Holistic Life Cycle Sustainability Assessment for Retail Stores and Application of Impact Reduction Strategies

Aranzazu Fernández-Vázquez [1,2] [0000-0002-5597-0085], Anna Maria Biedermann [1,2] [0000-0001-8313-1628], Natalia Muñoz López [1,2] [0000-0001-8313-1628] and José Luis Santolaya Sáenz [1] [0000-0001-7041-483X]

[1] Department of Design and Manufacturing Engineering, EINA, University of Zaragoza
[2] Member of the OAAEP research group, financed by the Government of Aragon with FEDER funds
aranfer@unizar.es

Abstract. Sustainability has become a critical value for retail stores, aligning with corporate social responsibility and the goals of the 2030 Agenda. Despite this, the spaces devoted to the retail sector remain under-researched in terms of comprehensive sustainability assessments. This paper fills this gap by conducting a Life Cycle Sustainability Assessment (LCSA) of retail stores, examining their environmental, economic, and social impacts from creation, through the use, to end-of-life. Three key sustainability indicators—Global Warming Potential, Global Costs, and Time of Labour —were analysed for a case study store in Spain. The analysis revealed that the creation phase has the highest impact across all dimensions, highlighting the importance of targeted interventions at this stage. Several strategies were proposed to reduce the store's sustainability impacts, including optimising lighting layouts, improving insulation, and reusing materials. These changes led to notable improvements, particularly in environmental and economic performance, while maintaining a balanced social impact. This research contributes to the field by offering a holistic methodology for assessing retail store sustainability and presenting practical strategies for reducing life cycle impacts. It provides a framework that can guide both designers and retailers in implementing more sustainable practices, thus addressing a critical area of sustainability research.

Keywords: Retail space, LCSA, Sustainability strategies.

1. Introduction

Retail stores are one of the most relevant formats for companies to communicate brand values, and integrating sustainability as a key one has proved to increase consumer's loyalty, while serving as a source of competitive advantage as it ensures brand awareness and improves the perceived quality of the store [1]. In addition, corporate social responsibility has established itself as an increasingly necessary value in companies: initiatives, codes, and norms aim at promoting more ethical, sustainable and respectful behaviour of companies with society and the environment. In a context in which achieving objectives of the 2030 Agenda for Sustainable Development has arisen as a priority for society and citizens, and thus clients of retail spaces, increasingly committed to sustainable practices [2], applying sustainability strategies has taken on greater relevance within brands.

Retailers have seen that sustainable development could become an important source of competitive advantage and analyse under which conditions the sustainability initiatives can give better results. In this line, the main trends of research developed in this field [3, 4] are the selection of suppliers and supply chain management, the evaluation of different types of sustainable products, the communication of sustainable actions or the sustainable management of stores. Thus, companies would be interested in adopting measures that can be positively valued by customers attending their stores, such as reducing energy and water consumptions, reducing waste generation or greater commitment and awareness by workers, but also those actions to reduce the environmental impact and economic cost of new stores and the promotion of different business models and new strategies for the retail spaces design and execution.

On the other hand, numerous research works have been carried out from the construction field to improve sustainability of its activities [5, 6]. This sector is responsible for a high number of impacts that, particularly, include the use of a huge amount of materials that come from natural resources and large energy consumptions. The application of the life cycle approach has been quite common to make environmental impact assessments [7], but it is not usual to apply a holistic approach that simultaneously studies environmental, economic and social impacts. Consequently, studies have been mainly focused on reducing environmental impacts and providing methods to guide the design, construction and operation of high performance green buildings. In addition, most of the published works focus on buildings for residential or industrial purposes, which do not consider the particularities of a retail space.

The research work associated with the construction of retail stores studies typically the whole commercial building in which the store is located [8] overlooking the significant contributions of the physical retail environment itself. In order to value the environmental impact of construction activities in the retail sector, a sustainability assessment method, tailored for Portuguese retail buildings, emphasises the use of benchmarks like Energy Intensity and Carbon Intensity [9]. In urban retail systems, sustainability efforts have expanded to include addressing the environmental impacts of shopping malls and large retail formats, with an increasing push towards integrating sustainability into city planning and retail governance [10]. A sustainability concept based on three dimensions has also led international retailers to gradually develop and implement high-performance building solutions in new or refurbished retail stores, recurring strategically to Building Sustainability Assessment (BSA) methods to increase building sustainability performance [11].

Despite the progress in integrating sustainability in construction activities, particularly through different certification patterns, the implementation of practical and effective sustainability measures in retail spaces often falls short, with many companies engaging in greenwashing rather than transformative action. This raises the need for clear criteria, as well as transparent verification systems to ensure genuine sustainability [12, 13]. Moreover, while some areas of retail, such as supply chain management, logistics, and packaging, have been thoroughly studied, retail store design remains under-researched, particularly with respect to sustainability. This work addresses the sustainability assessment of a retail space model along its entire life cycle, identifies the most significant impact source and analyses the application of improvement strategies, guiding retail space designers in developing more sustainable projects.

2. Materials and methods

2.1. Life Cycle Sustainability Assessment (LCSA)

Life Cycle Assessment (LCA) is an internationally recognized method used to evaluate the environmental impacts of a product, since considering the complete life cycle prevents burden shifting amongst different phases of a product's life [14]. It is the only one that covers the entire life cycle of the product or system, makes use of scientific knowledge in a systematic way, and has the advantage of being well supported by international standards (ISO 14040/14044:2006) [15].

According to a holistic approach to sustainability, along with environmental indicators, socio-economic indicators should also be evaluated to allow for an integrated analysis of all dimensions and the application of effective sustainable design strategies, avoiding possible trade-offs amongst categories [16]. The Life Cycle Sustainability Assessment (LCSA) is based on this approach, but there are still scarce studies and no unanimously accepted indicators exist for comprehensive sustainability assessment. Most studies focus either on environmental aspects or on the combination of environmental and economic impacts, driving to “partial" sustainability assessments [17]. Therefore, additional research is needed to improve knowledge and consolidate the standards to achieve real sustainability.

LCSA developed in this study has been carried out in accordance with the four phases defined by ISO 14040 for LCA: i) Goal and scope definition, ii) Inventory analysis, iii) Impact assessment, iv) Interpretation of results.

2.2. Life Cycle of Retail Stores

The Life Cycle of Retail Stores can be divided into three stages: **Creation, Use and End of Life**. It is necessary to evaluate its sustainability performance in each of them, considering environmental, economic, and social dimensions [18]. Many activities and different stakeholders are involved in each of these stages, and its intensity and subsequent impacts vary depending on the type of store developed, from brand new types, in which the whole store is renovated, to mere pop-up interventions [19].

However, all types or models are in any case subject to very short renewal cycles to remain attractive and competitive since retailers spend millions of dollars annually to create and/or remodel their store environment to influence customer perceptions and choices [20]. These renovation and refurbishment short cycles increase the already high impact of this type of building [21], but there is a tremendous lack of studies in this field for many reasons, such as poor data availability, lack of experience of building designers, lack of quantified environmental targets, and inability to measure performance against these targets [22].

2.3. Tools, software and databases used

Inventory data collection for the case study is done through various tools, depending on the phase of the store life cycle. For the **Creation** phase and for part of the **Use** and **End-of-life** phases, inventory data have been obtained through the construction Bill of Quantities (BoQ), since this includes all the processes, agents, materials, and costs needed for developing the construction and demolition of a retail store.

One major aspect in the incorporation of sustainability impacts into project budgets is that of being part of the construction work breakdown system (WBS) or classification system. Construction cost databases have their own WBS that can either be regionally oriented or allow calculations to be tailored to their specific location, adjusting energy costs, wages and other characteristics on a case-by-case basis [23].

Specific software tools utilise these construction costs databases to generate the BoQ of the project with a hierarchical structure that organises the information from the more general works to each small process needed. In recent years, they have evolved to meet sustainability requirements and include information not only related to the cost of the materials, but also additional environmental information. Integration of environmental assessment into cost databases makes more visible the sustainability of projects during the **Creation** phase and therefore is very useful for the decision-making process at this stage [24] allowing the use of only one tool for obtaining sustainability indicators in its three dimensions.

For this study, the 2024 version of the commercial package developed by CYPE [25] has been used, and more specifically:

- ”Arquímedes” (CYPE AQ) for the BoQ,
- “Price Generator” (GdP for Spanish version “Generador de Precios”) costs database,
- ”Life Cycle Analysis” module (CYPE LCA) for the environmental information
- ”Waste Management” module (CYPE WM) for waste generated.

Once the BoQ has been completed, information obtained includes not only the detailed cost of the works and various environmental information, but also additional information about working hours needed, types of specialised work required, average wages costs, or amount and type of waste generated.

For the **Use** phase of the store, environmental and economic data has been also obtained by modelling the store with CE3X, one of the official software in Spain for calculating the energy consumptions and emissions of a construction during its life cycle. This information has been complemented with direct data collected from different retailers about the maintenance and repairs needed during **Use** phase of the life cycle.

Finally, for the **End-of-life** stage, apart from the information obtained b y CYOE WM module, additional environmental data has been gained from SIMAPRO software and economic and labour data has been obtained directly from local WM companies.

Once the inventory phase is completed, from all the information obtained, three main indicators have been selected for the analysis, one for each sustainability dimension, as shown in Table 1, and they have finally been obtained for each one of the phases of the life cycle.

Table 1. Sustainability indicators selected for the study

	Name	Unit
Environmental indicator	Global Warming Potential (GWP)	$KgCO_2$-eq
Economic indicator	Global Costs (GC)	€
Social indicator	Time of Labour (T_l)	h

3. Case study

The store selected for this study is located in a shopping centre (SC) of a medium-large city in Spain. It has 214 square meters of usable surface area, and its plan layout is typical in the retail sector, as shown in Figure 1.

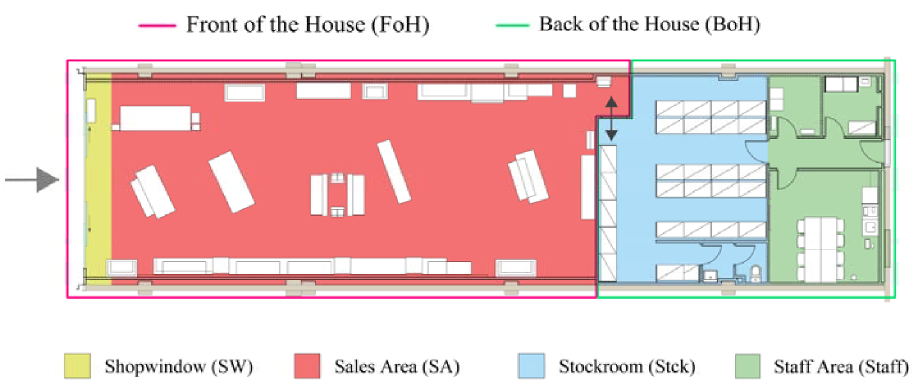

Fig. 1. Store layout

Wide-open access in the Shopwindow gives access to a Sales Area (SA) that occupies most of the surface area available, and staff area and stockroom areas, jointly identified as Back of the House (BOH), are located in the back part of the store.

The analysis is made considering the whole life cycle of the store, which includes the phases described in the standard UNE-EN 15978:2012. Thus, it has been considered the **Creation (A)**, **Use (B)** and **End-of life (C)** phases. The analysed life cycle could be any of the ones within the cycle of renovations that comprises the life cycle of a commercial space in a shopping centre or building. **Figure 2** shows this cycle referred to a retail store located in a SC. The Life Cycle of the SC is estimated at 50 years, the lifetime period considered for this typology in the main assessment methods, such as LEED or DGNB [26].

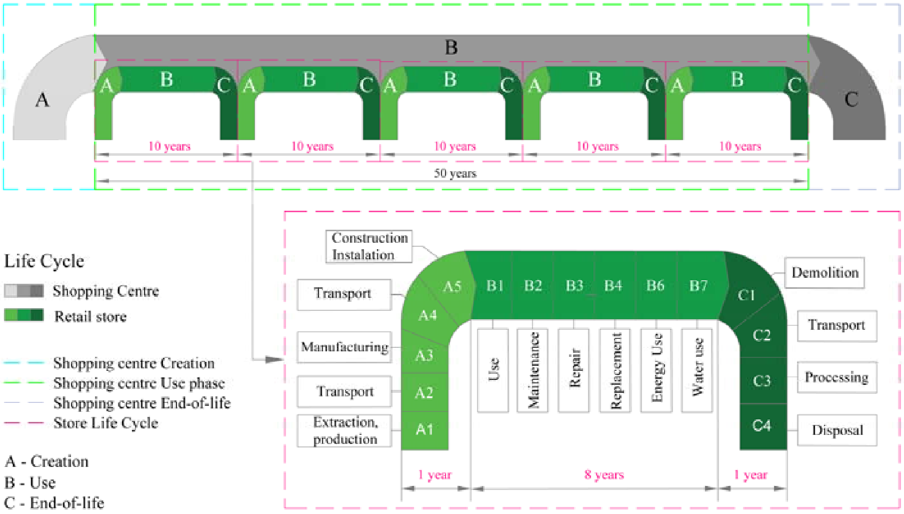

Fig. 2. Life cycle of a Retail Store in a Shopping Centre

The average lifespan of this type of store is about 10 years, but the economic costs, time, human resources, and environmental impacts associated with its construction are substantial. This is even more significant considering that the fixtures for these spaces, despite the impacts they cause, are also designed to last only for the same limited period [27].

For the **Creation** phase, construction works have been divided into 14 chapters or sections (see Table 2), although the analysis with CYPE LCA has been made considering each item of the BoQ, up to a total of 82, as individual processes, in order to allow a more detailed analysis within sections. Once the structure is created, measurements are made for each item in each section, defining items according to the database used. To maintain the consistency of data and standardise the result, all costs have been obtained from the same costs database (GdP), making the necessary corrections and adjustments if they do not coincide exactly with those included in the real project. This database defines amounts of materials and working hours for each process measured, though completing the whole project BoQ.

Once the BoQ is finished, complete project data is obtained in the form of several documents. On the one hand, the budget for the work, both global and detailed, has been obtained, broken down into the quantity of materials, hours, and type of labour required. On the other hand, the quantity and type of waste, is obtained. Finally, the corresponding environmental data is obtained through the corresponding CYPE LCA tool.

Information is provided in different formats, yet it is necessary to group it into spreadsheets that are subsequently dumped into a relational database to carry out the analysis. Meaningful indicators have been obtained for each dimension, the ones mentioned in the previous section being the ones selected: Cost (GC), Global Warming Potential (GWP), and Working Time (Tl), as shown in **Table 2.**

Table 2. Sustainability indicators of the Creation phase of the store

Section (A1+A2+A3+A4+A5)	GC (€)	GWP (Kg CO_2)	Tl (h)
Previous works	8.963,03	1.317,01	113,17
Façade	8.664,92	2.068,62	103,79
False ceilings	14.466,80	1.908,61	153,77
Carpentry	3.981,70	200,24	32,02
Masonry works	21.076,74	7.746,60	237,29
Finishes	8.992,35	1.283,83	94,62
Flooring	27.154,73	1.124,84	195,06
Painting	5.605,48	339,78	143,74
Equipment	7.034,21	377,16	104,22
Electricity	49.671,50	776,63	139,87
Mechanical	31.500,88	2.232,92	192,57
Plumbing	3.039,32	583,21	50,11
Fire protection	12.739,28	945,26	251,15
TOTAL	**202.890,94**	**20.904,71**	**1.811,38**

For the **Use** phase of the life cycle, data from CE3X, corresponding to Use, Energy and Water use (B1+B6+B7) has been also combined in spreadsheets, and a relational database, with the ones of Repair, Maintenance and Replacement (B2+B3+B4) works calculated with CYPE AQ based on information obtained directly from different retailers. Refurbishment works (B5) are not considered, as due to the short lifespan of the store, this type of work is not to be expected. All data obtained have been weighted according to the 8 years corresponding to this phase, as shown in Table 3.

Table 3. Sustainability Indicators of the Use phase

Stage	GC (€)	GWP (Kg CO_2)	Tl (h)
Use + Energy + Water (B1+B6+B7)	58.801,119	85.867,52	---
Repair + Maintenance (B2+B3+B4)	37.590,65	1.115,92	722,81
TOTAL	**96.391,76**	**86.983,44**	**722,81**

The **End-of-life** phase data has been obtained from CYPE AQ, CYPE GdP and SIMAPRO databases along with direct information collected directly by the authors. Indicators obtained for this phase are provided in Table 4, separated in data from the Demolition and Transport (C1+C2) phases on the one hand, and Processing and Disposal (C3+C4) on the other hand.

Table 4. Sustainability Indicators of the End-of-life phase

Stage	GC (€)	GWP (Kg CO_2)	TI (h)
Dem. + Transp. (C1+C2)	25.725,56	1.749,80	771,87
Proc. + Disp. (C3+C4)	444,06	2.042,31	48,00
TOTAL	**26.169,62**	**3.791,38**	**819,87**

Lastly, the total values of each phase are shown in Table 5, in which indicators are shown for the whole life cycle of a store, and also including the impact by year for the Use phase.

Table 5. Indicators of the life cycle for each phase.

Stage	GC (€)	GWP (Kg CO_2)	TI (h)
Creation	202.890,94	20.904,71	1.811,38
Use	96.391,76 (12.048,97 /year)	86.983,44 (10.872,93 / year)	722,81 (90,35 / year)
End-of-life	26.169,62	3.791,38	819,87
TOTAL	**325.452,32**	**111.679,53**	**3.354,06**

It can be noticed that **Creation** phase is the one with the biggest impact in the life cycle in all categories in relation to its duration, considering that it lasts for less than a year while the **Use** phase lasts eight years. The value of the economic and social indicator is much higher at this phase, but so is the value of the environmental indicator when compared on an annual impact basis. As store renovations are many over time, the high impacts of the **Creation** phase are a recurring problem, with stores producing very high impacts over and over again.

This results are aligned with many other studies in this field [23,28], which note the high impact of the **Creation** phase, and support the need for further studies to reduce the impacts of this phase within the life cycle.

If detailed data from the **Creation** phase is analysed, electricity appears as the section with the higher economic indicator, mainly due to the high quantity of spotlights installed; and masonry works is the section with the highest environmental indicator value and the second highest social indicator value, associated with plasterboard walls and drylining execution.

In the **Use** phase, the highest emissions and energy consumptions are related to the heating of the store. This type of construction does not have to accomplish insulation conditions as strict as other typologies, and therefore, they are not well insulated and consume a lot of energy that is dissipated through their partitions with other stores. The **Use** phase is the one with the lowest impacts in the year-by-year comparison in the economic and social dimensions, although the total duration of 8 years accumulates a significant impact, especially in the environmental dimension.

Finally, social impacts in the **End-of-life** phase, mainly in demolition and transport (C1+C2), are very high in relation to the environmental and economic indicators of this phase when compared with the other two phases of the life cycle. Demolition works, due to its nature, are very intensive in terms of labour, as materials needed for these works are minimal, and also require less skilled workers than others, and consequently, generally with lower wages.

4. Strategies for reducing the impacts of a retail store

Some strategies can be proposed for improving the performance of a retail store in the different phases of its life cycle, taking as a reference the eight categories of strategies defined in LiDS (Life Cycle Design Strategy) wheel [29] shown in **Figure 3**. The 3R's of Circular Economy have been also considered in the proposal, specifically the first two (Reduce and Reuse), as the system boundaries established in the analysis limit the possibilities to work on significant improvement regarding the third one (Recycle). The strategies outlined in each phase of the life cycle are as follows:

In the Creation phase:
- **Material impact (1):** Better results can be obtained by selecting materials having less impact in all categories, including sustainability certifications, and by enabling better recycling processes (third R).
- **Reduction of materials (2).** Improving the lighting layout study for stores, giving priority to issues of sustainability and efficiency over those of an aesthetic or ornamental nature, would reduce (first R) the cost in **Creation** phase and consumption in **Use** phase. Accordingly, a one-third reduction in the number of spotlights in the store has been considered as **Strategy A**.
- **Optimization of production techniques (3).** Improving insulation of partitions, making it compulsory to comply with efficiency regulations in the construction of stores, as it has been done with other building typologies. Including rock wool insulation in partition walls and wall linings has been considered as **Strategy B**.
- **Distribution optimization (4).** Selecting materials produced by local manufacturers would allow reducing transport emissions and costs.

In the Use phase:
- **User experience optimization (5):** To take advantage of the existing space during **Use** Phase, without the need for major refurbishment operations beyond those necessary for maintenance.
- **Optimization of the initial life-time (6)**: Designing stores with materials and finishes that can last longer, enlarging the **Use** phase of the store. This decision, although it must be made by brands, can be sustained and promoted by implementing policies and standards that regulate the characteristics of the materials and the conditions necessary for the renovation of a space to be carried out.

In the End-of-life phase:
- **Optimization of end-of-life system (7):** Minimising demolition work to reduce (first R) the working hours of low skilled workers, thus improving more qualified and better paid working hours on average. It is known that less demolition also

implies less waste management, hence less emissions, so this objective should be addressed for many reasons. Consequently, **Strategy C** is proposed consisting of reducing the demolition to be carried out in the end-of-life phase, maintaining those existing elements that can be reused (second R) by the future occupant of the space but without conditioning the design of the space.

- **New concept development (8).** The design of the store should consider the pre-existing elements for reducing (first R) overall cost and impacts of Creation phase and end-of-life by reusing (second R) existing elements from the previous store. For this purpose, a combination of established rules and standards along with promoting research about new types and models of stores should be fostered. Some of the elements that could be reused are the one of masonry works, the section with the highest value of environmental and social indicators, as mentioned.

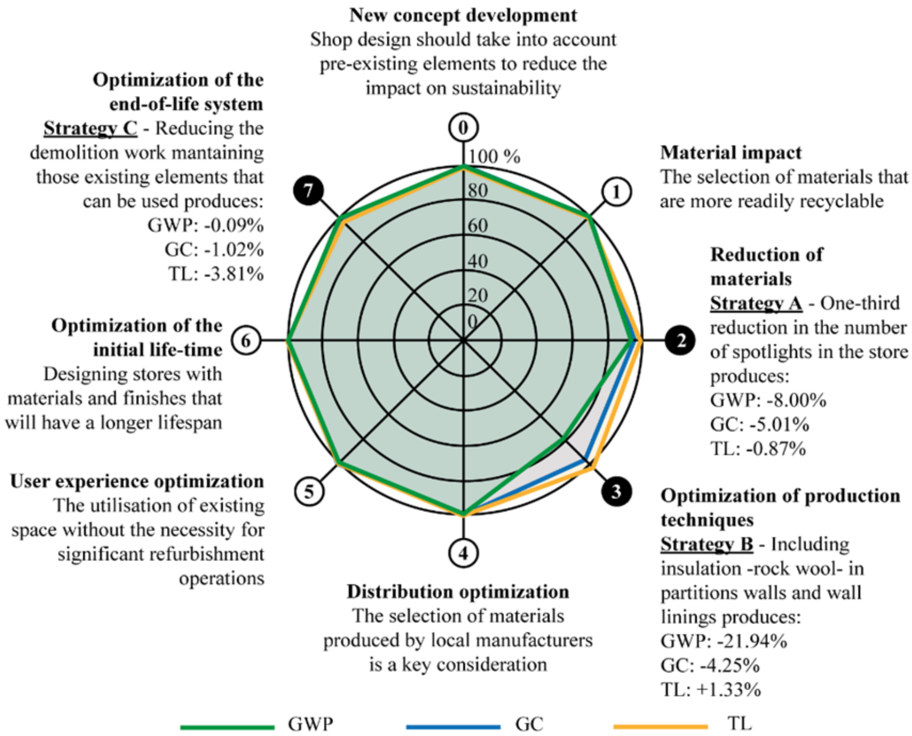

Fig. 3. Percentage reduction in each sustainability indicator after implementing selected sustainability improvement strategies based on the LiDS Wheel.

Improvement strategies A, B and C are applied to the initial case study and assessed for their impact on sustainability. These strategies affect the categories defined in the Lids Wheel of Material Reduction (2), Optimisation of Production Techniques (3) and Optimisation of the End of Life of the System (7) respectively. **Figure 3** illustrates the percentage variation in each of the selected indicators in relation to the implementation of the improvement strategy in comparison to the initial case. Those strategies have been selected in order to act on the major source of impacts detected analysing the results of LCSA.

It is noted that Strategy B achieves the largest reduction in the GWP indicator (-21.94%), although it slightly increases the TL indicator (+1.33%). Strategy A achieves the largest reduction in the economic indicator (-5.01%), but barely manages to improve the social indicator (-0.87%). Strategy C barely manages to improve the impact on the environmental (-0.09%) and economic (-1.02%) indicators, but still shows the largest reduction in the social indicator (-3.81%). It is therefore proposed to evaluate the combined effect of these three strategies to determine their impact on the sustainability of the original case. The results are shown in Table 6.

Table 6. Results of the application of the Strategies proposed

ENVIRONMENTAL DIMENSION	Global Warming Potential (GWP) (Kg CO2 eq)				
	INITIAL	STRATEGY A	STRATEGY B	STRATEGY C	3 STRATEGIES COMBINED
1, Creation	20904.71	20862.17	21639.62	20904.71	21597.08
2. Use	86983.44	78224.40	61823.44	86983.44	53064.40
3. End-of-life	3791.38	3749.83	3792.42	3695.61	3655.10
TOTAL	**111779.53**	**102836.40**	**87255.48**	**111683.76**	**78316.58**

ECONOMIC DIMENSION	Global Cost (GC) (€)				
	INITIAL	STRATEGY A	STRATEGY B	STRATEGY C	3 STRATEGIES COMBINED
1, Creation	202890.94	192833.17	206048.56	202890.94	195990.79
2. Use	96391.76	90396.26	79159.93	96391.76	73164.43
3. End-of-life	26169.62	25933.36	26406.50	22836.67	22837.29
TOTAL	**325452.32**	**309162.79**	**311614.99**	**322119.37**	**291992.51**

SOCIAL DIMENSION	Time of Labour (Tl) (h)				
	INITIAL	STRATEGY A	STRATEGY B	STRATEGY C	3 STRATEGIES COMBINED
1, Creation	1811.38	1796.56	1846.53	1811.38	1831.71
2. Use	722.81	722.81	722.81	722.81	722.81
3. End-of-life	819.87	805.55	829.36	692.00	687.17
TOTAL	**3354.06**	**3324.92**	**3398.70**	**3226.19**	**3241.69**

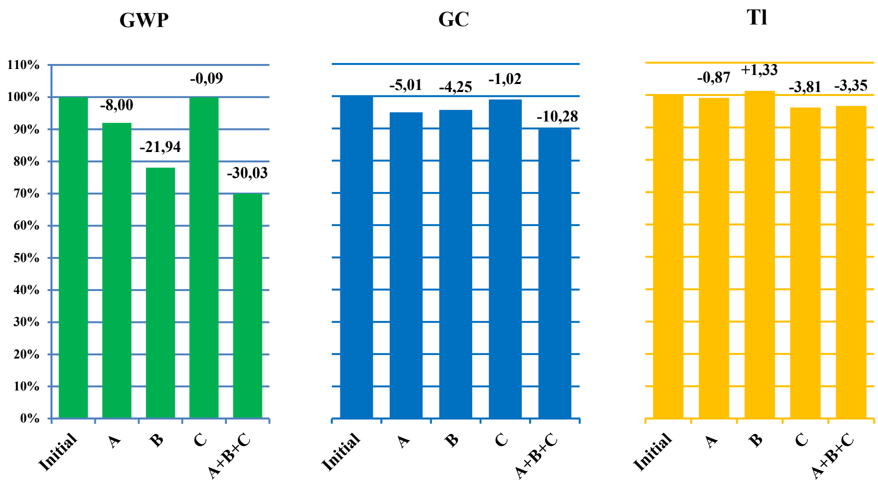

Fig. 4. Results of the application of the Strategies proposed

In conclusion, applying both individual and combined sustainability strategies significantly impacts the overall performance of a retail store throughout its life cycle. Individually, strategies A, B, and C demonstrate varied strengths across environmental, economic, and social dimensions. Strategy B, focusing on optimised production techniques, produces the greatest reduction in the greenhouse emissions, making it a standout for environmental benefits. Strategy A, emphasising material reduction, offers notable economic savings, while Strategy C shows considerable improvement in the social dimension by reducing labour costs and waste at the end-of-life phase.

When these strategies are combined, the results show compounded benefits, with reductions in total emissions, cost savings, and improved social outcomes compared to individual applications alone **(Figure 4)**. This synergy underscores the value of integrating multiple strategies for a more sustainable and holistic approach to retail store management, ultimately achieving a more balanced reduction across all sustainability indicators. This chapter's analysis confirms that a strategic combination of targeted actions is crucial for reducing the store's life cycle impacts.

5. Conclusions and further studies

This study provides a comprehensive sustainability assessment for a retail store model, covering the full life cycle from creation to end-of-life stage and obtaining environmental, economic, and social impacts, through the application of the Life Cycle Sustainability Assessment methodology. The quantitative evaluation of three key indicators: the Global Warming Potential, the Global Costs and the Time of Labour has been carried out in order to provide essential information about sustainability issues in each dimension. Thus, the distribution of impacts by life cycle stages is obtained and the most significant impact factors in each stage are identified.

The **Creation** stage of the retail store causes very high relative impacts, particularly in the economic and social dimensions. This is due to both the big amount of materials and resources used and the large number of working hours required by skilled workers along the building process. Masonry works generate very high impacts in each dimension, due to the plasterboard walls and drylining execution, but electricity appears as the section with the higher economic indicator, mainly due to the high quantity of spotlights installed. At the same time, the mechanical section, in which air conditioning units and ducts are installed, involves also significantly high indicators. The study of **Use** phase shows very high greenhouse emissions throughout the considered period as a consequence of the high consumptions related to the heating of the store. This type of construction does not have to accomplish insulation conditions as strict as other typologies, and therefore, they are not well insulated and consume a lot of energy that is dissipated through their partitions with other stores. Finally, demolition activities and the waste transport to treatment plants involve high impacts in the **End-of-life** stage mainly related to demolition works, which, due to their nature, are very intensive in terms of both time and labour costs.

According to those impact factors identified, a set of strategies have been proposed for improving the sustainability performance of the retail store throughout its life cycle. Three different strategies have been analysed in detail: Changes in the lighting layout (Strategy A); to add insulation in partition walls (Strategy B); maintenance of existing elements and reuse in future occupations (Strategy C). It is observed that sustainability performance of the retail store is notably improved when these strategies are applied in combination, with a reduction of 30% in greenhouse emissions, around 10% in costs and a little more than 3% in labour times. Strategy B is the most effective in the environmental dimension since it reduces up to almost 22% emissions but it causes a slight increase of the labour time. It should be noted that results are obtained projecting the application of these strategies on the retail store model object of study and should be supported by regulations and norms to guarantee their practical and effective application by all stakeholders.

Finally, the research contributes to the growing body of knowledge by filling the gap in comprehensive life cycle assessments of retail spaces. By providing actionable strategies that are both feasible and impactful, it paves the way for further optimization of sustainability practices in the retail sector. The results offer valuable insights for both designers and retailers, emphasising the critical role of early design decisions in minimising environmental and economic impacts. Future studies should further explore the potential of different ways of retail space renewal to enhance sustainability even further.

List of acronyms

AQ: Arquímedes (CYPE tool)
BOH: Back Of the House
BoQ: Bill of Quantities
BSA: Building Sustainability Assessment

CSR: Corporate Social Responsibility
GC: Global Costs (Economic indicator)
GdP: Price Generator (for the Spanish “Generador de precios”)
GWP: Global Warming Potential (Environmental indicator)
ISO: International Standardization Organization
LiDS: Life cycle Design Strategy
LCA: Life Cycle Assessment
LCSA: Life Cycle Sustainability Assessment
SA: Sales Area
SC: shopping Centre
Tl: Time of Labour (Social indicator)
WBS: Works Breakdown System
WM: Waste Management

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