	1	3	9	26	11	53
Teruel	1	3	1	5	19	7	36
Zaragoza	2	10	8	32	106	25	183
Aragón	6	14	12	46	151	43	272
	Average area (m^2)						
	<1900	**1901-1940**	**1941-1960**	**1961-1980**	**1981-2007**	**>2008**	**Total**
Huesca	1,708	794	8,395	3,664	3,283	2,522	3,359
Teruel	4,217	1,201	1,397	5,337	3,890	6,651	4,344
Zaragoza	1,246	4,568	1,513	5,188	2,914	5,964	3,733
Aragón	1,972	3,577	3,224	4,906	3,105	5,224	3,742

Taking into account energy performance, a significant portion (84.2%) of Aragonese care homes fail to meet the energy efficiency criteria stipulated by the Spanish Technical Building Code (built before 2008), with 28.7% categorized as extremely inefficient (constructed before 1980). Only 43 out of 272 care facilities in Aragon meet current energy efficiency standards.

3.6. Energy performance

The majority of care homes in Aragon receive ratings of D, C, or E in both energy consumption (82.8%) and carbon emissions (76.6%), indicating that these buildings consume and emit between 90% less and 110% more energy and greenhouse gases (GHG) compared to the average Spanish building stock.

Table 5. Carbon emissions and energy consumption by construction period and province.

	Carbon emissions ($kgCO_2eq/m^2/year$)				**Energy consumption ($kWh/m^2/year$)**			
	Huesca	**Teruel**	**Zaragoza**	**Aragón**	**Huesca**	**Teruel**	**Zaragoza**	**Aragón**
Before the Spanish Technical Building Code	82.2	72.3	64.9	68.4	375.5	305.7	309.0	318.4
After the Spanish Technical Building Code	-	36.2	74.7	59.3	-	212.4	338.8	288.2
Total	82.2	59.2	66.8	67.0	375.5	271.8	313.0	313.7

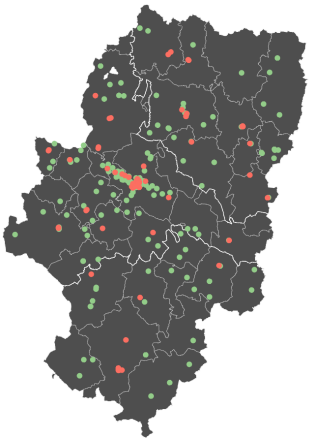
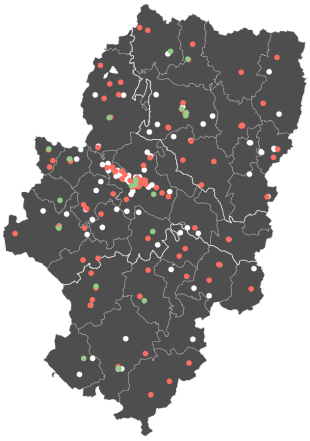
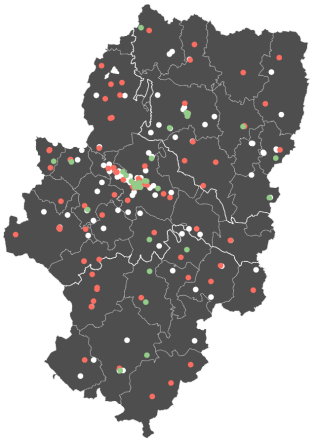
Table 5 illustrates carbon emissions ($kgCO_2eq/m^2/year$) and energy consumption ($kWh/m^2/year$) by province and construction period. In Aragon, care facilities exhibit an average annual emission of 68.4 $kgCO_2eq/m^2$ and an average annual consumption of 313.7 kWh/m^2. Teruel stands as the province with the lowest energy consumption and GHG emissions. Care homes for older adults constructed before the Spanish Technical Building Code have approximately 10% more environmental impact than those built post-2008.

4. Evaluating the holistic sustainability of person-centered building renovation of care facilities for older people in Aragon

4.1. Socio-cultural sustainability

Following the SAAD Agreement criteria, 68 out of 272 care homes for older people in Aragon (25.0%) have to reduce the number of available long-term places. Among these, 32 are in rural areas, nine in medium-density areas, and 27 in urban zones. Regarding person-centered living units, only 21 care facilities have implemented them. Of the remaining care homes, 111 do not have such units, and the information is unavailable for 140 facilities. As for individual bedrooms, only 33 care homes have a ratio of single rooms above 65%, while the ratio is lower in 91 facilities, and data is unknown for 148 (Table 6).

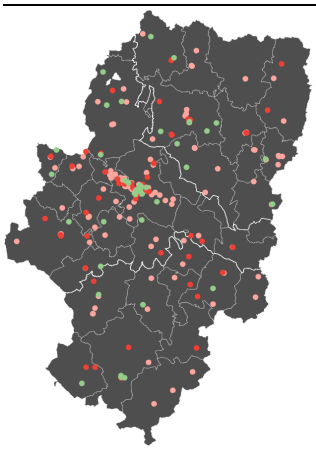
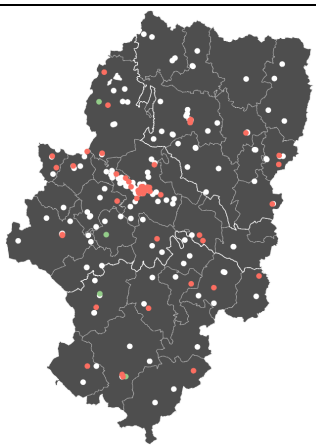
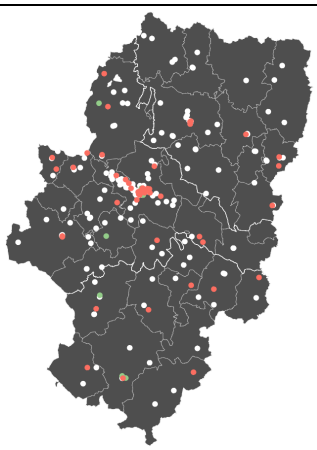
Table 6. Socio-cultural sustainability indicators of care facilities for older people in Aragon.

Socio-cultural sustainability		
Size	**Living units**	**Single rooms**
		
Compliant	Compliant	Compliant
Non-compliant	Non-compliant	Non-compliant
	Unknown	Unknown

4.2. Environmental sustainability

Considering the construction periods defined by ERESEE 2020, only 43 care facilities have been built since 2008 and therefore meet the Spanish Technical Building Code energy efficiency standards. Among the remaining non-efficient care homes, 154 were constructed between 1981 and 2007, and 75 were built in 1980 or earlier. Based on energy consumption data from the Energy Efficiency Certificate, only five care facilities have an A or B rating, while 59 have lower ratings and 208 lack an energy certificate. Regarding carbon emissions, nine centers have an A or B rating (Table 7).

Table 7. Environmental sustainability indicators of care facilities for older people in Aragon.

Environmental sustainability		
Construction year	**Energy consumption**	**Carbon emissions**
		
Compliant	Compliant	Compliant
Non-compliant (inefficient)	Non-compliant	Non-compliant
Non-compliant (very inefficient)	Unknown	Unknown

4.3. Economic sustainability

4.3.1. Cost of renovating care facilities in Aragon

The cost of the homelike living units currently being implemented in the nine care facilities for older people managed by the Government of Aragon ranges from €324/m² to €2,084/m² (Table 8). Projects exceeding €1,000/m² typically involve structural or envelope elements, whereas renovations focused on interior features average around €800/m².

El coste económico de las unidades de convivencia que se están implantando en los centros residenciales para personas mayores del IASS se mueve en un rango de los 324€/m² a los 2.084€/m² (Tabla 8). No obstante, los proyectos de mejora que superan los 1.000 €/m² son aquellos que también afectan a elementos estructurales o de la envolvente. En cambio, las rehabilitaciones que solo intervienen en los elementos interiores se mantienen en una media de 800€/m².

Table 8. Cost of person-centered living units implemented by the Government of Aragon.

Care homes	Living units	Living unit area	Care home area	Renovation percentage	Structural renovation	Envelope renovation	CEB [1]	CEB/m²
Albarracín	2	807	2,803	29%	x	x	846,845€	1,270€
Borja	5	2,212	7,881	28%	x	x	3,809,607€	2,084€
Calatayud	1	310	3,638	9%			252,977€	987€
Ciudad de Huesca	2	1,302	14,884	9%			937,500€	871€
Hogar Doz	2	836	9,666	9%			530,382€	768€
Javalambre I	3	4,344	27,910	16%	x		3,664,715€	1,021€
Javalambre II	1	899	27,910	3%	x		1,003,483€	1,351€
Romareda	1	900	20,795	4%			241,175€	324€
Sagrada Familia	2	445	12,733	3%			287,418€	782€
Utrillas	2	675	3,398	20%	x		1,071,207€	1,920€

[1] The cost estimate includes the Contract Execution Budget (CEB), with 21% VAT applied to the sum of the Material Execution Budget (MEB), General Expenses (GE, 13% of MEB), and Industrial Profit (BI, 6% of MEB).

Assuming a Contract Execution Budget (CEB) of €800/m² and a 10% renovation area (scenario S1), the estimated cost to improve the socio-cultural sustainability of the 111 care facilities for older people in Aragon without living units is €31.7 million. This calculation is based on a total renovation area of 39,636 m², according to the Land Registry data. Including care facilities with unknown living unit status—140 care homes totaling 81,022 m² (scenario S2)—increases the investment to €64.8 million.

For a comprehensive renovation of the care homes in Aragon—implementing living units (socio-cultural sustainability) and improving the envelope (environmental sustainability)—, a CEB of €1,500/m² and a 25% renovation area are assumed. The cost for care facilities lacking living units surpasses €40.8 million for buildings constructed before 1980 (scenario S3). For all inefficient facilities built before 2008 (scenario S4), the investment reaches €105.8 million. Including care homes with unknown living unit status, the estimated cost rises to €101.0 million (scenario S5) and €245.9 million (scenario S6). Detailed characteristics of these six scenarios are provided in Table 9.

565 **Table 9.** Renovation costs for care facilities for older people in Aragon based on proposed scenarios.

Renovation	Scenario	CEB/m²	Living units	Building period	Renovation percentage	Care facilities	Renovated area	Economic impact
Interior	S1	800	None	-	10%	111	39,636	€31,7 million
Interior	S2	800	None + unknown	-	10%	251	81,022	€64,8 million
Comprehensive	S3	1,500	None	<1980	25%	27	27,193	€40,8 million
Comprehensive	S4	1,500	None	<2008	25%	91	70,527	€105,8 million
Comprehensive	S5	1,500	None + unknown	<1980	25%	70	67,362	€101,0 million
Comprehensive	S6	1,500	None + unknown	<2008	25%	215	163,923	€245,9 million

566

567 4.3.2. Savings from renovating care facilities in Aragon

568 The estimated values for thermal transmittance and insulation thicknesses in care facilities
569 for older people in Aragon are based on a scenario assuming 60% savings in energy and
570 carbon emissions, in accordance with ERESEE 2020 guidelines (Secretaría General de
571 Agenda Urbana y Vivienda, 2020).

572 Table 10 provides the thermal transmittances (W/m²·K) of the building envelope in its
573 existing condition, along with the transmittances proposed for the renovation scenario.
574 These transmittance values have been used to establish minimum required insulation
575 thicknesses, assuming a material conductivity of 0.035 W/m·K and aiming for a 60%
576 reduction in environmental impact (*RuralREGEN. Estudio sobre el estado de la rehabilitación*
577 *energética de viviendas en el ámbito rural en España: diagnóstico, barreras y soluciones*, 2022).

578 **Table 10.** Thermal transmittance (W/m²·K) and insulation thickness (cm) of building envelope
579 elements by construction period in the existing condition and renovation scenarios.

Scenario	Values	Elements	<1900	1901-1940	1941-1960	1961-1980	1981-2007
Existing condition	Thermal transmittance (W/m²·K)	Wall	2.12	2.12	2.12	1.85	1.40
		Roof	3.00	3.00	2.47	2.03	1.13
		Floor	1.45	1.45	1.45	1.52	1.20
		Windows	4.24	4.24	4.24	4.24	4.04
Renovation	Thermal transmittance (W/m²·K)	Wall	0.50	0.50	0.50	0.50	0.50
		Roof	0.44	0.44	0.44	0.44	0.44
		Floor	0.64	0.64	0.64	0.64	0.64
		Windows	1.81	1.81	1.81	1.81	1.81
Renovation	Insulation thickness (cm)	Wall	53	53	53	51	45
		Roof	68	68	65	62	38
		Floor	31	31	31	38	34

580

581 By improving thermal insulation as proposed in the renovation scenario, total energy
582 savings in Aragon are expected to reach 149.4 gigawatt-hours annually, with an overall
583 reduction of 32.2 thousand tons of CO_2 equivalent per year (Table 11). Care facilities for
584 older people built between 1961 and 2007 would see the greatest savings, as they comprise
585 85.9% of the total building stock that needs to be renovated.

586

Table 11. Energy and carbon emissions savings from improved thermal insulation in care facilities for older people in Aragon, categorized by construction periods.

Building period	Energy consumption (kWh/m²/year)	Carbon emissions (kgCO_2eq/m²/year)	Care facilities	Area	Energy savings [2] (kWh/year)	Emissions savings [2] (kgCO2eq/year)
<1900	400.0 [1]	100.0 [1]	6	11,834	2,840,160	710,040
1901-1940	386.0	88.1	14	50,074	11,597,138	2,646,912
1941-1960	313.4	72.3	12	38,686	7,274,515	1,678,199
1961-1980	298.7	69.6	46	225,674	40,445,294	9,424,146
1981-2007	318.6	65.1	149	456,482	87,261,099	17,830,187
Total	313.7	67.0	227	782,750	149,418,207	32,289,483

[1] Energy consumption and carbon emissions for care facilities built before 1900 are estimates, as none of the six care homes from that period hold an energy efficiency certificate.
[2] A 60% savings rate is assumed in line with the proposed scenario.

5. Discussion

The assessment of care facilities for older people in Aragon, presented in the previous section, highlights the need to enhance long-term care environments, guided by a three-fold approach to sustainability. This section provides a critical reflection on the five key findings from the study in Aragon: territorial inequalities in access to care homes; the prevalence of private management in long-term care services; the limited adoption of a person-centered care model in care facilities (socio-cultural sustainability); the energy inefficiency of the existing building stock (environmental sustainability); and the significant investment needed to achieve holistic sustainability in these care homes (economic sustainability).

The first finding, based on the analysis of the existing care home building stock in Aragon, highlights a clear regional imbalance in the distribution of care facilities for older people. Zaragoza, the capital of Aragon, holds 67% of the region's available long-term places. While this can partly be attributed to Zaragoza's higher population density and subsequent demand for care services, the concentration of facilities in urban areas—114 out of 272 care homes are in provincial capitals—reveals a pattern that leaves much of the rural population with limited access to these infrastructures. This urban concentration directly impacts the ability of older adults in rural areas to access formal care, which, over time, may lead to forced migration to urban areas in search of these care services, exacerbating rural aging and depopulation.

The second significant finding is the prevalence of private ownership in the management of care homes for older adults in Aragon. Approximately 71.3% of these care facilities are privately owned, with 44.5% managed by commercial entities and 26.8% by non-profit organizations, mainly religious. This strong private presence reflects a commercial approach to long-term care, which can impact both the quality and accessibility of care services, particularly in lower-income areas. Zaragoza has the highest concentration of private facilities, while Teruel, which has the lowest population density and gross disposable income, is the only province where public care homes are predominant.

This situation highlights the need for public care services in areas with less appeal for private investment. In regions where commercial viability is low, as in Teruel, the public sector plays a critical role in ensuring fair access to long-term care for older adults. Nevertheless, the growing outsourcing of care services—30.3% of long-term places are funded by the Government of Aragon through the Framework Agreement—indicates a shift toward partial privatization of the care sector. Public-private collaboration can be

effective when quality standards and affordability are secured, but risks may arise if these care services are not well-managed, leading to inequalities in access.

Care homes for older people in Aragon also face considerable challenges in terms of socio-cultural sustainability. Only 21 facilities have implemented the small-scale person-centered living units recommended by the SAAD Agreement, which create a homelike environment and improve residents' quality of life. Moreover, 25% of care facilities need to reduce their capacity, and only 12% have an appropriate proportion of single bedrooms. These indicators suggest that most care homes in Aragon have yet to adapt to provide dignified, personalized care as envisioned by the person-centered care model.

However, the limited implementation of these homelike living units could be due to the considerable economic costs associated with shifting to a new person-centered care model. Adapting care homes in Aragon requires significant investment, estimated between 31.7 million and 245.9 million euros, depending on the extent of the changes. This elevated cost raises questions about the feasibility of these renovations, particularly given the limited resources of Social Security. Nonetheless, the substantial improvement in residents' quality of life and socio-cultural sustainability underscores the importance to seek additional funding sources or adopting mixed investment models.

In terms of environmental sustainability, one of the greatest challenges for Aragon's care homes is energy inefficiency. Approximately 84.2% of the care facilities were built before 2008, the year the Spanish Technical Building Code was enacted. Consequently, these buildings do not meet the current insulation standards, resulting in high energy consumption and increased carbon emissions. Energy efficiency has both environmental and economic implications, as energy-inefficient facilities incur higher operational costs, which may affect care service pricing. Furthermore, low energy efficiency impacts residents' well-being, as poorly insulated buildings create less healthy and comfortable living environments.

Improving insulation and implementing energy efficiency measures, as outlined in the proposed renovation scenarios, are key priorities to reduce the environmental impact of these care facilities and enhance residents' quality of life. Estimated energy savings could reach 149.4 GWh annually, along with a carbon emission reduction of 32.2 thousand tons, demonstrating the positive impact these interventions could have on environmental sustainability while ensuring care affordability for older adults through reduced energy costs. However, the short-term investment associated with these upgrades may be challenging to meet without substantial support from public and private sectors. In this regard, raising climate awareness and engaging all stakeholders—older adults, families, caregivers, managers, and others—is essential to minimize the environmental impact of care facilities.

6. Conclusions

The study of care facilities for older people in Aragon highlights both challenges and opportunities. The long-term care sector faces significant issues, from an uneven geographic distribution—affecting rural areas especially—to the predominance of private management and the need for enhanced holistic sustainability in these care facilities. Addressing these challenges requires public policies and strategies that ensure a fairer allocation of public resources and services, particularly focused on vulnerable areas. Public care facilities will continue to be vital, especially in provinces like Teruel, where long-term care options are limited.

On the other hand, this research also faces certain limitations worth noting. A large proportion of care facilities in Aragon lack energy efficiency certifications or detailed information on living units or bedroom types, which restricts the scope of analysis and may have affected the precision of economic estimates. Furthermore, the results should be generalized with caution, as the unique demographic and territorial characteristics of Aragon may not mirror those in other regions. Future studies could aim to gather broader data from these care homes for older people, moving beyond the current quantitative indicators to include qualitative assessments of residents' and staff well-being. A more holistic view of environmental impact could also be implemented. This would involve not only evaluating energy consumption and carbon emissions but also considering other aspects such as waste management and water usage.

From an environmental sustainability standpoint, energy retrofit, and sustainable renovation policies should be prioritized not only to align with European Commission's decarbonization goals but also to enhance the quality of life for residents and reduce long-term operating costs. On a socio-cultural level, implementing person-centered living units must be paired with sufficient funding to ensure that all older individuals can live in homelike settings tailored to their needs and wishes.

In conclusion, effective public-private collaboration should aim to guarantee equitable access to care services and uphold quality standards that protect the rights and well-being of older adults. A holistic approach that combines socio-cultural, environmental, and economic sustainability measures is essential to implementing a person-centered care model in Aragon's care facilities, fostering a more inclusive and sustainable future for older people.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the author(s) used Grammarly and ChatGPT in order to translate the paper. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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